This project has received funding from the European Union's Horizon Innovation Actions - Sustainable, secure and competitive energy supply CL-5-2021-D3-01 under Grant Agreement: 101069839

SYNERGIES

Shaping consumer-inclusive data pathwaYs towards the eNERGy transItion, through a reference Energy data Space implementation

WP6: Dissemination, Stakeholder Engagement and Business Innovation

D6.2: SYNERGIES Dissemination, Engagement and Exploitation Plan

Deliverable Leader: TXT

Due Date: M30

Dissemination Level: PU - Public

Version: 1.0

Document Log

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Internal Reviewer 1	FORNES
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Type	R — Document, report

History

Versions	Date	Description
0.1	02.04.2024	TOC definition
0.2	28.06.2024	First contribution on sections 1,2,3,4
0.3	09.09.2024	Update sections 1 and new contribution on sections 5,6
0.4	20.11.2024	Update of section 3 and 5
0.5	07.02.2025	Partners contribution on section 4 and Annexes
0.6	21.02.2025	First consolidated version for peer-reviewers
0.7	26.02.2025	Revision of internal reviewers
1.0	28.02.2025	Final version for the EC

Executive Summary

The present document provides the intermediate version of the "SYNERGIES Dissemination, Engagement and Exploitation Plan" at M30. The results presented in this deliverable derives from the work carried out in all WP6 tasks: "T6.1 Setup and Operation of the SYNERGIES Living Lab", "T6.2 Dissemination and communication Activities – Planning and Implementation", "T6.3 Exploitation and Business Innovation Planning" and "T6.4 New data sharing-driven business models for prosumers and local energy communities". The goal is to provide a complete overview of the performed activities and achieved results concerning: stakeholder engagement event organization and next period plan for SYNERGIES Living Labs; the update of project Dissemination, Engagement and Communication Strategy and Roadmap while describing the project's dissemination, engagement and communication activities executed in this period; the preliminary exploitation tasks related to the KERs list and bundle in 3 exploitation packages according to the asset nature, in addition to the first Individual Exploitation plan per each partners of the consortium and the Joint Exploitation vision with the description of the 3 key KERs BMCs; preliminary definition of new data-driven business models and opportunities arising for prosumers, local energy communities and network operators.

Concerning LLs activities, a detailed description of performed events has been provided along with the planning for next period which will be crucial for the successful implementation of the prosumers' engagement. This includes not only the organization of physical and remote workshops but also the promotion of dedicated initiatives for external actors to disseminate project results, collect feedback, elaborate best practices and support validation tasks.

Concerning communication and dissemination activities, the reporting of actions performed and materials released in this period has been provided, highlighting the results achieved in terms of KPIs and impact. More in detail, this document provides a description of the following actions:

- Update on the actual dissemination and communication plan, with roadmaps for the three project periods (M1-M30; M31-M42; M43 - + 5 years post project) and the expected outcomes, including tools to monitor progress and KPIs achievement of the different activities.
- Description of online presence and media, that includes the diffusion of SYNERGIES using online channels such as the website (and the measurement of its traffic), and social media presence (LinkedIn, YouTube), presenting achieved progress per each type of activity
- Update on the new communication materials, including brochure, video, press releases and e-newsletter that show the objectives, ongoing advances, benefits, and exploitable results generated by SYNERGIES for different target groups.
- Update on events attendance and planning (Face-to-Face and Remote), for collaboration of the project with other projects and initiatives, as well as for knowledge exchange during conferences and events of scientific and industrial nature.
- Update on new Blog news content and Publications, including papers and articles published on Zenodo.

Concerning exploitation activities of T6.3, the KERs listing and categorization in 3 major exploitation packages has been performed in its preliminary version, leading to individual and joint exploitation paths depiction. It is a comprehensive description of the relevant activities planned to ensure the exploitation of SYNERGIES's results during and beyond the end of the project focusing on the implementation of project exploitation strategy and roadmap. The critical target of all exploitation

activities of SYNERGIES is to pave the way towards the widespread adoption and sustainability of its results beyond the end of the project, thus maximizing their impact. Following the methodology applied to SYNERGIES, the present document describes more in detail the report of the activities foreseen in the Second Phase of exploitation planning focusing on the following key aspects:

1. Preliminary list of Key Exploitable Results (KERs) analysis, which will be further enriched and deepened as the technological developments of the project evolve. The identified assets are bundled in 3 major exploitation packages:
   a) Consultancy Package: this category includes services, models and methodologies developed and know-how/expertise gained thanks to the project. These KERs ownership will lead to an advantage related to acquired know how, skills and analysis.
   b) Technological Package: this category comprehends all digital solutions related to the design, development and applications of Energy Data Space and Data Marketplace, AI Analytics Platform and the several components of the Energy Service Marketplace. These KERs can generate earnings and competitive advantages for the owner and co-owners.
   c) Industrial Package**:** this category includes the value generated by partners involved in the Demo site operations leveraging on assets generated by project Demo sites and technical partners specifically for the demonstrators both in terms of physical assets (such as the goods and infrastructure used for measurements) and software related assets (such as the algorithms customization, collected data set, platform integration).
2. An update of the in-depth analysis of the project's external context was then carried out, identifying the markets of interest and their growth trends. From this analysis, it emerges that the AI applications to the energy sector relevant to SYNERGIES technologies are expected to experience growth in the coming years, thus ensuring fertile ground for the sustainability of our outcomes. Following the market study, the SWOT and Pestel analysis is performed taking into account the future joint exploitation
3. In parallel with the first definition of KERs, the analysis of intellectual property rights-related issues is also addressed, laying the groundwork for activities planned for next phase till the end of the project especially considering joint ownerships.
4. Based on the previous points, the elaboration of the exploitation strategy, roadmap and routes is provided. The exploitation objectives of SYNERGIES are highlighted in correlation with the activities planning to ensure goals achievement not only during the project but also and mainly in the post project phase. According to the classification defined for the KERs in three major packages, the exploitation routes includes both commercial exploitation of SYNERGIES solutions under different Business Models including, new Products /Services and Consultancy Services; and Scientific exploitation of SYNERGIES outcomes through continue participation in events to promote project results, such as workshops, seminars, conferences and publication of joint articles, case studies in the scientific journals. The overview of the project exploitation is presented to depict the how the KERs are applied to joint and individual exploitation based on the asset bundle they belong to.
5. The joint exploitation vision is presented based on the three key KERs, the Energy Dataspace and Data Marketplace; the AI Analytics Platform and the Energy Services Marketplace. A related preliminary business plan is outlined for all three major assets underlying the key business elements that will be then use in the final stage for the elaboration of the Business Plan.

6. The preliminary individual exploitation intentions are summarized and attached in Annex which are executed by partners to benefit from project results both in terms of business and research.

Finally, concerning the data-sharing driven BMs activities, a dedicated analysis has been performed to firstly define the energy actors involved in these actions as a target group to which the different BMs are addressed to. The goal is to determine the different aspects for energy stakeholders to obtain tangible benefits that can be monetized, either through direct participation in open energy markets or through the obtention of energy and economic savings. In Synergies 5 main target groups related to the energy data spaces have been identified considered as beneficiary of the BMs: Consumers (prosumers); Local Energy Communities (LECs); network operators (DSOs, TSOs); data providers; and data analysis and technical solution providers. With these energy actors in mind, the following list of business models have been proposed:

- Prosumers as beneficiaries:
  - Transparent and fair entry of prosumers in flexibility markets
  - Prosumer lock-in avoidance and engagement with multiple energy service vendors for increased energy autonomy and independence from energy price fluctuations
- LECs as beneficiaries:
  - Local Energy Community transformation to Flexibility Aggregator
  - Energy-as-a-Service for Local Energy Communities
- Network operators as beneficiaries:
  - TSO-DSO Data Bartering for Collaborative Flexibility-based Network Management
  - Data Intelligence-driven Predictive Maintenance for Network Assets
  - Crowdsourcing for evident investment planning in RES and Flexibility Assets

Since the exploitation strategy implementation is an iterative process, the described key aspects will be further explored and updated for its final version in D6.3 “SYNERGIES Business Innovation Plan” which will be release at M42.

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List of Acronyms/Abbreviations

Acronym/ Abbreviation	Description
BM(C)	Business Model (Canvas)
C&DC	Communication & Dissemination Category
CO	Communication Objective
DER	Distributed Energy Resources
DO	Dissemination Objective
DoA	Description of Action
DSO	Distribution System Operators
EC	European Commission
EDS	Energy Data Space
GA	Grant Agreement
KER	Key Exploitable result
KPI	Key Performance Indicator
LEC	Local Energy Community
RES	Renewable Energy Sources
ToC	Table of Content
TSO	Transmission System Operators
WP	Work Package

1 Introduction

The main aim of Section 1 is to provide a brief overview of content structure and deliverable scope in order to present comprehensive background information regarding SYNERGIES project for a better understanding of the contents displayed in the present document.

1.1 SYNERGIES Project Overview

The growing number of distributed energy resources (DERs) connected to the network continuously expands the energy system "edge", in terms of controllability and operational complexity. The progressive decentralization, which is also accompanied by the introduction of new digitalized assets (EVs, IoT, batteries), poses significant challenges for the resilience of the system, while introducing increased uncertainty in traditional control routines, given the stochastic and intermittent character of renewable generation and the new control variables (not currently addressed in existing tools for the system management) introduced by new assets.

SYNERGIES introduces a reference Energy Data Space Implementation that will attempt to unleash the data-driven innovation and sharing potential across the energy data value chain by leveraging on data and intelligence coming from diverse energy actors (prioritizing on consumers and introducing them as data owners/ providers) and coupled sectors (buildings, mobility) and effectively making them reachable and widely accessible. In turn, it will facilitate the transition from siloed data management approaches to collaborative ones which promote the creation of a data and intelligence ecosystem around energy (and other types of) data and enable the realization of data (intelligence)-driven innovative energy services. SYNERGIES solution will:

- value the flexibility capacity of consumers in optimizing energy networks' operation, maximizing RES integration and self-consumption at different levels of the system (community, building)
- evidently support network operators in optimally monitoring, operating, maintaining and planning their assets and coordinating between each other (TSO-DSO collaboration) for enhancing system resilience
- create an inclusive pathway towards the energy transition, through consumer empowerment, awareness and informed involvement in flexibility market transactions
- step on real data streams and intelligence to deliver personalized and automated features to increase prosumer acceptance and remove intrusiveness
- facilitate the establishment of sustainable LECs by enhancing their role with Aggregator and Business Service Provider functions
- establish solid grounds for the creation of a new economy around energy data produced and shared across a complex value chain, in a secure, trustful, fair and acceptable manner

In this context, SYNERGIES aims at re-conceiving data sharing against traditionally bilateral contracting applied in the energy sector and acting as multiplier of the collective data value that can be accrued, shared and traded towards achieving the resilient operation of energy systems through the coordinated optimization of their constituent components (generation, demand, storage) and the orchestrated integration with relevant sectors that can inject significant amounts of flexibility (mobility and EV charging, buildings and heating/cooling systems' control). SYNERGIES will be extensively validated in 3 large-scale demonstration sites in Greece, Spain and Denmark involving complete value chains, diverse data sources, heterogeneous energy systems/assets and spanning different socio-economic characteristics.

1.2 Deliverable Purpose and Structure

The major focus of the SYNERGIES Dissemination, Engagement and Exploitation Plan is to provide a first evaluation of the communication, dissemination and engagement activities carried out during the first project period (M1-M30): how and to which extent the project's objectives were communicated to the general public and disseminated to the appropriate target groups, how the major stakeholders were engaged for the preliminary design, co-creation and validation of the project concept, and overall how the project is performing with regards to the communication, dissemination and engagements activities and dedicated means (e.g. website, social media, printed materials, participation to events, organisation of physical and online workshops, etc).

Moreover, the present deliverable includes an additional feature compared to its first version (D6.1): it depicts the first overall picture of the exploitation strategy, the exploitation intentions of the single partners and the joint exploitation endeavours for the project results planned for the post project phase (M42 onward).

More specifically, the deliverable is structured as follows:

- *Section 2* outlines the roadmap for communication and dissemination activities for the second project period (M30-M42). It provides an update on the performances of the communication and dissemination tools and engagement channels used until M30, offering an overview of the results in terms of project website and social media, scientific publications, participation in fora and thematic events, promotional contents and communications materials developed and collaborations with sister projects.
- *Section 3* outlines the results of the engagement activities carried out up until M30, especially in terms of Living Labs, and the introduces a new tool, the Virtual living lab; moreover, the section presents the roadmap for engagement activities during the second project period (M21-M42).
- *Section 4* outlines the first version of the SYNERGIES exploitation strategy, both in terms of individual and joint exploitation. More specifically, preliminary information will be provided in terms of the Key Exploitable Results (KERs) identified by the consortium, how they've been divided in packages, IPR Analysis and Strategy, a preliminary Market Analys for the relevant sectors, the exploitation roadmap, the individual exploitation intentions for each consortium partner and a first overview of the joint exploitation strategy, including a preliminary idea of a SYNERGIES Business Model Canvas. All the single partners' exploitations intentions and the KERs factsheets will be included in the Annex.
- *Section 5* focuses on data-sharing driven business models: more specifically, the section outlines the business roles played by the different actors involved in the project and the main SYNERIGES business scenarios. In addition, it presents a set of preliminary Business Models related to energy data spaces.
- *Section 6* summarizes the next steps for communication, dissemination, engagement and exploitation activities, including information on the future updates of the present document.

The present document serves as a tool to the European Commission (EC) to assess the performances of the procedures and instruments put in place by the SYNERGIES consortium to promote and disseminate the project scope and results.

A strategy towards an efficient, consistent and finally wide and successful promotion of the project and of its results is also key to prepare the ground for the exploitation of project's results. Exploitation is tightly connected to several dissemination actions that implicitly and explicitly contribute to the timely commercialization of the project results, inside and beyond the consortium.

Similarly, a strong exploitation strategy multiplies the chances of a successful development and commercialisation of the projects resulting products and services beyond the project lifetime. The current deliverable aims to build a solid baseline for the exploitation activities. The final version of the SYNERGIES exploitation strategy will polish and specify the preliminary version presented in the current document, and it will be delivered at the end of the project (M42).

1.3 Positioning in SYNERGIES

The communication, dissemination and engagement activities included in WP6 are cross cutting to all project activities, as they are inherently embedded also to more technical tasks in WP2, WP3 and WP4 regarding the SYNERGIES Energy Data Spaces.

To this direction, the dissemination of the policy briefs to be delivered by SYNERGIES will depend on the analysis of regulation gaps performed in WP2 (task 2.3) and the learnings of the demonstration in WP5 (task 5.5).

The external validation and demonstration site engagement activities carried out in WP5 feed communication, giving the opportunity to share the results of the discussions held at the living labs and workshops.

In addition, in terms of the dissemination of contributions to standardisation activities, this builds on the demonstration activities within WP5, and on the relevant outcomes from the collaborations with the sister projects and other R&I initiatives envisioned in WP7.

Finally, this document is directly linked to

- deliverable 6.3 “SYNERGIES Business Innovation Plan” (M42), as communication, dissemination and exploitation strategies will feed into the design of a SYNERGIES Business Innovation Plan; the deliverable will also report on the final results of the dissemination, communication and engagement activities and define an associated plan for the post-project period to support the exploitation of the SYNERGIES Energy Data Space.

2 Communication, Dissemination and Engagement Activities

Section 2 describes the progress of the development of the of communication and dissemination (C&D) instruments (categories) and the relative sub actions at the moment of the submission of this Dissemination, Communication and Exploitation Plan (M30). The progress for each category will be complemented by screenshots of the online tools developed thus far. This is an ongoing process: some sub actions are almost concluded, others will be constantly carried out during the project execution (e.g., events, collaboration to sister projects and other initiatives) and others are yet to be started (e.g. dissemination of policy recommendations). Therefore, this section provides the status of the progress of Communication and Dissemination up until M30. A new update will be provided at the end of the project (M42).

Finally, section 2 outlines the activities roadmap for the second project period (M30-M42).

This section does not include information about the engagement activities such as Living Lab Workshops, which will be outlined in section 3.

2.1 Progress in a nutshell

As mentioned in deliverable 6.1, for what concerns communication, dissemination and engagement activities the project timeline had been divided into two periods: M1-M20 and M21-M42. This allowed a better planning of the activities; nonetheless, the partition of the two periods was also aligned with the different objectives that concerned the progress of the project more technical activities. As planned, whereas in the first period the main objective focused more on the promotion of the scope and the methodology of SYNERGIES and to engage the targeted stakeholders, during the second project period the attention will gradually shift towards activities targeted at disseminating the preliminary outcomes of the demonstration tasks, attracting potential users, fostering the acceptance of the project's outcomes by new and current users and stimulating the appropriate market segments to support the project's exploitation strategy.

However, some modifications to the original planning occurred, impacting both technical and non-technical (e.g. communication, dissemination and engagement) activities. As some activities technical activities experienced a shift along the project timeline (e.g. final version of requirements and architecture design, validation framework and demonstration management plan), this influenced the communication and dissemination (and exploitation activities) planning. As a result, the two partitions were modified to M1-M30, and M31-M42, in order to maintain unchanged the original alignment with all project activities.

The updated communication and dissemination roadmap and planning for the 1st period is depicted in the following picture.

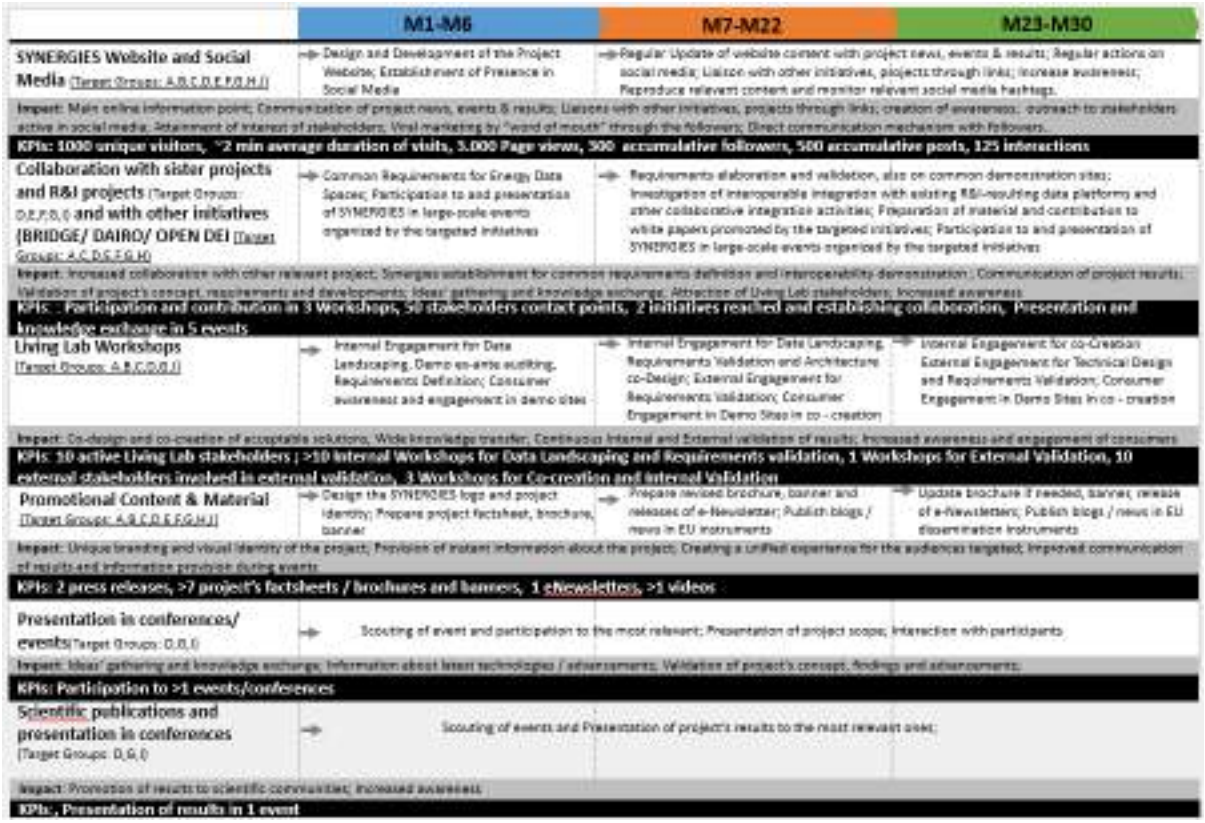

Figure 1: Updated SYNERGIES communication and dissemination roadmap for the 1st project period (M1-M30)

No substantial modification was made to the content, which is still characterized by the division between the promotion of the SYNERGIES scope and activities to attract stakeholders (key for external validation, as will be further discussed in Section 3) of Period 1 and the shift to promotion of outcomes and finally dissemination of policy recommendations and support to primary commercialization activities. The gradual shift to this latter set of activities is already ongoing: snippets and preview communications about preliminary results and first versions of the technical solutions have been published ever more frequently, giving both the general and specialized audience a taste of the progress of project activities as more concrete achievements come.

The following table depicts a general overview of the progress of all the communication and dissemination activities carried out and material produced since M1.

Figure 2: Overall progress of SYNERGIES communication, dissemination, engagements and exploitation activities

Generally, the project is performing well in its communication and dissemination endeavors. The majority of KPIs have been achieved or is in progress: KPIs about social media, communication material production and initial stakeholder engagement (e.g. living labs) have been successfully achieved; KPIs about workshop for external validation and engagement are ongoing, but several activities are being carried out to disseminate and validate the SYNERGIES solutions to stakeholders of the energy sector.

More detailed descriptions of the activity categories, with a focus on the achievement of the C&D KPIs, will be provided in the next sub-sections.

2.2 Project Web Portal and Social Media presence (M1 -M30)

As originally planned on D6.1, the project website and its social media channels are the main means of communication and dissemination for SYNERGIES.

The Project web portal was successfully launched in the first months of the project; since then, it has experienced some modifications and improving and has served as important entry point for disseminating project activities to the public at large. It has evolved into a more complete platform, where the audience can find comprehensive information on the project's scope, objectives, methodologies, and results. Additionally, the web portal contributed to familiarizing the public with the project consortium, demo site localizations, and their outcomes.

Throughout the project duration, the website has promoted the key publications detailing project results and future applications. The Communication and Dissemination coordinator has maintained and updated the website, ensuring it remains relevant. As planned, the portal has been branded with the SYNERGIES project identity, including the logo and color scheme, reinforcing a cohesive and recognizable brand presence. More details on the web portal evolution and performance will be provided in section 2.1.1.

Social media channels have played a pivotal role in creating awareness about the project among the full range of potential adopters and users within the general public. They have successfully communicated the project's concept, goals, and results, progressively laying the groundwork for the exploitation of the project's outcomes. The dedicated SYNERGIES LinkedIn page was proven to be an effective platform for dissemination to both general and sector-specific audience.

Additionally, the SYNERGIES YouTube channel was set up as planned, serving as a public repository where the audience can easily access the videos produced throughout the project lifetime. These videos have been strategically promoted through the LinkedIn page to maximize visibility and outreach. More information about the YouTube channel and the videos produced will be provided in section 2.5.3.

Other social media channels such as Twitter and Facebook were not utilized, as they were deemed less suitable for reaching the project's target audience, which is more focused on professional and scientific communities.

All partners have actively contributed to the dissemination efforts by sharing relevant content through their personal and organizational channels. This collaborative approach has effectively amplified the project's visibility and created a substantial "buzz" around SYNERGIES' activities, significantly enhancing its public impact.

2.2.1 SYNERGIES Website

As mentioned, the website was launched since the first months of the project using a WordPress platform. It is available here: https://energydataspaces.eu/

As described in D6.1, it was initially structured in the following sections: Homepage, Project (subsections: About, Objectives, Workplan), Consortium, Demo Cases and Contact.

After Month 4, two more pages were added in order to improve the website and make it more informative in terms of the continuous updates and results of the project:

• News & Events: this section promotes both events organized and attended by project partners and articles of topics related to the scope of SYNERGIES. It is periodically updated with contents provided by all consortium partners concerning their activities and main updates.

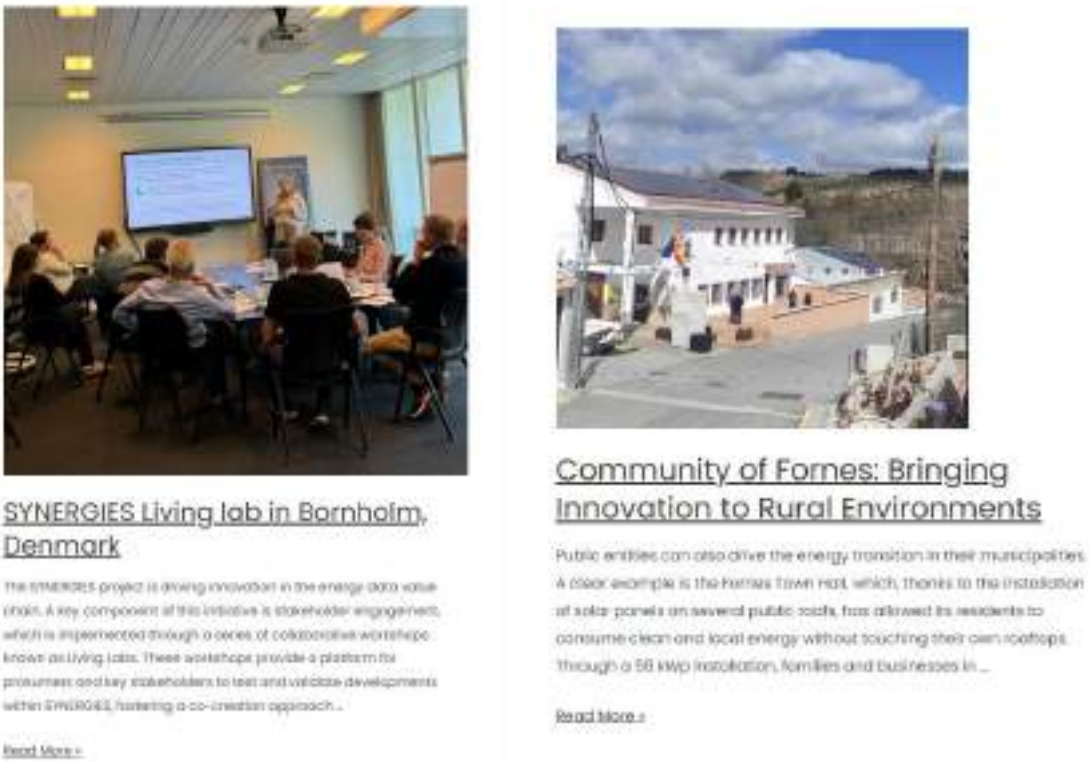

Figure 3: examples on blogposts published on the SYNERGIES website

• Resources & Network: this section includes updates about the latest activities and results, as well as the links to SYNERGIES' scientific publications, press releases, public documents.

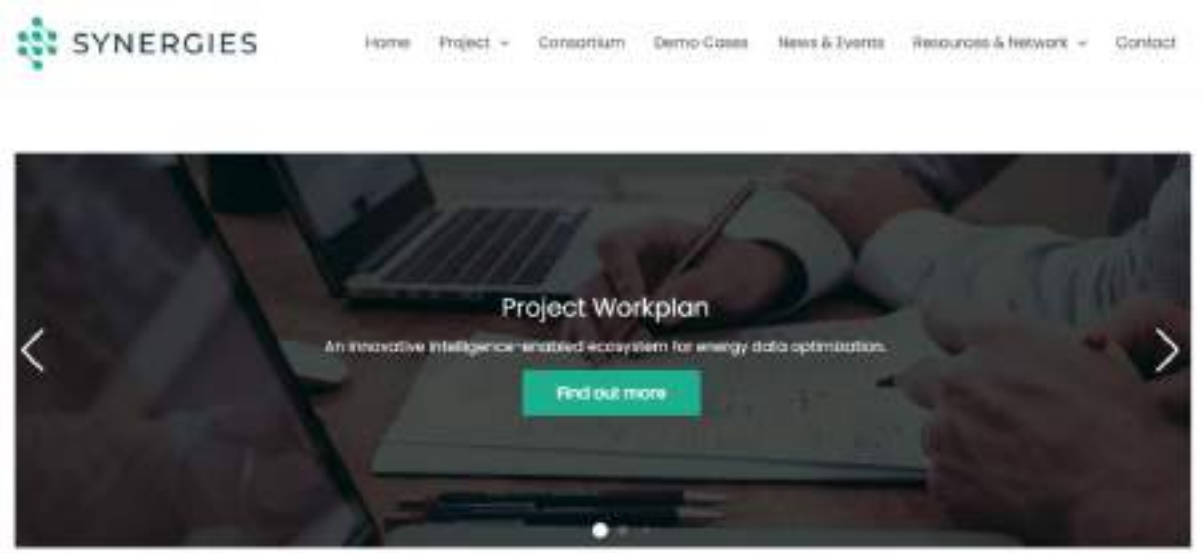

Figure 4: current homepage of the SYNERGIES website

In the framework of the discussions among WP6 partners concerning engagement, it was concluded that the website could serve as a support for external validation. As a result, the "virtual living lab" concept was defined and developed. Therefore, as a further implementation, around month 12 the "Resources and Network" page was restructured through a drop-down menu in the following sub-sections:

• Virtual Living Labs: it includes a general homepage which describes the concept of Living Labs and then specific links which redirects the users to the specific user group sections (Prosumers & Energy Communities; DSO & TSO & Energy Market Operators; Associations and EU initiatives; Regulators and Standardisation Bodies; Scientific Community). The user group sections are planned to include useful info and materials for the users to know more about data spaces and relevant benefits for them, as well as targeted surveys that the consortium will leverage to gain more knowledge towards the validation of the SYNERGIES solutions. This section is still undergoing modifications, and it is being developed by TXT in collaboration with PI (see task 6.1): TXT is in charge of the technical development of the webpage and PI is in charge of the draft of the specific contents for the target dissemination groups. More specific information about the Living lab concept and implementation are provided in section 3.1.4;

Figure 5: SYNERIGES Virtual Living Lab homepage

• Public deliverables: all public deliverables have been and will be progressively uploaded.

• Collaborations: list of all the relevant initiatives that SYNERGIES.

Finally, users' data is collected, stored and managed according to the privacy and cookies policies published on the website (footer section).

In terms of performances, the following table summarises the figures from M1 to M30[1]. Data about the users' traffic ad statistics were gathered through Google Analytic tools.

- ***Unique visitors:***

In the first 30 months of activities, the SYNERGIES webpage has performed satisfactorily, ensuring that the most important KPIs were reached before the end of the project. As outlined in the picture below, the average duration of the users' session was 2 minutes and 23 seconds, exceeding the 2 minutes set as KPI. We have almost reached the number of 3000 total users (currently 2.952); moreover, the number of current page visit, currently 7.064, is in line with expectation and the final KPI set at 10.000.

Figure 6: SYNERGIES website figures in terms of session durations, page visualisations and total users from Month 1 to Month 30

Another interesting indicator are the main sources of access to the SYNERGIES website by first-time visitors; as depicted in the picture below, the main access to the website is by directly link or by browsing the website itself: this proves that the website is well promoted and easily accessible. Other important points of access are through the channels of other relevant projects or platforms which are part of the SYNERGIES network: this highlights the strong and strategic connections that SYNERIGES has built, and which serve as useful springboard for promotion.

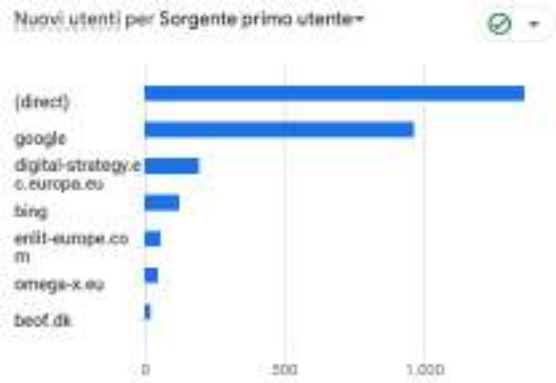

Figure 7: Main sources of access to the SYNERGIES website for first-time visitors from Month 1 to Month 30

[1] The numbers refer to data collected up to 28/02/2025.

2.2.2 SYNERGIES LinkedIn page

The SYENRGIES LinkedIn page has been active since M1, and it is frequently updated with the contribution of the entire consortium (under the coordination of TXT). As planned in the social media rotation described in D6.2, partners send their contributions for posts to be published periodically. This modus operandi guarantees both an even workload balance and that the perspective and activities of each partner are represented. As foreseen by the roadmap drafted for the first period of communication and dissemination activities (M1-M30), the posts are about SYNERGIES organization of workshops or participation to events, the development of its activities, through a specific post series called "SYNERGIES INSIGHTS", and topics related to the scope of the project.

During the last month of the first phase, the posts on the development of the SYNERGIES solutions has been progressively increasing, due also to the first release of said solutions. In this regard, for the next period (M31 onwards), a new series of posts dedicated to the single developed solutions will be launched, in collaboration with the technical partners, who will provide more specific information and review the contents that will be published.

Specific SYNERGIES hashtags and tag expressions are consistently used for each published, in order to further promote the project and create consistency and a sort of peculiar identity to the SYNERGIES social media content. In addition to this set of fixed and standard hashtags, new ones are added to each post based on the content and the target audience, in order to facilitate the outreach of these activities to the different communities that regularly use those hashtags.

The joint effort of the consortium and the SYNERGIES network (sister projects and relevant initiatives) reached a number of 264 posts about the project (duly registered in the Dissemination Plan excel sheet by TXT, the Communication and Dissemination Manager).

In terms of further performances, the following figures report the overall progress from the beginning of the project[2].

- ***Followers***

The SYNERGIES LinkedIn page currently count a total of 493 followers, gained during the first 30 months of activities.

The following pictures provides an example of the overall annual performance of the LinkedIn page in terms of followers.

[2] The numbers refer to data collected up to 28/02/2025.

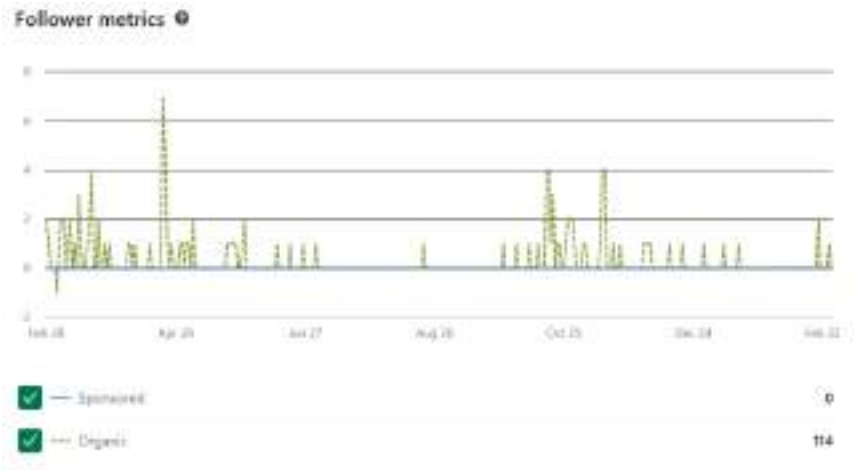

Figure 8: Followers increase of the SYNERGIRS LinkedIn page from M18 to M30 (February 2024 - February 2025)

As shown in the picture above, the number of followers has been increasing slowly but steadily and consistently: the page gained about 10 followers per month, getting to the current number of 493. It is a very positive result, considering the specific sector which SYNERGIES targets.

- **Reactions**

Up to month 30 of activities, the SYNERGIES LinkedIn page and its contents reached the audience in a successful way, counting a total of 1484 reactions (1058 until Month 19 + 426 from Month 20 to Month 30). The following pictures outlines the numbers reached since the last internal update (Month 19):

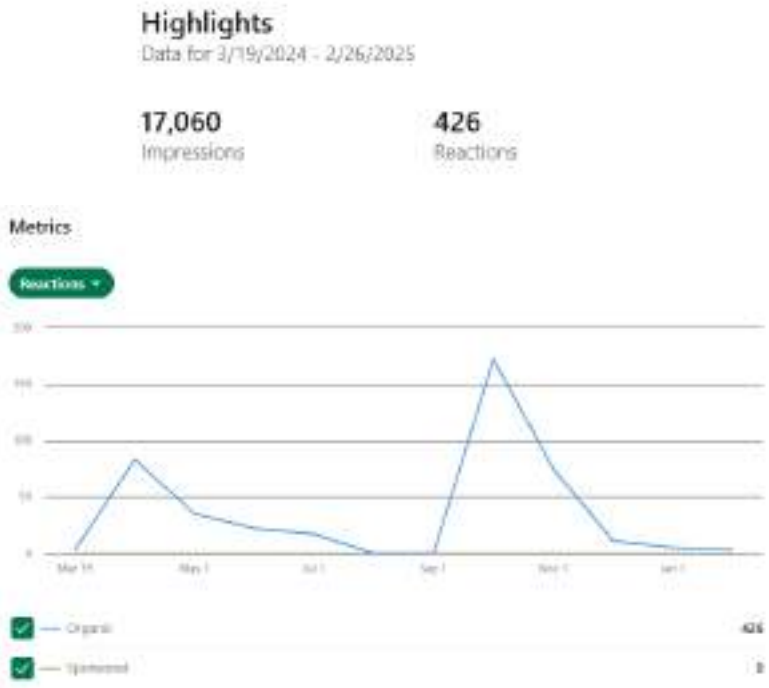

Figure 9: Increase of the SYNERGIRS LinkedIn page reactions from M19 to M30 (March 2024 - February 2025)

- ***Visitors' demographics***

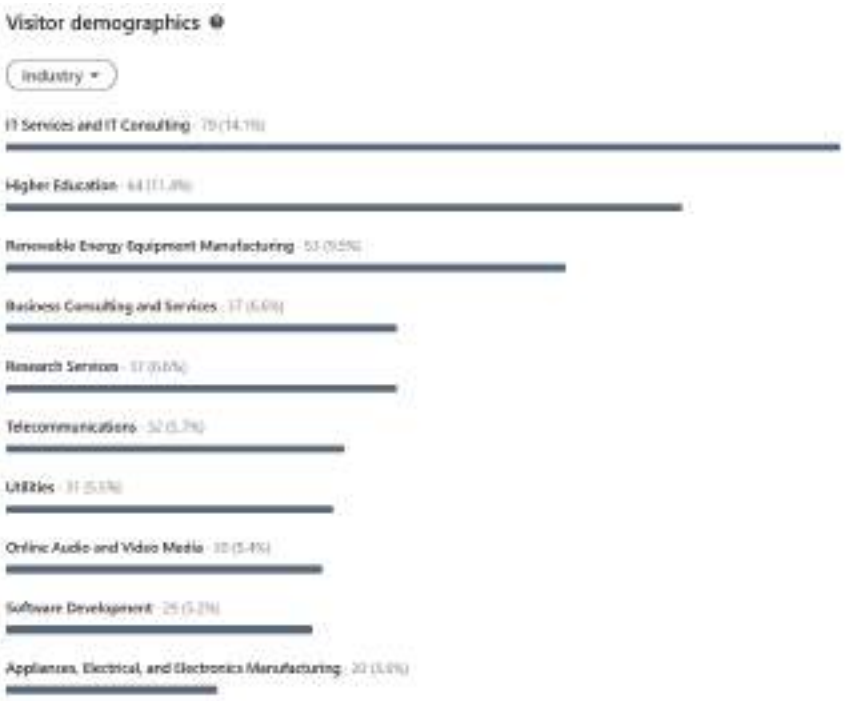

Figure 10: Demographics of the visitors of the SYNERGIRS LinkedIn page from M18 to M30 (February 2024 - February 2025)

The picture here above outlines the demographics of the visitors of the SYNERIGES LinkedIn account in the last year of activities (February 2024 - February 2025). The figure highlights how the contents published reach a share of public which is relevant and highly in line with the project's scope: IT companies, Research organizations, companies from the energy sector (utilities, telecommunication and renewable energy companies); this proves that the contents published by SYNERIGES appeal the relevant audience and reflects their interest.

2.2.3 Posts in partner social media channels

As previously outlined in the document, all project partners actively participate in the communication and dissemination of SYNERGIES activities. In addition to publishing news articles or creating dedicated SYNERGIES pages on their organization's websites, partners have successfully promoted SYNERGIES on their social media channels, with a particular focus on LinkedIn. This strategic approach has significantly enhanced SYNERGIES' reach by leveraging the partners' networks and has been critical to achieving the ambitious KPIs set for social media communication activities.

While the main communications about SYNERGIES were disseminated in English, on some occasions partners effectively utilized their native languages to further strengthen their communicative potential and engage local audiences more effectively. This multilingual approach has expanded the project's visibility and impact across different regions.

No specific content guidelines were imposed, allowing each partner the flexibility to share a variety of information, including general project updates, detailed insights into their activities within SYNERGIES, and highlights from relevant events they attended. This freedom of content creation enriched the overall communication strategy.

Partners consistently tagged the official SYNERGIES LinkedIn profile when publishing related communications, enabling the Communication and Dissemination coordinator to efficiently monitor the consortium's activities. All posts—whether newly created or re-posted to amplify content published by the SYNERGIES page—were systematically documented in the Dissemination Plan

(monitoring tool described in D6.1). This comprehensive tracking ensured accurate reporting and evaluation of the communication efforts throughout the project's duration.

Here below some examples of posts published by project partners' individual or organisation social accounts.

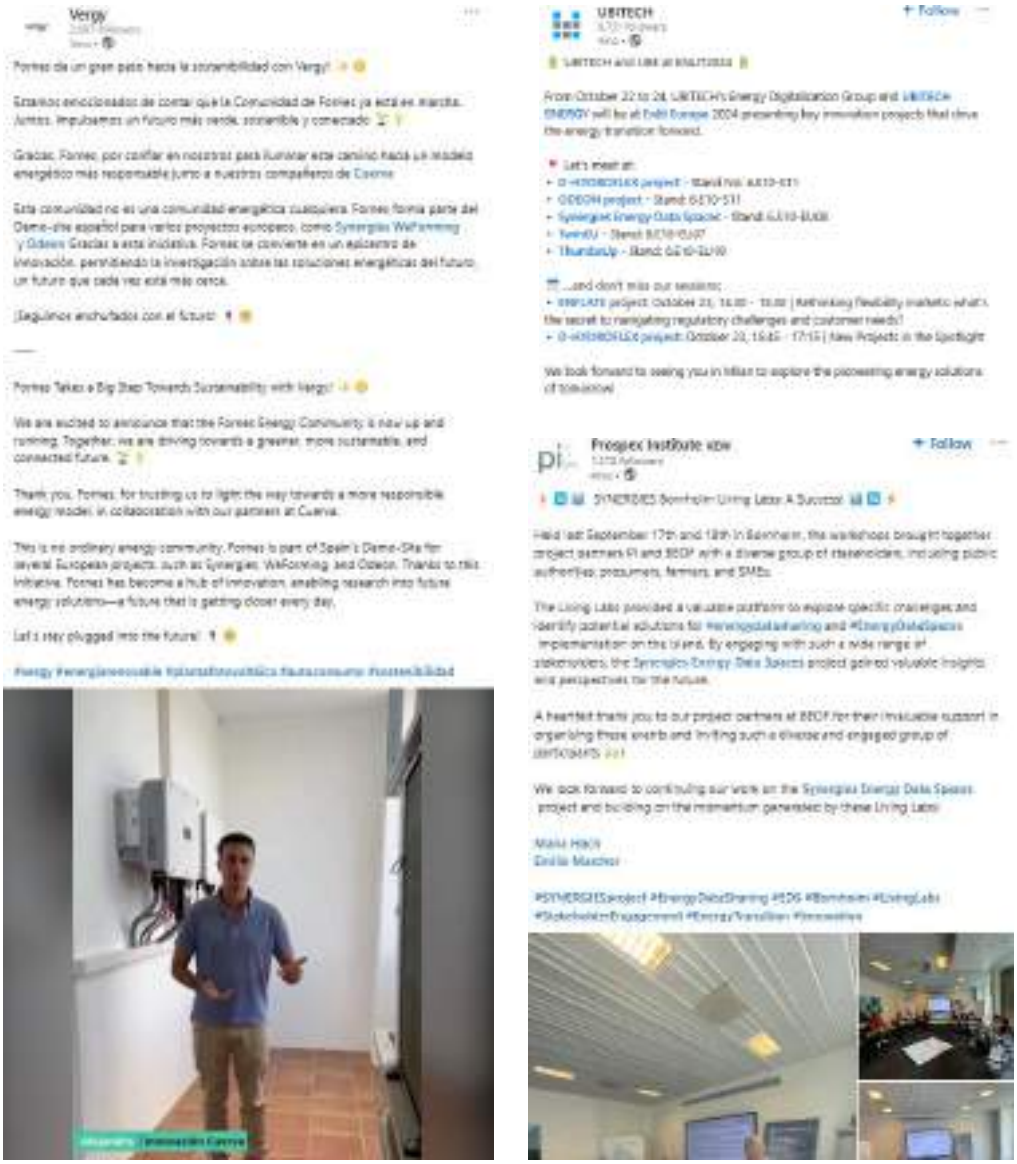

Figure 11: Examples of LinkedIn posts related to SYNERGIES published by project partners

2.3 Scientific Publications and Presentations in Conferences (M1-M30)

As outlined in D6.1, publications in scientific journals and presentations at relevant conferences have been crucial for targeting sector-specific stakeholders and engaging scientific communities that are directly or indirectly related to the scope of SYNERGIES.

Up to Month 30, SYNERGIES has been presented at various conferences and events (the complete list will be reported in the following section), although no scientific paper has been published specifically for those occasions. However, a number of 3 scientific publications have been made public through the Open Science channels, namely Zenodo. A SYNERIGES account had already been opened, an it is now populated with the four publications, namely:

Enriching Neural Network Training Dataset to Improve Worst-Case Performance Guarantees Rahul Nellikkath, Spyros Chatzivasileiadis – June 2023

Physics Informed Neural Networks for Phase Locked Loop Transient Stability Assessment Rahul Nellikkath, Andreas Venzke, Mohammad Kazem Bakhshizadeh, Ilgiz Murzakhanov, Spyros Chatzivasileiadis – March 2023

Design and Implementation of a Versatile OpenHAB IoT Testbed with a Variety of Wireless Interfaces and Sensors

Sotirios Tsakalidis, George Tsoulos, Dimitrios Kontaxis and Georgia Athanasiadou – August 2023

Moreover, all publications are in progress to be made available on the SYNERGIES website under the section "Resources and Network", "Public Deliverables and Scientific Publications".

Future publications will be treated similarly.

2.4 Participation in Fora and Thematic Events (M3-M30)

As mentioned above, from month 3[3] up to month 30 of project activities, the various partners of the consortium represented SYNERGIES in several Fora, Thematic Events, Conferences and Fairs.

SYNERGIES participated in several events with a dedicated speaking slot where it was possible to disseminate and promote the objectives and benefits put forward by the project activities. The following table summarizes the events where SYNERIGES partners had dedicated speaking slot or booths.

Event Name	Date	Location	Partner attending	Activity
Data Week 2023	June 2023	Lulea (Sweden)	SUITE5	Dedicated session "digital twins with data spaces and standards"
PACE DAYS 2023	May 2023	Berlin (Germany)	TXT	Company Innovation booth with presentation of SYNERGIES
Athens Energy Community Gathering	May 2023	Athens (Greece)	COeN	Promotion of the project to Greek Energy stakeholders
European Big Data Value Forum 2023	October 2023	Valencia (Spain)	SUITE5	Presentation of SYNERGIES "From energy big data platform to energy data spaces"
Driving the data economy in smart grids	November 2023	Bilbao (Spain)		Promoting SYNERGIES
Enlit Europe 2023	November 2023	Paris (France)	TXT, SUITE5	SYNERGIES booth + activity with sisters project

[3] Month 3 refers to December 2022, when the first report on events was provided in D6.1.

National Energy Communities Cluster Meeting	December 2023	Athens (Greece)	COeN	Promotion of SYNERGIES objectives and benefits for prosumers
Collective Energy General Assembly	January 2024	Athens (Greece)	COeN	Promotion of SYNERGIES objectives and benefits for prosumers
PACE DAYS 2024	May 2024	Berlin (Germany)	TXT	Company Innovation booth with presentation of SYNERGIES
MEDPower 2024	November 2024	Athens (Greece)	ICCS, SUITE5	Presentation of SYNERGIES of dedicated sessions
MI2.0 GPFM Task Force II Europe meeting	May 2024	Online	CIRCE	Presentation of SYNERGIES
GPFM Webinar	June 2024	Online	CIRCE	Presentation of SYNERGIES
Urban Transitions 2024	November 204	Melia Sitges (Spain)	VTT	Presentation of SYNERGIES

Table 1: List of events where SYNERGIES partners had a speaking slot or a booth to promote the project from month 3 to month 30

In other occasions, SYNERGIES partners attended events without any speaking slots; however, these occasions are very valuable opportunities to contribute to the enlargement of the network of relevant stakeholders and keep up to date with the latest technology developments and trends of the energy and data sectors. The following table summarized this kind of evets attended by SYNERIGES partners from Month 3[4] to Month 30.

Event Name	Date	Location	Partner attending
Digitalize DSOs to unlock flexibility: PLATONE project final conference	June 2023	Brussels/Online	TXT, CIRCE
'Energy Communities & Civil Society' - Public information & networking event on Energy Communities	May 2023	Athens	CoEn
First mini-festival of Greenpeace's Energy Communities Platform, "Common Power,"	October 2023	Athens	CoEn
Flex community conference	February 2024	Online	TXT, HEDNO, IPTO, UBITECH

[4] Month 3 refers to December 2022, when the first report on events was provided in D6.1.

[AI Roundtable] Ensuring Data Security in the World of AI	January 2024	Online	TXT
Folkemøde Fair	June 2024	Bornholm	BEOF
World Digital Built Environment WDBE 2024	October 2024	Helsinki/Tallin	VTT
Smart City Expo World Congress 2024	November 2024	Barcelona	VTT

Table 2: List of more general events where SYNERGIES partners attended to enlarge the network from month 3 to month 30

Events organised and attended in collaboration with Sisters Projects and other relevant Initiatives will be mentioned in section 2.6 of the present deliverable.

2.5 Promotional Content and Communication Material (M3-M30)

Promotional content and communication materials have been essential in establishing the project identity, supporting its consolidation, enhancing external recognition of SYNERGIES, and promoting it to the general public.

These materials have been widely used by project partners to officially promote SYNERGIES across various channels, including online platforms, events, fairs, workshops, and other private or public initiatives where the project has been showcased or presented.

The following sections will outline the updates, if any, in the specific materials categories.

2.5.1 Logo, power point template, press release

As outlined in D6.1, the core elements shaping the project's identity—the logo and project colors—were successfully developed and consistently applied to all promotional and communication materials. These elements were among the first to be created, alongside the launch of the social media channels and the website, ensuring a cohesive and recognizable brand from the outset.

However, since from month 3[5], there is no significant modification or update to the logo and power point template to be notified. Moreover, no additional press releases were launched to promote the project.

2.5.2 Brochure and roll-up

In addition to the abovementioned foundational elements, SYNERGIES promotional content and communication materials include two brochures and a roll-up banner.

[5] Month 3 refers to December 2022, when the first report on events was provided in D6.1.

During the first months of the project a first brochure was drafted as a preliminary version that included the main information about the project challenge, solution, objectives and main features. This brochure was officially published at Mont 4 and subsequently printed and distributed to partners at the first General Assembly in Athens at M8.

Figure 12: first version of the SYNERGIES brochure delivered at M8

Along with the first brochure, the project roll-up was delivered. It matches the graphic design of the brochure and features a very brief description of the project, a QR code which redirects the public to the SYNERGIES and the logos of the consortium partners, as well as the main SYNERGIES' communication channels and contacts.

Figure 13: SYNERGIES roll-up delivered at month 8

A second brochure was drafted in the next months, with an increased focus on bringing forward the Energy Data Space implementation and the technical features of SYNERIGES. The brochure is in A4 format (foldable in 3 sections); the content was updated and shortened focusing on a brief description of as-is situation and SYNERGIES solution highlighting the most valuable key features. Moreover, the new graphic is more in line with the Synergies colours. The new brochure was delivered at Month 12 (August 2023).

Figure 14: second version of the SYNERGIES brochure delivered at month 12

All the materials have been consistently used during all private and public events by all partners to support the promotion of the project.

The planning includes a third version of the brochure, more market oriented, which will be developed in the second period of the project (M31 onwards) to support the promotion of the technical solutions and their uptake in the energy sector.

2.5.3 Video

Up to M30, SYNERIGIES has produced 4 videos.

As planned, these videos were published on the SYNERGIES YouTube channel, which was created on Month 3; being it easily accessible to all kind of audiences, the page was and will be used as a repository for all the project video materials. The channel is available here: SYNERGIES - Energy Data Spaces - YouTube.

The first informative video has been shot and published. It was shot at TXT premises, and it represents a general explanation of the project (scope, consortium), the challenges that SYNERGIES aims to tackle and the solutions it brings forward. It targets both the general and more sector specific audiences.

Figure 15: Screenshot from SYNERGIES first informative video

The second video was produced using the material recorded during the Living Lab in Fornes; in that occasion, SYNERGIES had the opportunity to meet the City Mayor, Ana Belen Fernández Nava, and discuss the advantages that the Energy Community of Fornes can bring to the local citizens and the possibilities that SYNERGIES can bring forward. The interview consisted in 8 questions, which were recorded and later edited into a full video.

Figure 16: Screenshot from the video interview to the City Mayor of Fornes, one of the SYNERGIES demonstration sites

The third video was designed in a more fluid cartoon graphic, where the animations allow for an easier comprehension of the concept, which might result complex to a non-technical audience. The video has a more commercial flavor to it, and it outlines in a more straightforward and less technical way the objectives of the projects and how it benefits the stakeholders of the energy value chain.

Figure 17: Screenshot from SYNERGIES' video focused on objectives and benefits

A final video was produced in collaboration with Enlit Europe, during the Exhibition that took place in October 2024. SYNERGIES was invited to attend as guest to one episode of the Enlit Podcast series; a whole episode was dedicated to the SYNERIGES project, where Tasos Tsitsanis from SUITE5 outlines

the rationale behind the project and its benefits. More specifically, he presented highlighted SYNERGIES' major strengths and approach in terms of:

- interoperability within the diverse energy landscape
- prosumers engagement
- data privacy
- replication and scalability of the SYNERGIES solution throughout the different European regions
- emerging opportunities and economic benefits for the stakeholders involved

Figure 18: Screenshot from video interview at Enlit Europe 2024

An additional video is planned for the future months to showcase and promote the SYNERGIES technological solutions, which will also serve as a support for the post-project exploitation activities.

2.6 Collaboration with Sister Projects and other Initiatives (M3-M42)

As part of the activities of WP7, several activities have been carried out to effectively reach the sister projects of SYNERGIES and teaming up with them for a joint effort towards of a common set of fundamental requirements for the establishment of a common European Energy Data Space. Contact with sister projects (DATA CELLAR, EDDIE, ENERSHARE, OMEGA-X) and with the Interoperability Community (int:net) was established, as well as with other relevant initiatives such as BRIDGE, ETIP SNET, EnTEC, IDSA, DSSC, and the first joint activities were successfully completed.

The activities with these groups focused on topics such as: background and analysis of Energy Data Spaces definitions, definition of minimum requirements for the Common European Energy Data Space (CEEDS), interoperable data exchanges validation and definition of an interoperability testing framework, elaboration of business models around energy data spaces, enabling consumer and citizen engagement in energy transition and leveraging energy data spaces for flexibility markets and transactions. Most of the work was organized in topics and working groups, resulting mainly in online meetings and closed workshops and webinars.

A solid framework of continuous collaboration has been set up with the sister projects through the int:net project (which focuses on interoperability), which acts as coordinator of the energy data space related projects. As previously mentioned, most of the activities were carried out in the form of closed meetings and workshops. However, after month 3[6] some informative and discussion sessions open to the public were organized at thematic events. Some examples:

- ENLIT Europe 2023, session addressing Key Challenges for Energy Data Spaces - Paris, 28/11/2023

[6] Month 3 refers to December 2022, when the first report on events was provided in D6.1.

- EUSEW 2024, session on "Interoperability and sovereignty: sharing a European energy data space" – Brussels & online, 13/06/2024
- ENLIT Europe 2024, Session on advancing digitalization in the energy sector – Milan, 23/10/2024
- MEDPower 2024, panel session on European Data Spaces – Athens, November 2024

In addition to contributing to the interoperability of data exchanges in energy data spaces, the results of the collaboration with the sister projects and with other relevant communities and initiatives have also fed into standardization activities. More specifically, within int:net collaborative efforts were carried out to establish a unified and interoperable Common European Energy Data Space (CEEDS), which resulted in the drafting and publishing of a dedicated blueprint[7].

Moreover, SYNERIGES and the sister projects, as well as int:net, actively support each other on social media, promoting the joint activities and results thus boosting the visibility of all the projects involved.

For a more detailed report of all the activities in collaboration with the sister projects please refer to deliverable 7.1 “Intermediate Report on Interoperability Demonstration and Liaison activities”[8]

2.6.1 Collaboration with H2020/ Horizon Europe Big Energy Data Projects and other relevant initiatives

In addition to the collaboration with the sister projects, up to Month 30 SYNERIGES built and strengthened liaisons with other EU initiatives that focus on Energy and Data and other initiatives relevant to the SYNERIGES’s scope of work.

Collaboration with relevant initiatives has been extended to the active participation of SYNERGIES to the various working groups of the BRIDGE Initiative, a European Commission initiative that brings together projects from Horizon 2020 and Horizon Europe with a focus on smart energy systems, in particular Smart Grid, Energy Storage, Islands, and Digitalisation Projects. In this framework, SYNERGIES contributed to Data Exchange Reference Architecture (DERA) 3.0[9], providing targeted contributions addressing semantic interoperability enhancement, data privacy, and system sovereignty, which was published in July 2023.

Moreover, in the framework of the CEEDS, SYNERGIES actively collaborated with the Technology and Innovation Platform for Smart Networks for Energy Transition (ETIP-SNET). This involvement aimed at advancing the digital energy transition across the EU through targeted policy recommendation. As a result of this activities, SYNERGIES contributed to drafting the ETIP SNET policy paper, published on January 2nd, 2024, focusing on technical, regulatory, and organizational challenges related to energy data spaces in Europe, and suggesting appropriate policy instruments for these challenges[10]. Furthermore, SYNERGIES took part in the ETIP-SNET & BRIDGE Joint Workshop in Brussels, June 2023. This event was a significant milestone where preliminary outcomes and critical recommendations were shared, offering early insights derived from the collaborative efforts in drafting the Policy Paper on Energy Data Spaces.

Furthermore, SYNERGIES took part in the ETIP-SNET & BRIDGE Joint Workshop in Brussels, June 2023. This event was a significant milestone where preliminary outcomes and critical recommendations were shared, offering early insights derived from the collaborative efforts in drafting the Policy Paper on Energy Data Spaces.

[7] Available online here: https://intnet.eu/images/Blueprint_CEEDS_v1.0.pdf
[8] Available online here: https://energydataspaces.eu/wp-content/uploads/2024/05/D7.1-Intermediate-Report-on-Interoperability.pdf
[9] Available online here European (energy) data exchange reference architecture 3.0 - Publications Office of the EU
[10] Available online here: https://op.europa.eu/en/publication-detail/-/publication/21b0260e-a2d5-11ee-b164-01aa75ed71a1/language-en

As additional activity, through participation in the Energy Interoperability Task Force led by the Data Space Support Center (DSSC), SYNERGIES contributed to defining a framework for energy domain interoperability. This included brainstorming sessions and workshops focused on technical and semantic interoperability challenges, leading to the preparation of a white paper to guide the sector towards unified interoperability practices. SYNERGIES also provided vital insights into the Data Spaces Survey conducted by DSSC focusing on the analysis and assessment of the degree of alignment with the Data Space Building Blocks defined by DSSC.

Moreover, SYNERGIES engaged during the DSSC-Blueprint v0.5[11] consultation phase, contributing with its expertise and providing feedback based on the project viewpoint on the core building blocks that should be addressed. Finally, SYNERIGES took part in the Energy Interoperability Task Force, spearheaded by the DSSC, which marked a significant stride toward fostering interoperability within the energy sector. the task force engaged in technical and semantic interoperability workshops aimed at preparing a white paper, which was eventually published in its first version in October 2023.

Since the beginning of its activities (September 2022), SYNERGIES has been linked to the Big Data Value Association (BDVA), an industry-driven research and innovation association with a mission to develop the innovation ecosystem that enables and accelerates the data and AI economy with European values and focus. More specifically, SYNERGIES attended the annual BDVA event, participating in panel sessions:

- Data Week 2023, session on digital twins with data spaces and standards – Lulea (Sweden), 13/06/2023

Finally, SYNERGIES supported the European Commission in its endeavours to pilot a new approach to monitor Research & Innovation investments though a survey aiming to capture how projects contribute to environmental impact reduction by 2030. More specifically, the Commission requested for short impact stories on expected environmental savings, with supporting data and estimates, to which SYNERGIES dutifully contributed with its inputs.

These above-mentioned activities are only a brief overview of the collaboration with other relevant project and initiatives that produced results that were disseminated or contributed to standardisation efforts.

For a more detailed report of all the activities in collaboration with European big data energy projects and initiatives please refer to deliverable 7.1 “Intermediate Report on Interoperability Demonstration and Liaison activities”[12]

2.7 Communication and Dissemination Roadmap for the 2nd project period (M31-M42)

As well as for the first project period, the draft dissemination, communication and engagement roadmap has been updated for the 2nd period, which covers project activities running from M31 to M42. During this period, project activities will be in an advanced phase, and the project will start promoting the first results and producing the more refined versions of its technical solutions. Therefore, the focus communication and dissemination activities will shift principally on promoting the preliminary results of demonstration tasks, attracting potential users, fostering the acceptance of the project’s outcomes by new and current users and stimulating the appropriate market segments to support the project’s exploitation strategy. During the last phases, attention will be given to the

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12 Available online here: https://energydataspaces.eu/wp-content/uploads/2024/05/D7.1-Intermediate-Report-on-Interoperability.pdf

replication of the project solutions, and dissemination will also be intended to encourage the development of further outcomes in new initiatives. The 2nd project period communication activities will be targeted to the general public and to the sector-specific stakeholders.

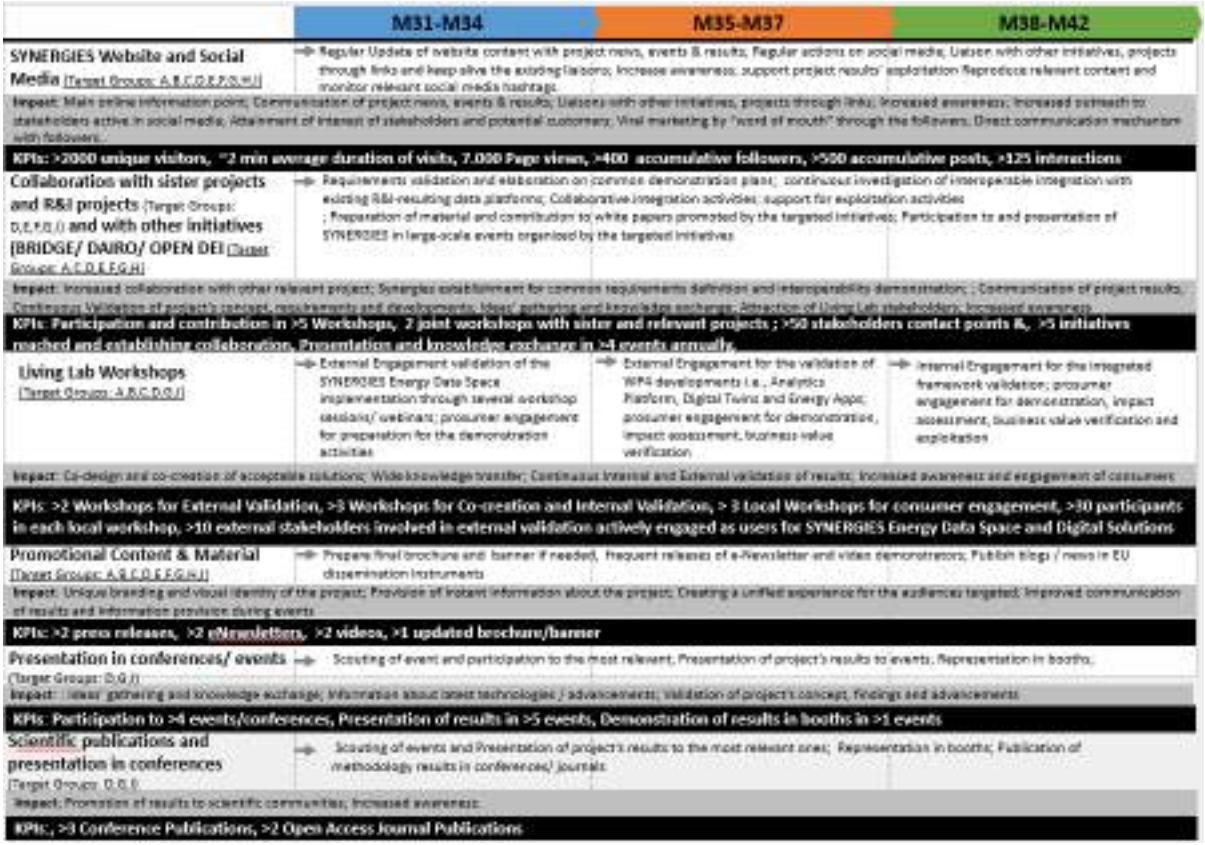

Figure 19: updated SYNERGIES communication and dissemination roadmap for the 2nd project period (M31-M42)

The communication and dissemination KPIs for the second project period are calibrated on the period's main objectives and on the Gantt for the development of project activities.

3 Stakeholder Engagement

The SYNERGIES project places significant emphasis on stakeholder engagement/co-creation. It adopts a User-Driven Innovation Approach, actively involving stakeholders throughout the innovation process. This includes energy prosumers (those who consume and produce energy) and various players across the energy value chain. The project caters to their specific needs through different engagement formats, focusing on Business-to-Consumer (B2C) and Business-to-Business (B2B) interactions, respectively.

To ensure the final data-driven ecosystem effectively meets these needs, SYNERGIES aims at capturing stakeholder feedback throughout the project lifecycle. This is achieved through various activities, held during the so-called Living Labs, that are operational throughout the project at the three demonstration sites in Greece, Spain, and Denmark.

Beyond the physical Living Labs, SYNERGIES is also exploring the concept of a Virtual Living Lab. This online platform allows continuous engagement with stakeholders, regardless of location. This approach fosters user engagement and helps gather feedback from a wider, geographically diverse audience.

Moreover, SYNERGIES further bolsters its stakeholder engagement efforts through active participation in the BRIDGE Initiative. This European Commission initiative unites projects focused on Smart Grids, Energy Storage, Islands, and Digitalization.

Finally, SYNERGIES strengthen the positioning of its solutions by carrying out external validation activities aimed to assess the applicability and effectiveness of the technical solutions developed within the project
Finally,

This section delves into the achievements of the SYNERGIES project's stakeholder engagement efforts during the first 30 months. It focuses on three key areas previously introduced: Living Labs, the Virtual Living Lab concept, participation in the BRIDGE Initiative and external validation activities. The section also provides a roadmap for future stakeholder engagement activities in the coming months.
Following a chronological structure, Section 3.1 details the specific activities undertaken from project months 1 to 30. Section 3.2 then explores the planned activities for months 31 to 42, generally outlining the project's roadmap for future stakeholder engagement initiatives.

3.1 First period reporting (M1-M30)

During the first reporting period the first two Living Labs were organised and implemented in the Greek and Spanish demo-sites.
Conducted in May 2023 (M9), both Living Labs focused on prosumers and local energy community leaders, as identified by the demo site partners. These B2C Living Labs provided a platform for direct engagement with these key stakeholder groups.

3.1.1 Living Labs in Greece

The SYNERGIES project kicked off its B2C Living Lab activities on May 8th 2023, in Athens, Greece. This initial workshop was a collaborative effort between project partners Prospex Institute (PI) and Energeiaki Koinotita Periorismenis Evthinis (CoEn) and had twenty local energy community leaders from Eastern Europe and the Balkan region attending. The workshop was held as part of a larger event organized by REScoop, a European organization uniting over 1.9 million citizens interested in a sustainable energy future. REScoop's network boasts more than 1,900 energy communities across Europe, all working towards a more sustainable energy landscape.

The logistical aspects of the workshop, including participant registration and GDPR compliance, were managed by REScoop. The event's workshop design was handled by SYNERGIES' project partners, Prospex Institute (PI) and CoEn.

The workshop preparation spanned over months and was managed by Prospex Institute (PI) and CoEn, that collaborated closely to shape the workshop. Through a series of internal meetings, both organisations established the workshop's goals and objectives and crafted the facilitation plan.

REScoop determined the workshop's duration and scope, and within the allocated hour and a half, PI developed a comprehensive facilitation plan. Additionally, Kostas Tsatsakis from the technical project partner Suite5 presented and introduced participants to the SYNERGIES project during the first part of the workshop.

The workshop was facilitated by PI engagement experts. They, along with CoEn and Suite5, conducted a dry run to fine-tune the facilitation plan and address technical setups. The workshop was held at the ImpactHub in Athens, a co-working space in the city center known for hosting workshops aimed at fostering innovative, citizen-led projects.

At REScoop's Community Energy Spring Gathering in Athens, the SYNERGIES project held a side-event workshop titled "The Benefits of Energy Data Platforms for Local Energy Communities." This workshop delved into the potential value these platforms offer to such communities. The workshop, co-designed by SYNERGIES' project partners PI and CoEn, had the following objectives:

- To discuss benefits of common energy data spaces for local energy communities;
- To understand the barriers that energy communities are facing in the development of common energy data spaces;
- To come up with solutions to overcome the barriers identified by the energy communities;
- To get insights on the priorities according to the local energy communities to successfully implement common energy data spaces.

Following the interactive nature of the Living Labs, during the workshop participants were engaged in different activities. They actively participated in three brainstorming sessions, exploring the advantages of common energy data spaces for their respective local energy communities, potential barriers these communities might face in developing such spaces and possible solutions to overcome those barriers. Such brainstorming sessions were structured in interactive exercises, where participants were divided in two groups of 10 people each. The reasoning for adopting this particular structure is rooted in the desire to motivate each group to develop ideas, identify similarities or synergies among responses, and enhance individual participant involvement in the group discussion.
The workshop offered valuable insights. Firstly, it revealed that most local energy community leaders were unfamiliar with common energy data spaces. This underscored the project's innovative nature, but also the need for clear communication strategies to bridge the gap for non-experts, even those with existing energy project experience.

A key concern raised by participants was data transparency for prosumers within these spaces. This encompassed both personal data (names and addresses) and energy data (individual consumption, appliance usage patterns, and costs). Notably, the discussion highlighted a preference for a bottom-up approach to design, development, and implementation. This included a focus on open data/open-source models to ensure independence from large technology companies or centralized authorities.
Overall, participants at the workshop were generally enthusiastic about the potential benefits of common energy data spaces. However, there was a clear consensus that wider adoption by prosumers and active engagement from energy communities require careful consideration of data security and privacy.

Figure 20: Some pictures from the first SYNERGIES Living Lab in Athens, Greece

3.1.2 Living Lab in Spain

The second B2C workshop took place on the 16th of May 2023 in Granada, Spain, and it comprised three different activities. First, the Cuerva Workshop with experts from project partners Cuerva and Vergy. Second, an interview with the Mayor of Fornes, Mrs. Maria Belen. Finally, a workshop in Fornes with citizens. During a day full of activities and exchanges, 12 experts and around 50 citizens (who attended respectively the Expert workshop in Cuerva and the Citizen Workshop in Fornes,) were introduced to the concept of common energy data spaces and the SYNERGIES project.

In this case the logistical coordination of the workshop, including participant registration and adherence to GDPR policies, was managed by project partners Cuerva and Vergy. Additionally, the design of the workshop for the event was crafted by PI and Vergy.
The workshop was scheduled for a duration of two hours, with a comprehensive facilitation plan developed by PI that incorporated all previously mentioned elements. Conducted entirely in Spanish, the workshop was moderated by PI.
The overall preparation spanned over the previous months and involved different meetings held between PI and Vergy. Prior to the event, PI experts and Vergy carried out a dry to ensure alignment on the facilitation strategy and address technical details. The workshop was held at the offices of Cuerva.

As above-mentioned, the workshop with project partner Cuerva was the first of the three activities of the B2C Living Lab in Granada. This first section of the workshop gathered a total of 12 participants. Also, in this case the main objectives reflected the same explored in Athens (identifying benefits, barriers, solutions and priorities for the implementation of common energy data spaces). Similar to the activities structure in Athens, the workshop featured three interactive exercises. However, this time they were conducted in a plenary format rather than in groups, due to the smaller number of participants.
However, the plenary format did not hinder participants from being engaged both individually and collectively. The underlying rationale for designing the activities, aimed at encouraging participants to actively participate and share their inputs, remained consistent.

Mirroring the Athens workshop, experts in Granada tackled similar issues in a series of interactive brainstorming sessions. These sessions delved into the pros, cons, and potential solutions for common energy data spaces. On the positive side, participants saw opportunities to optimize user behaviour and consumption patterns by analysing data and market trends and to boost energy community performance through innovative business models. However, they also identified potential roadblocks, including a lack of clear regulations and laws governing energy data spaces and technical hurdles such as digitizing the grid and ensuring high-quality, real-time data.

Next, the workshop turned its attention to the local government's perspective with an interview featuring the Mayor of Fornes, Mrs. Ana Belen Fernandez Navas. This segment of the Living Lab explored the Mayor's key considerations regarding implementing energy data spaces. The Mayor pinpointed funding, installation timeframes, user engagement, and compatibility between individual and collective energy consumption models as key considerations. In addition, the Mayor stressed the importance of community benefits that outweigh the costs, user commitment through annual fees, and the need for reliable service and maintenance to ensure the smooth operation of the energy community. She also highlighted the importance of education and accessible information for fostering community engagement.

Finally, the floor opened to citizens during the last segment of the Living Lab, the Fornes workshop. The event was prepared by the PI team along with the Cuerva and Vergy team, to accommodate around 50 participants. This section of the workshop aimed to introduce the SYNERGIES project and solicit community feedback on the feasibility and implications of establishing an energy community in Fornes. The session, moderated by PI, was conducted entirely in Spanish. The facilitated discussion was focused on the following three topics: the benefits and opportunities the energy community could offer Fornes, potential challenges and concerns, and the characteristics of an ideal energy community in the town.

Citizens echoed concerns both about cost and the potential impacts on local, as well as on technical aspects related to installation and grid connectivity. They also stressed the importance of trust and ongoing support from energy companies and the public sector in building a thriving energy community.

Figure 21: Some pictures from the second SYNERGIES Living lab in Spain

3.1.3 Living Labs in Denmark

The SYNERGIES Bornholm Living Lab workshops, held on September 17th and 18th 2024, aimed to engage stakeholders in the development of Energy Data Spaces and validate the integration of energy data sharing within different sectors. Organised as part of Task 6.1 under Work Package 6, the workshops brought together 28 participants, including representatives from public authorities, SMEs, farmers, and prosumers. The sessions with each stakeholder group explored challenges, opportunities, and practical implementations for data-driven energy management on the island.

The workshops were structured to encourage collaborative discussions, with sessions dedicated to stakeholder-specific topics. The first workshop involved city authorities and focused on identifying key energy challenges and opportunities for Bornholm, particularly around expanding renewable energy projects and optimising energy storage and distribution. Specifically, participants emphasised the importance of expanding renewable energy projects, such as wind and solar power, and integrating new technologies like Power-to-X (P2X) to increase energy independence. The discussions also touched on the need to optimise energy storage and distribution, particularly in relation to reducing

CO2 emissions through initiatives such as transitioning the island's ferry system to renewable energy sources. Throughout these discussions, participants recognized the role that energy data sharing could play in enhancing the efficiency and sustainability of these projects. By sharing data across the energy value chain, stakeholders could better understand energy consumption patterns, identify inefficiencies, and collaborate on solutions that benefit the entire island.

Similarly, in the Prosumers Workshop, participants discussed how energy data sharing could support their efforts to balance energy production and consumption. Many of the prosumers in attendance were already generating renewable energy through solar or wind power and were interested in exploring how data sharing could help them better manage their energy resources. The workshop's group activities encouraged participants to map out the energy value chain and consider the flow of data between different actors, such as energy retailers, technology providers, and regulatory bodies. These discussions underscored the importance of a collaborative approach to energy management, where data sharing serves as a tool for improving transparency, efficiency, and innovation. However, the workshop also highlighted the nuanced attitudes toward data sharing, with participants generally expressing a positive view on sharing data for research and public interest purposes but expressing greater scepticism toward commercial use cases. This distinction underscores the need for careful consideration when designing frameworks for data sharing in the future, ensuring that privacy concerns are adequately addressed while also promoting innovation and sustainability.

The second day of Living Labs implementation in Bornholm was focused on workshops with farmers and SMEs from the island.

The Farmers Workshop also highlighted the potential benefits of energy data sharing, particularly in relation to optimising energy usage in agricultural operations. Farmers were asked to reflect on their peak energy consumption periods and consider strategies for reducing energy use during those times. They were particularly interested in exploring how data sharing could help them identify patterns in their energy usage and implement solutions to reduce costs and improve efficiency. Many of the farmers in attendance referred to having participated in renewable energy projects, such as wind farms, and were already familiar with the benefits of integrating renewable energy into their operations. The workshop provided an opportunity for them to explore how data-driven approaches could further enhance their energy management practices. Given the structure of the farming sector in Bornholm (large farms with significant energy needs) and their high level of familiarity with the production and use of energy from renewable sources, this stakeholder category closely resembles SMEs.

Key findings from the discussions included a strong desire among farmers to maximize self-consumption of their own produced energy, rather than sending excess back to the grid. Solar panels were identified as a suitable option for many farmers, especially those with livestock, due to their ability to immediately utilize the energy produced. Battery storage was deemed less practical for farmers with high and continuous energy demands, primarily due to limitations in storing excess power. The 50-kWh limit imposed by Danish laws before an "availability tariff" is triggered was identified as a significant obstacle to expanding solar capacity. Despite these challenges, farmers expressed a willingness to share their energy data to support the green transition, demonstrating a commitment to sustainability.

Finally, in the SMEs Workshop, the discussion focused on the practical challenges and opportunities that small and medium-sized businesses face in managing their energy consumption. Participants from various industries, including manufacturing and craft-based businesses, shared their experiences with energy costs and explored how data sharing could help them optimise their energy use. One of the key takeaways from this workshop was the importance of achieving self-sufficiency in energy production through the use of renewable sources, such as solar panels. Participants saw data sharing

as a valuable tool for identifying inefficiencies in their energy consumption and exploring ways to reduce costs, particularly during peak hours when energy prices are higher. The participants all have plans for expansion of their core business and look for different possibilities to satisfy their increased energy needs.

Throughout all workshops, the Virtual Living Lab (VLL) was introduced as an additional engagement tool to support ongoing discussions and knowledge-sharing. While the tool generated interest, discussions naturally shifted towards practical challenges and opportunities, leading facilitators to prioritize stakeholder engagement over detailed demonstrations of the platform.

Overall, the Bornholm Living Lab workshops revealed that the island is well-positioned to lead the way in energy data sharing and the implementation of Energy Data Spaces. The high level of trust and willingness to share data among participants is a testament to the general political and societal culture, as well as of island's advanced energy infrastructure and the widespread adoption of renewable energy technologies. The insights gained from these workshops will play a crucial role in shaping the next steps of the SYNERGIES project, as they provide a clear understanding of the opportunities and challenges that lie ahead in implementing EDS on Bornholm.

Moreover, the workshops underscored the importance of stakeholder collaboration in achieving the project's goals. By bringing together a diverse group of participants from different sectors, the workshops fostered a sense of shared responsibility and collective action. Participants recognised that optimising energy consumption and sharing data are not isolated efforts but rather part of a broader strategy to ensure the sustainability and resilience of Bornholm's energy systems. The positive reception to the Virtual Living Lab, introduced during the workshops, further highlighted the potential for digital tools to support ongoing stakeholder engagement and collaboration in energy data sharing. It transpired that the stakeholders were also digitally fully literate and familiar with use of the various applications in the energy sector.

In conclusion, the Bornholm Living Lab workshops have provided valuable insights into the potential for EDS implementation and energy data sharing on the island. Bornholm's advanced energy infrastructure, combined with the trust and openness demonstrated by participants, creates a strong foundation for the successful implementation of Energy Data Spaces. The results of these workshops, described in detail throughout this report, offer a roadmap for future collaboration and innovation in energy data management, positioning Bornholm as a model for other regions seeking to embrace sustainable energy practices and data-driven solutions.

Figure 22: Some pictures from the third SYNERGIES Living Lab in Bornholm, Denmark

3.1.4 Virtual Living Lab

As mentioned in section 2.2.1, beyond the physical Living Labs, the SYNERGIES project has embraced virtual space to broaden stakeholder engagement through the concept of a Virtual Living Lab (VLL). This online platform was conceived to overcome limitations of physical location and time constraints, allowing for continuous interaction from the stakeholders.

The VLL offers several advantages. Firstly, it provides a constant stream of feedback and insights from stakeholders, informing project decisions throughout its lifecycle. Secondly, targeted engagement allows SYNERGIES to approach different stakeholder groups individually, ensuring their specific perspectives are captured. Finally, the VLL fosters a mutually beneficial relationship. Stakeholders receive relevant and engaging information on the project and the energy sector in general, while SYNERGIES partners gain valuable feedback on the solution envisaged by the project.

During the first 30 months of project implementation, the focus was on laying the groundwork for the VLL. The planning phase for the VLL was focused on establishing a structured and interactive online platform. The VLL homepage was therefore set to introduce the context and objectives of SYNERGIES, supported by a targeted video to visually explain the project's scope. In addition, the VLL structure included the design different user group sections, a dedicated page providing customized content, videos, documents, and links to further engage and inform the stakeholders about the benefits and features of SYNERGIES solutions.

To ensure a comprehensive understanding of stakeholder needs, the stakeholder categories originally outlined in the grant agreement were expanded. This resulted in the creation of more categories, each addressed through a dedicated survey. The VLL website itself reflects these categories, with separate sections for each "User Group."

The stakeholder categories encompassed a broad range of participants within the energy sector:

- Distribution and Transmission System Operators
- Prosumers & Local Energy Communities
- ICT Ecosystem (Technology providers, Data Scientists, ICT Solution Developers)
- Policy regulators
- Standardization Bodies
- Scientific Community
- Energy Market Operators

In addition to the comprehensive stakeholder analysis, the VLL's preparatory work encompassed crafting targeted content for various user groups. This included an introduction page explaining energy data spaces and the SYNERGIES solution, customized surveys to gather user feedback on their understanding and potential interaction with the project, and supplementary materials for each user group section.

The introduction page serves as an educational resource, providing an overview of energy data spaces and the SYNERGIES approach. The customized surveys aim to gauge user perception of energy data spaces and their interest in engaging with the project. Finally, a variety of supplementary materials (e.g., stakeholder mappings, energy data space explanations, academic articles, energy management tips, EU energy goals, fun facts,…) were curated to engage users and broaden their understanding of the energy landscape surrounding SYNERGIES.

This collaborative effort involved Prospex Institute (PI) taking the lead on content development, while TXT focused on designing the VLL's user interface and graphics. By leveraging the strengths of both of them, the two partners established a strong foundation for the VLL, paving the way for stakeholder engagement beyond the occasion of the in presence Living Labs.

3.1.5 Involvement in BRIDGE

In addition to the implementation of the first two Living Labs and the development of a Virtual Living Lab concept, over the first 30 months of project implementation SYNERGIES has been actively involved in the BRIDGE Initiative. As mentioned above, this initiative brings together various Horizon 2020 and Horizon Europe projects focused on smart grids, energy storage, islands, and digitalization. Through its participation in BRIDGE working groups, SYNERGIES contributes to ongoing knowledge exchange on business models, consumer engagement, and regulation in these areas.

SYNERGIES has actively participated in the BRIDGE Initiative's Consumer Engagement Working Group and has been represented in it by the project partner PI. PI has been specifically involved within the Consumer Engagement WG sub-groups of Indicators of Engagement, Smart tools to enhance consumer & citizen engagement and Strategies of engagement.

This implied that SYNERGIES wasn't just a participant within the BRIDGE Initiative's Consumer Engagement Working Group, but it actively contributed to it. Its contributions were documented in the BRIDGE Annual Report, where SYNERGIES was positioned as a best practice example for stakeholder engagement. This expertise was shared even further during a workshop held by the BRIDGE Smart Tools Sub-Group on Consumers & Citizen Engagement, where SYNERGIES presented their project and its unique approach. SYNERGIES' impact extended beyond presentations, though. It also actively participated in crafting the Handbook on Strategies of Engagement, contributing with its methods, experiences, and lessons learned from implementing the Living Labs and from conceptualizing the Virtual Living Lab. Finally, SYNERGIES consistently attended WG and sub-group meetings, providing regular feedback to improve the BRIDGE network's overall approach to consumer engagement.

3.1.6 External validation workshops

The external validation workshops aimed to assess the applicability and effectiveness of the technical solutions developed within the project. Organised by SYNERGIES technical coordinators and partners, with the support of PI, the workshops engaged external stakeholders, including DSOs, TSOs, Local Energy Communities, Aggregators, ESCOs, and Retailers, to gather critical feedback. Held online, these sessions provided a platform for demonstrating solutions such as the SYNERGIES Energy Data Space, Digital Twins, and Energy Applications (EApps), while fostering discussions with external validators.

The workshops served as an opportunity for the technical partners to present their solutions to external scrutiny, ensuring alignment with real-world industry needs. A total of 22 participants actively contributed, evaluating the presented solutions in terms of usability, relevance, and potential challenges. While participants expressed appreciation for the breadth of tools demonstrated, they also highlighted the need for more in-depth exploration of each solution, suggesting a reduction in the number of solutions covered per session to improve more in-depth comprehension. However, in order to compensate for the lack of time during the workshops, technical coordinators and partners also offered their availability to address the solutions in more depth in separate future follow-up sessions.

The first workshop, held on January 15th, 2025, involved the presentation of solutions for DSOs and TSOs. Participants were introduced to the SYNERGIES Energy Data Space, Digital Twin solutions for network congestion management and long-term asset planning, and a set of energy applications, including those for operational scheduling, investment prioritisation, and predictive maintenance. After the presentations of the technical solutions, the floor was open to external validators to express their feedback on the solutions they had been presented. Fenareti Lampathaki, the technical coordinator, initiated the dialogue by asking validators to assess the alignment of the presented solutions with their operational needs and to anticipate challenges when implementing the most relevant tools. This opened the floor to reflections on the appropriateness of these innovations for their businesses and organisations.

Some participants highlighted the impressive breadth of tools presented but noted the difficulty of fully processing the information in a short workshop. They commended the alignment of the tools with their organizations' ongoing efforts, particularly in the areas of data and digital twins. However, they emphasized a critical foundational challenge: the need to standardize and clean decades of manually entered, inconsistent, and often incomplete data. This, they explained, was essential for effectively integrating advanced tools and algorithms into existing systems. The participants also suggested providing a concise summary of the tools presented for further reflection and feedback.

The session moderator, addressed the possibility of follow-up sessions and exploratory discussions with technical partners, encouraging participants to indicate their interest in continuing the dialogue via the post-workshop questionnaire. In response the moderator's question about applications that resonated particularly well, validators expressed interest in advanced analytics, especially those requiring capacities beyond what their organisations could develop internally.

In particular, they pointed out the importance of focusing not just on medium-voltage networks but also on low-voltage systems, given the increasing penetration of EV charging stations, renewables, and flexible loads in rural and small-scale networks. They also highlighted the value of detailed analysis and planning for such networks, which often experience unique challenges due to their size and the evolving energy landscape.

The technical coordinator Tasos Tsitsanis (Suite5Suite 5) contributed to the discussion by clarifying the SYNERGIES approach to data spaces, pointing out the attention on the project's efforts to address foundational issues like data interoperability and quality enhancement before enabling data sharing. He invited feedback on the readiness of DSOs and TSOs to adopt AI and advanced analytics.

In this regard, validators acknowledged the growing complexity of regulatory requirements and the necessity for digital twins, advanced calculations, and more sophisticated analytics. One participant shared that while his organization is not yet operationally leveraging AI, they are actively preparing for its integration to meet new regulatory demands. He described the evolving challenges, such as the calculation of network capacity, the introduction of flexible connection points, and the rise of flexibility markets, which require far more detailed and accurate planning than before.

Overall, the session underscored a common theme: while the tools presented are seen as valuable and aligned with the direction of industry needs, the successful adoption of the presented solutions depends on overcoming foundational challenges in data quality, interoperability, and regulatory adaptation.

The questionnaire sent to the external validators after the workshop was another tool to gather feedback, both on the technical solutions presented and on the organisation of the event itself. Designed with a mix of open and close-ended questions, the survey aimed to capture participants' general impressions, suggestions for improvement, and insights into the relevance and applicability of the presented technical solutions.

Overall, the feedback highlighted the informative nature of the workshop, with one participant describing it as "informative about the tools developed in SYNERGIES." Many participants appreciated the broad range of topics covered, though some noted the fast pace of delivery due to time constraints. A common suggestion was to enhance the clarity of presentations by minimising text on slides and incorporating more diagrams, ideally displayed progressively to aid comprehension. One participant proposed presenting the tools through practical examples, such as simulating a DSO's grid planning process, to better illustrate the tools' real-world applications and technical content.

Several respondents found specific solutions particularly intriguing, such as the Digital Twins. These were deemed highly relevant to DSOs and their operations, especially from a technical perspective. However, participants also acknowledged significant challenges in integrating these solutions into their work, often due to the complexity of aligning them with existing systems and processes.

Feedback on the impact of the solutions on participants' work varied, with some indicating moderate or low impact, while others expressed interest in exploring certain areas further, such as real-time control and monitoring of critical energy systems. A few participants suggested including references to additional public resources or materials to allow for deeper engagement with the content beyond the workshop.

Importantly, there was a clear interest in follow-up activities, stating they would like to be contacted for future sessions. This reflects a positive outcome for the workshop and an opportunity for the project to build on the external validation workshops as initial engagements and to further evaluate the projects' solutions in dedicated follow-up sessions.

The second workshop, conducted on January 17th, 2025, targeted LECs, Aggregators, and ESCOs. This session introduced community and prosumer-level digital twins, smart energy management

applications, and a blockchain-based flexibility marketplace. A key difference in this workshop was the integration of live feedback via Mentimeter. This interactive tool allowed participants to share their immediate reactions and insights on each specific technical solution presented, fostering a dynamic exchange of ideas while preventing information overload. The inclusion of Mentimeter was a direct response to feedback from the previous workshop, where participants had suggested breaking down the flow of information and integrating more opportunities for interaction.

Following each presented solution, participants were invited to provide feedback through Mentimeter by scanning a QR code displayed on the screen. They were asked to respond to two key questions:

"How relevant is the presented solution for your operation?"
"Is there anything you would like to suggest?"

Responses appeared on the screen in real time, creating an interactive feedback process.

With regard to the Energy Data Space and its relevance for the external validators' operations, the responses received through Mentimeter highlighted a generally positive perception of its potential value. Participants described the solution as *"interesting," "relevant," "useful and relevant," "very relevant," and "very brief presentation, but it's clear that there's added value for us."* However, one participant remarked, *"At this point, no, because we didn't get into details,"* indicating a need for more in-depth information. Another participant noted, *"The solution looks comprehensive. I wonder, are there any data transformation capabilities in the pipelines (renaming/combining fields, changing fields' format/values, …)?"*which demonstrated a specific interest in the technical functionalities of the solution.

For the second question, "Is there anything you would like to suggest?", participants offered a mix of practical recommendations and positive observations. Suggestions included *"more time for explanation"* and making the *"connection to the data space easier and more understandable."* Others commented, *"Not easy to suggest anything from the quick overview"* and *"It looks well-thought,"* expressing an appreciation for the solution despite the limited time available for explanation. The same query about data transformation capabilities was reiterated, reflecting a recurring interest in this specific aspect of the Energy Data Space's functionality.

The feedback from external validators on the Digital Twin for Local Energy and Flexibility Management Optimisation and the Prosumer Digital Twin for Optimised Management and Control of Individual Assets highlighted a strong relevance of these solutions for their operations. Validators recognised their potential impact, describing them as highly relevant to their needs. However, the feedback also revealed important questions aimed at *understanding the practicality and scalability of these tools.* Participants inquired whether the *benefits for users* had been quantified in such a complex process and asked about the level of effort required to replicate a community with 100 users. Additional questions focused on the applicability of these tools for communities and the feedback received from such communities. Validators also sought clarity on how prosumers and LECs would profit from the implementation of these solutions, reflecting their interest in the tangible outcomes and value provided by these innovative tools.

The feedback received from external validators on EApp1, the Prosumer Energy Analytics and Smart Building Application, and EApp2, the Smart Charging Application for EV Fleets, reflected strong interest and recognition of their potential. Validators described both solutions as *"very relevant,"* with comments such as *"important feature and I would be glad to learn more"* and *"EApp2 is very interesting. I would like to know more."* EApp1 was noted as being *"quite comprehensive,"* demonstrating its value as a holistic tool for energy analytics and management. Additionally, participants suggested exploring possibilities for *"experimenting with load-shifting,"* highlighting an interest in further enhancing the flexibility and efficiency of these solutions.

The feedback on EApp4, the Local Flexibility Pooling and Sharing App for Intra-Community Flexibility Transactions, highlighted its perceived utility and relevance while also pointing out certain challenges.

Validators described the solution as *"very useful" and "complex,"* acknowledging its potential impact within the energy flexibility domain. One validator noted its relevance but emphasised that its success would depend on the development of *more supporting regulations*. Regarding suggestions for improvement, feedback focused on practical implementation questions, such as *"How easy is it for a regular consumer to create an Ethereum wallet?" and "Could the aggregator create their wallet?"*, underscoring the importance of ensuring accessibility and usability for end-users while addressing technical barriers to adoption, particularly around blockchain-related features.

No specific feedback was provided by the external validators regarding the Energy Services Marketplace. While the solution was presented in detail and accompanied by a demonstration video, the participants did not share particular comments or suggestions during the feedback session. This lack of specific input may suggest a general clear explanation of the concept during the presentation of the technical solution.

In addition to the feedback gathered during the workshop, further input was collected through an online questionnaire sent to the external validators after the event. This follow-up provided additional insights into their overall impressions and perspectives on the workshop and the presented solutions. Regarding the general impression of the event, validators described it as *"well organized"* but noted it was *"not so participated,"* which they attributed to the composition of the audience. When asked what they liked most about the workshop, *validators appreciated the breadth of topics covered*. However, they also mentioned that the interactive sessions could have been stronger, suggesting potential for improvement in engaging the audience more effectively in future validation sessions.

In terms of the project's aspects and solutions that sparked particular interest, validators highlighted the *tools related to energy communities settlement as a key area of focus*. When asked about the impact of the presented solutions on their work, they described it as having a *"moderate impact*" and expressed confidence that there were *"no" or "minimal challenges"* anticipated in integrating the solutions into their workflows. Notably, one validator expressed a clear interest in continuing the dialogue, with one respondent indicating that they are interested in finding out more about the presented solutions and would like to be contacted in the future for follow-up sessions. This additional feedback underscores both the positive reception of the workshop and the importance of building on the interest generated by maintaining engagement with the validators in the project’s next steps.

Overall, the external validation activities successfully facilitated constructive interactions between project partners and external stakeholders, ensuring that the solutions developed align with industry needs and regulatory landscapes. The feedback gathered will be instrumental in refining the technical components of SYNERGIES, with recommendations focusing on allocating more time per solution, enhancing interactive elements, and addressing foundational data and regulatory challenges. By integrating these insights, the project can strengthen its contributions to the evolving energy sector, making the Energy Data Space and associated applications more accessible and impactful for stakeholders across the value chain.

3.2 Stakeholder Engagement foreseen activities for the second reporting period (M31-M42)

For the second reporting period (M31-M42) SYNERGIES work on stakeholders' engagement will actively continue with regard to different initiatives.

3.2.1 Virtual Living Lab & BRIDGE involvement

Stakeholder engagement will continue to focus on the preparation of the Virtual Living Lab as well. The next steps in this regard will involve finalizing the surveys tailored to the above-mentioned specific stakeholder categories. Such surveys will ensure the VLL effectively captures the needs and interests of each group. Additionally, the development of informative materials and resources will continue, expanding the knowledge base offered by the VLL. Throughout this process, there will be continuous interaction and sharing of updates with TXT, fostering collaboration and ensuring alignment with project goals.

A crucial aspect related to the VLL will be the direct involvement of stakeholders in testing and launching the VLL. To achieve this, the project partner PI will prioritize the development of activities specifically designed for this purpose. These activities might include website tours with feedback sessions, where participants can provide their initial impressions and suggest improvements. Additionally, scenario-based user testing will be conducted to assess the VLL's usability and user experience under realistic conditions. By incorporating stakeholder feedback and test results, the VLL will evolve into a user-friendly and effective platform, ensuring it not only delivers valuable information but also directly addresses the needs of the Bornholm community. Furthermore, the launch and initial testing of the VLL in Bornholm will provide valuable insights into how similar testing procedures can be incorporated into future Living Labs throughout the project.

In addition to the creation of the Virtual Living Lab, stakeholders' engagement in SYNERGIES will continue to be focused also on the BRIDGE Consumer Engagement Work Group. Efforts will focus on finalizing contributions to the Handbook on Strategies of Engagement. Additionally, there will be ongoing participation within the various BRIDGE sub-groups to ensure SYNERGIES remains informed and can potentially contribute to their work. Finally, within the BRIDGE framework, an internal assessment will be conducted to identify useful tools for sustained engagement that can be applied within SYNERGIES' initiatives.

3.2.2 External validation activities

As mentioned in section 3.1.6, based on the feedback received from the stakeholder participating in the external validation workshops, a clear interest for follow-up activities and sessions emerged. This reflects a positive outcome for the workshop and an opportunity for the project to build on the external validation workshops as initial engagements and to further evaluate the projects' solutions in dedicated follow-up sessions.

The stakeholders provided also valuable feedback to be implemented in future sessions. First, future sessions should allocate more time for in-depth exploration of each solution to allow participants to fully grasp the functionalities, benefits, and implementation processes. To avoid overwhelming participants, it would be advisable to present only two or three technical solutions per session. This approach would provide more room for discussion, detailed demonstrations, and interactive engagement, enabling participants to provide more substantive feedback. Additionally, integrating practical examples and use-case simulations could help illustrate real-world applications and enhance

understanding. They highlighted the importance of ensuring the accessibility and usability of solutions for end-users while addressing potential barriers, such as the complexity of blockchain features and the need for regulatory alignment. These adjustments would enhance the overall effectiveness and impact of the workshops, ensuring meaningful engagement and actionable insights to drive the continued success of the SYNERGIES project.

4 Individual and Joint Exploitation

This chapter provide a comprehensive analysis of project exploitation topics starting from the KERs preliminary list according to the roadmap for assets definition based on the approach described in the Grant Agreement, taking into consideration the technical developments achieved in the project at M20.

The timeline determining ER identification, revision and commercialization process is described in the next section, following the project exploitation framework and related milestones. The preliminary assets list is provided with high level depiction and leading partner/s involved in the development of the outcome, also for a IPR purpose. A more in depth description of each KERs is provided as Annex with a table highlighting main key elements such as the owner and related percentage of ownership, the license availability, the WP and deliverable reference. After KERs mapping, 3 main exploitation packages are identified with specific characteristics based on the type of ER and use. This is based also on the IPR analysis and management principles, in addition to study market trends for effective project positioning leading to the performance of SWOT and PESTEL analysis.

Following the strategy principles and according to the KERs list, the individual exploitation per each project partner is presented altogether with the joint exploitation based on 3 main building blocks. It has to be noted that chapter 4 Individual and Joint Exploitation focuses on the exploitation analysis related to SYNERGIES project while chapter 5 Data-sharing driven Business Models is dedicated to study the Business Models around the energy data spaces emerging from project experience (thus with a broader scope with respect to traditional project exploitation investigation). If this chapter considers project partners and consortium roles and steps towards assets using and commercialisation, the following section applies to energy value chain stakeholders outside the consortium for the identification of successful data-driven Business Models.

4.1 Exploitable Results

4.1.1 Methodology

This chapter describes the methodology applied for key exploitable results definition based on the framework proposed in the Grant Agreement, in addition to consider the technical developments achieved in the first half of project period. The work performed up to M30 was driven by the exploitation strategy as detailed in section 4.4 to maximize the impact of assets developed during the project both at partner and consortium level. Similarly, the timeline determining ER identification, revision and commercialization process follows the project Gantt and related milestones. Thus, the first step towards the exploitation has been the identification of the Individual Exploitable Results provided by each partner collecting the key information related not only to the asset per se but also its link with other project outputs in the light of joint exploitation and IPR definition.

For this reason, a table for KERs description has been shared among partners and revised by WP leaders in order to list all emerging assets. More in detail, this format gathers crucial elements such as major characteristics and functionalities, dependencies with other elements developed in the project and ownership. Here below the template is shown while the tables filled in by partners are attached to this document as Annex 2.

SYNERGIES Shaping consumer-inclusive data pathwaYs towards the eNERGy transItion, through a reference Energy data Space implementation

Exploitable Result Table

Element	Description
Acronym and full title	
Reference WP and Deliverable	
Contact person	
License of the result	
Ownership (if joint, express in %)	
Description and major characteristics	
<Dependencies with other ER/components in the project	
Availability of technical/user manual	
Availability of source code	
Availability of binaries	
Screenshots / Mock Ups of the ER (if applicable)	

Figure 23. KER Table Format

This template will be constantly updated during the project in an iterative process following technical developments. The goal is to collect the KERs' commercial features, the individual exploitation ideas and the joint exploitation point of view supporting the involvement of the Consortium towards a strategic exploitation plan with strong partnerships and a clear path paving the way to the market penetration.

All the collected information converged in the KERs database storing all relevant data of KERs and is constantly updated during the different project phases as a live document in an iterative process. The M30 updated version is presented in section 4.1.3 Exploitable results list. This document represents the underlying structure of both the individual and joint exploitation being the starting point for the joint results and IPRs management. In fact, the KER table format will be complemented by ownership entity (and percentage in case of joint results), type of license and involved background proprietary asset. These aspects are crucial to perform an efficient IPR management following the approach presented in section 4.2.

4.1.2 KERs Development Framework

SYNERGIES exploitation methodology for KERs identification is based on the project development framework that consists of the four core iterative phases, as depicted in the following figure.

Figure 24 SYNERGIES Framework

Each step lay the foundation for the definition and revision of the assets developed in the different stages of the project.

1st Phase: Exploitable assets definition for the MVP and fine granularity result requirements.
During the first phase, the business needs and technical requirements have been analysed both form an internal and external perspective leading to the MVP definition and reference architecture following these steps:

1) Concept Detailing and MVP definition: the as-is and to-be processes around data management, processing, sharing and innovative data-driven energy services have been analysed to define SYNERGIES concept and, according to the technical specification, MVP features
2) Industrial needs identification and business scenarios definition: the analysis of the end-user, business and energy ecosystem-relevant requirements has been performed in order to create the necessary inputs for producing the specifications for the different technological components of SYNERGIES
3) Regulatory and socio-economic barriers identification: this study focuses on emerging socio-economic, regulatory and organizational barriers involved in the demonstration and applicability of the SYNERGIES technological results
4) Architecture design and technical specifications: based upon the results of the previous points, the overall architecture of the project, the technical specifications of the key components and their functionalities is defined to translate end-user and business requirements and needs in a viable technological set of digital solutions

2nd Phase: implementation of SYNERGIES technological solutions

This is the development phase that involved a series of steps to develop new technologies and extend or customize existing technology assets in accordance with the agile development philosophy to constantly update the platform based on feedback received from the actual users. The 2nd Phase includes the elaboration of the methods and theoretical foundations of the data-driven services bundles, the architectural design, the technical specifications, the actual development, and the integration of the SYNERGIES components as follows:

1) *SYNERGIES Data Space and Data marketplace*: it enables energy stakeholders to collaborate and innovate by securely sharing and analysing interoperable data across sectors like energy, buildings, and mobility, while ensuring data sovereignty and trust. It provides a secure

platform for data owners/providers to control, monitor, and share data, while allowing consumers to access valuable insights.

2) *Energy Services Marketplace*: it enables energy value chain stakeholders to access energy solutions and services developed on SYNERGIES Data Space by providing key functionalities, including a Contract Manager for transaction oversight, an Apps Requirements Engine for managing service requirements, and a Services Register Engine for publishing.
3) *AI Analytics*: it enables energy stakeholders to design, execute, and visualize custom data analytics pipelines, leveraging both internal and external data to optimize operations. It offers tailored AI-driven solutions for both personal and grid-level energy analytics, enhancing decision-making across the energy value chain.
4) *Digital Twins:* it provides prosumers, energy communities, and aggregators with analytics and tools to optimize energy usage, self-consumption, and flexibility asset control at both facility and community levels. Key functionalities include flexibility aggregation, energy management optimization, demand response strategies, and real-time monitoring to enhance decision-making and maximize efficiency across multiple levels of energy operations.
5) *Energy Apps and services*: it enables energy stakeholders to buy and sell applications and services through a data marketplace based on the SYNERGIES Energy Dataspace, providing a platform for seamless access to energy-related apps and services. It facilitates efficient transactions and integration within the energy ecosystem, enhancing data-driven solutions for various stakeholders.

In this phase, SYNERGIES set up the necessary processes, infrastructures and tools based on existing best practices adopted by its partners, with the view to optimizing the platform development, deployment, integration, testing and maintenance

3rd Phase: Digital Solutions Demonstration and Impact Assessment for Market Feasibility

To the end of verifying, validating and demonstrating SYNERGIES EDS, marketplace, AI analytics and all the related apps and services; an iterative approach, engaging the project's demonstrators, in the assessment and feedback loop from the very early development stages, is envisioned. The demonstrator partners and the technology experts were constantly engaged with the intermediate versions of the platform's backbone, services, APIs etc. to continuously populate the platform with data and models and test its functionalities while their feedback was provided to the developers in order to update, parameterise and improve the platform and app accordingly.

a) *Pre-validation:* During the validation and demonstration activities, all the different features were tested and the corresponding KPIs measured to verify the achievement of the objectives, according to the assessment methodology defined in T5.4. Nevertheless, pre-validation testing activities will be applied to ensure fulfilment of requirements and specifications, prior to proceeding with the roll-out in the pilot sites.
b) *Pilot Preparation and Deployment:* The purpose of this step is to bring together a variety of mature and proven components, integrate them and further enhance their features to enable the delivery of functional, integrated prototypes which will be continuously validated to elicit user feedback and realize significant impact achievements. This step comprises, also, activities for the optimization of the SYNERGIES results throughout the duration of the project to ensure their alignment to the value chain requirements, along with their compliance with regulation, social needs, business and economic factors.
c) *Demo Implementation:* These tests represent the most important step for user co-creation. The consortium will perform unsupervised beta tests to obtain unbiased feedback regarding operation of the SYNERGIES solutions. Validation will involve a vast number of stakeholders and end-users involved in the demonstrators and overall energy data value chain. A second,

equally important goal will be to validate the impact claims of the project. This step includes demonstration, performance verification, testing and validation towards market replication.

d) *Impact Assessment:* the activities performed in T5.4 play a relevant role in guiding the technical improvements to be included in the future productization of SYNERGIES assets to support the post project commercialization

4th Phase: consolidation of all project exploitable assets and final result packaging

The last phase of the project's methodology aims at successfully preparing an early entry in the market, by constantly analysing the market, and by devising a detailed exploitation strategy that takes advantage of the emerging market opportunities and prepares all the necessary mechanisms for the effective operation, exploitation and go-to-market of the product, putting particular emphasis on the organisations represented in SYNERGIES, while mitigating the underlying exploitation risks. The activities carried out during the 1st period from M1 to M30 lays the foundations for the definition of individual exploitation strategy while tasks performed in the second stage from M31 to M42 determined the joint exploitation approach, leading up to the business model delineation according to market analysis and use cases experiences. This will include:

a) *Industrialisation of SYNERGIES Assets* to promote integration and further development of these KERs in company Commercial offering to support the business sustainability strategy. The outcomes emerging from the project will be a part of the company/institution services/products catalogue according to the individual exploitation plan defined at the end of the project. The aim is not only using these results as a stand-alone asset but to make them a crucial asset of the company business backbone integrated with other key elements of the commercial offering.
b) *Marketing campaign for SYNERGIES assets* to increase visibility and interest in the energy domain. The planning and implementation of the marketing strategy will follow the work carried out in WP6.
c) *Stakeholders' engagement:* Parallel to implementation activities, a variety of means will be employed for engaging stakeholders and disseminating the project results, thus paving the way for exploitation.
d) *Business model:* A business innovation plan will be developed to prepare for the commercialization phase after the project end. This plan will detail sales strategy, continuous market/competition analysis, marketing mix, operational plan, business unit exit strategy and financial projections.

4.1.3 Exploitable results list

The KERs database represents the registry of identified KER that are listed in the table below. It has to be noted that this is a preliminary list that summarizes major results identified by partners and, being a living document, it's subject to revision and integration. Thus, a consolidated version will be made available in the upcoming and final release of the document (M42) that will encompass the consolidated assets from month 31 till the end of the project, reflecting the dynamic nature of the database development in tandem with the project's advancements.

For each asset a unique ID n. has been assigned based on the exploitation package with the following classification:

- CP stands for Consultancy Package
- TP refers to Technological Package
- IP stands for Industrial Package

Related WP	Exploitable Asset	ID	Exploitation Package	Type of result	Responsible Partner/s	Involved partners	Notes	Dependency with other ER
WP3	Energy Data Space (SYNERGIES EDS)	TP-1	Technological Package	Software	SUITE5	Maggioli, Ubitech, ROESOFT and TXT	-	N/A
	Network of Sectorial Data Models	TP-2	Technological Package	Software	SUITE5	UOP	-	SYNERGIES-EDS (Energy Data Space)
	Energy Services marketplace	TP-3	Technological Package	Software	ETRA	none	-	SYNERGIES-EDS (Energy Data Space)
WP4	AI Analytics On-Demand Service Platform (AISP)	TP-4	Technological Package	Software	SUITE5	none	-	SYNERGIES-EDS (Energy Data Space)
	AI (Energy) Analytics Solutions	TP-5	Technological Package	Software	SUITE5	TXT, ICCS, CIRCE, ETRA, Ubitech, Maggioli, DTU	-	SYNERGIES-EDS (Energy Data Space) SYNERGIES AISP (SYNERGIES AI Analytics on-Demand Service Platform)
	Prosumers and Aggregator Energy Analytics Toolset	TP-6	Technological Package	Software	ETRA	ETRA, IES	it includes: DT3, DT4 & EApp1	Energy Data Space, Energy Services Marketplace, AI Analytics Solutions

	EV Fleets Analytics Toolset	TP-7	Technological Package	Software	ETRA	ETRA, IES	it includes: DT3, DT4 & EApp2	Energy Data Space, Energy Services Marketplace, AI Analytics Solutions
	TSO-DSO Operation Optimisation and Flexibility Management Toolset	TP-8	Technological Package	Software	ICCS	ICCS, DTU	it includes: DT1, DT2 & EApp3	Energy Data Space, Energy Services Marketplace, AI Analytics Solutions
	End-User Flexibility Pooling Services and Smart Contracting	TP-9	Technological Package	Software	Ubitech	Ubitech, IES	it includes: DT3, DT4 & EApp4	Energy Data Space Energy Services marketplace AI Analytics On-Demand Service Platform AI Analytics Solutions
	Mid-to-Long Term Network Planning & Green Investment Assessment Toolset	TP-10	Technological Package	Software	ICCS	ICCS	it includes: DT2 & EApp5	Energy Data Space, Energy Services Marketplace, AI Analytics Solutions
	Network Asset Management & Maintenance Assessment Toolset	TP-11	Technological Package	Software	CIRCE	CIRCE, ICCS	it includes: DT2 & EApp6	Energy Data Space, Energy Services Marketplace, AI Analytics Solutions
WP6	Stakeholder Engagement Methodology	CP-1	Consultancy Package	Methodology	PI	none	-	N/A
WP5	Data Processing Legal Compliance Toolkit for Energy Communities	CP-2	Consultancy Package	Template Documents	COEN	-	-	-
WP5	IoT Platform for Energy Communities	TP-12	Technological Package	Software	COEN	-	It supports the integration of COENs data to EDS platform	-
WP5	Impact assessment methodology	CP-3	Consultancy Package	Methodology	VTT	Suite5, ICCS, ETRA, DTU, IES, CIRCE, Ubitech		

Table 3 KERs List

4.1.4 Packages overview

The compilation of the KERs Database by the Consortium members lead to the identification of the preliminary list of KERs that, being an ongoing task, will be constantly updated in alignment with the progression of project activities. Based on the type of result, two main bundles have been identified in this first iteration:

- *Consultancy Package (CP):* this category includes services, models and methodologies developed and know-how/expertise gained thanks to the project. These KERs ownership will lead to an advantage related to acquired know how, skills and analysis.
- *Technological Package (TP)*: this category comprehends all solutions both hardware and software, related to the design, development and applications of Energy Data Space and related Platform and Energy Marketplace and related Apps. These KERs can generate earnings and competitive advantages for the owner and co-owners of the result.
- *Industrial Package (IP)*: this category includes the value generated by project Demo sites both in terms of physical assets (such as the goods and infrastructure used for measurements) and software related assets (such as the algorithms customization and platform integration). Also in this case, these KERs can generate earnings and competitive advantages for the owner and co-owners, especially in the case of the digital assets.

Thus, the exploitation strategy is based on the identification of assets that include not only tangible components that can be commercialized as products or services, such as software, digital application, data space, but it also covers the methodological aspect, comprising models and expertise that can be exploited as consultancy services. These results can satisfy stakeholders with different goals and expectations, including scientific, societal or economic purposes.

The following sub sections explore more in detail the key features and scope of each bundle.

It has to be noted that, within the major package, a sub classification can be derived according to the specific application sphere. This further categorization will be developed in the next deliverable version once the KERs list is integrated with additional elements following project advancements. Moreover, the Technological Package is related to WP3 and WP4 activities that, according to project planning, have the end of the 1st iteration at M36. This means that the KER description and value proposition is based on the expected outcomes of the first implementation and testing phase that is still ongoing. Thus, the KERs version presented in this document is a preliminary one that will be finalized in D6.3 once the project activities progress and end.

4.1.4.1 Consultancy Package

Generally, this package refers to expertise and knowledge developed during the project within the different WPs. This intelligence is exploited in form of consultancy services provided to targeted customer segments. For this preliminary analysis, this package comprises the approach and techniques implemented to enable the participation of citizens and public entities in societally relevant dialogue and decision-making processes. It has to be noted that this package will be further expanded in the next deliverable D6.3 with the outcomes of the pilot impact assessment (T5.4) and the scaling-up and replication (T5.6) activities. Since these tasks have a ramp-up at the end of the iteration, starting from M28 it will be possible to have a clearer vision of exploitation asset features related to the methodologies used for the demonstrators' evaluation and experience application to other use cases.

In the first phase, two consultancy results have been identified as follows

1) **Stakeholder Engagement Methodology**
   the Stakeholder Engagement Methodology is playing a crucial role in the actual energy business environment since in the last decades local energy communities has proven to and

in the future will be even more pivotal in driving the flexibility market. This asset is developed by Prospex Institute (PI) that engages with professionals with extensive expertise in engaging broad stakeholder groups, often in multi-cultural and multi-sectorial workshop formats, having strong competences in stakeholder engagement and co-creation, and through participatory methodologies. It adopts a User-Driven Innovation Approach, actively involving stakeholders throughout the innovation process. This includes energy prosumers (those who consume and produce energy) and various players across the energy value chain. The project caters to their specific needs through different engagement formats, focusing on Business-to-Consumer (B2C) and Business-to-Business (B2B) interactions, respectively. To reach these objectives, the LLs is the preferred tool both in its in-person and virtual version to expand the stakeholder pool to reach. The concretization of this methodology is evident in the activities reporting described in section 3 Stakeholders Engagement.

2) Data Processing Legal Compliance Toolkit for Energy Communities

This consultancy package offers a comprehensive toolkit to assist energy communities in meeting legal and regulatory requirements related to data processing and operational agreements. It includes:

- **Template Legal Documents**
- **Loan-for-Use Agreement**: A standardized framework for the allocation and use of community assets like energy meters, batteries, and renewable energy equipment among members, ensuring clear terms on asset ownership, usage, and responsibilities.
- **Terms of Service**: Legally compliant terms for the services provided by the energy community, ensuring that these terms align with EU and national energy laws, protecting both the community and its members.
- **Guidelines for Data Processing Compliance**: It ensures adherence to GDPR and other relevant data protection laws by providing detailed processes for collecting, processing, and securely storing member data. It focuses on transparency, outlining the necessary steps to inform community members about how their data will be used in energy optimization, billing, and service management, and obtaining their informed consent.

This toolkit helps energy communities navigate legal complexities and safeguard member data, ensuring compliance with applicable laws while promoting trust and transparency

3) Impact assessment methodology

This consultancy package provides an **Impact Assessment Methodology** for evaluating energy data space developments from technical, business, and socio-economic perspectives. The methodology includes:

- **KPI Specifications**: Clear metrics to assess the performance and effectiveness of energy data space developments, helping to evaluate outcomes from a variety of angles (e.g., technical efficiency, business impact, and societal benefits).
- **Process Description for Data Collection and Analysis**: A structured approach for collecting and analysing data related to energy data space developments, ensuring a thorough and consistent evaluation process.

The methodology offers a comprehensive **evaluation framework** that can be applied to future energy data space projects, helping stakeholders measure the impact and guide decision-making for sustainable, effective development in the energy sector.

4.1.4.2 Technological Package

This bundle covers all digital solutions, including both hardware and software, developed during the project within WP3 and WP4 scope being related to the design, development and applications of Energy Data Space and Marketplace, SYNERGIES Platform and demonstrators' apps.

1) **SYNERGIES Energy Data Space (SYNERGIES-EDS)**: it aims at allowing the energy stakeholders to unlock the potential of data-driven innovation and collaboration throughout the whole data value chain. By incorporating data from various energy actors, particularly prioritizing consumers as data owners/providers, and integrating sectors like buildings and mobility, the SYNERGIES-EDS seeks to ensure widespread access to interoperable data and valuable insights in a trustworthy manner. In practice, the SYNERGIES Energy Data Space is a secure and isolated data sandbox environment that is provided to or is available by each stakeholder (from the energy data value chain and its interrelated, coupled sectors) through different modalities in order to collect, monitor, control, analyse and share their data in their own terms and to obtain access and use external data (from other data spaces) through a reliable, interoperable and sovereignty preserving approach, effectively enhancing their data-driven intelligence and increasing their data outreach. To this end, the main functionalities that are offered for a Data Owner/Provider span over three (3) core axes: (a) Data Interoperability & Governance, (b) Data Security & Sovereignty, (c) Trusted Data Sharing, that represent Core Building Blocks, properly integrated to realize the SYNERGIES Reference Energy Data Space. From the perspective of a Data Consumer, the main offerings of an Energy Data Space span over two (2) core axes: (a) Trusted Data Sharing and (b) Data Value Accrual, that represent Core Building Blocks, properly integrated to realize the envisaged Reference Energy Data Space.
2) **Network of Sectorial Data Models:** it aims at reconciliating the most prominent open standards, semantic models and ontologies in different sectors that are integrated in SYNERGIES, i.e. Energy, Building, Electromobility, and at contributing to addressing the inherent data interoperability problems that naturally emerge when different stakeholders share their data or even leverage them outside the context they were originally designed. The Network of Sectorial Data Models consists of 4 data models, namely Energy, Building, Electromobility and General, that collectively include over 155 concepts and 2606 simple fields. It is also accompanied by the underlying processes and mechanisms for their life-cycle management, especially with regard to their consistent evolution to facilitate the handling of updates performed in each one of them and their propagation in the related sectorial data models and concepts.
3) **Energy Services marketplace**: This package enables energy value chain stakeholders to access energy solutions and services developed on SYNERGIES through key functionalities. These include the **Contract Manager**, which oversees and controls transactions between sellers and buyers, ensuring effective monetization via an external API; the **Apps Requirements Engine**, which collects and manages service requirements and communicates them clearly to end-users; and the **Services Register Engine**, which provides a user-friendly platform for sellers to publish their services in the marketplace.
4) **AI Analytics On-Demand Service Platform (AISP):** The SYNERGIES AI Analytics on-Demand Service Platform enables energy stakeholders to gain data-driven insights by designing, executing, and visualizing custom analytics pipelines using their own or acquired data. It caters to various user types, allowing them to experiment with algorithms, apply machine learning and deep learning models, and leverage pre-trained analytics models for energy-specific challenges.

AI (Energy) Analytics Solutions: The SYNERGIES AI Analytics Solutions provide a comprehensive suite of energy analytics for electricity stakeholders, offering pre-packaged algorithms in two main areas: personal data analytics (e.g., consumer behavior and building energy) and grid/portfolio-level analytics (e.g., RES plant and demand forecasting). This enables users to leverage both internal and external data to optimize operations and improve decision-making, maximizing business benefits.

5) **Prosumers and Aggregators Energy Analytics Toolset:** This package provides prosumers, energy communities, and aggregators with tools and analytics to optimize energy usage, self-consumption, and flexibility asset control at both facility and community levels. Key functionalities include flexibility aggregation and Virtual Power Plant (VPP) configuration, energy management optimization, self-sufficiency in off-grid conditions, and demand response strategies, as well as real-time monitoring, KPI analysis, and energy tariff optimization, helping users improve efficiency and maximize renewable energy use.
6) **EV Fleets Analytics:** This package aims to optimize the charging process of EV fleets by respecting owners' boundaries while enabling flexibility for the grid through the integration of grid-to-vehicle (G2V) and vehicle-to-grid (V2G) strategies.
7) **TSO-DSO Operation Optimisation and Flexibility Management Toolset** This package enables transmission and distribution network operators (TSOs & DSOs) to manage critical events by optimally allocating flexibility products from aggregators at the distribution network level. It involves prioritizing network operators' needs and clearing a central flexibility marketplace to match flexibility demand with available offers.
8) **End-User Flexibility Pooling Services and Smart Contracting:** This package provides prosumers and aggregators (acting as LEC operators) with a tool for negotiating and settling flexibility smart contracts using distributed ledger technology. It also offers monitoring and informational tools to track performance, including flexibility request satisfaction and financial gains, at the prosumer or local energy community level after optimized VPP configuration and flexibility activation.
9) **Mid-to-Long Term Network Planning & Green Investment Assessment Toolset** This package aims to implement features that provide simulation-based inputs to Distribution System Operators (DSOs) for optimal planning and sizing of network assets, supporting more informed decision-making in network operation and planning.
10) **Network Asset Management & Maintenance Assessment Toolset:** This package is an expert support system for grid maintenance, offering a toolset that monitors and analyses grid incidents using DSO database information. It also includes predictive vegetation management based on satellite imagery and historical data, providing maintenance plans and presenting information on a map, with downloadable monthly reports to help DSO staff optimize their maintenance actions.
11) **IoT Platform for Energy Communities** This package provides a robust IoT framework for energy communities, enabling seamless integration, management, and monitoring of diverse IoT devices. Key features include support for various devices, efficient data ingestion and processing, advanced device management with OpenRemote, flexible data storage solutions, and a scalable, modular architecture to accommodate growth and adapt to new IoT scenarios.

The assets emerging from the work carried out in these 2 WPs set the basis for the first round of KERs identification linked to SYNERGIES platform and digital components. The KERs are exploited both in form of products or services added to company commercial offering as new assets or further features of background applications. Concerning this package the partners involved belong to the IT provider or digital enablers category being in charge of the technical developments of hardware and software applications or components. The exploitation thus revolves around the improvement of the current portfolio of the company’s AI solutions by incorporating part of the technology to be developed during the project into new or existing products.

Following the project's iterative approach, all digital solutions here reported and their related components are planned to be delivered in two iterations. Thus, the major results of this exploitation package have been here presented in this preliminary version following the 1st design and implementation phase that was completed with MS6 "First release of the SYNERGIES Data sharing-driven solutions and apps" at M22. The exploitation list will be further detailed and revised after the launch of the 1st demonstration phase (corresponding to MS7) at M28 which concludes on M36 with MS8 with the completion of the 1st iteration of testing and validation activities and in parallel with the 2nd release of the SYNERGIES solutions. Thus, the KERs table will be integrated with the final exploitable assets once the fully developed solutions are delivered with features that cover the full set of defined requirements, as well as any enhancements and adaptations based on the lessons learnt from their integration and technical verification in the context of D5.3 and D5.6.

4.1.4.3 Industrial package

This exploitation package covers several kinds of assets generated by project Demo sites during the project implementation activities in WP4 and WP5. The pilots are supported by IT providers in the development of tailored digital solutions related to their specific application to use cases. This means that the outcomes of this collaboration are both exploited in terms of application, algorithm, software etc, and use cases success stories to be replicated to similar domain/production/department/local prosumers community. More in detail, the industrial package includes the set of results developed throughout the performance of demo sites related tasks that comprise both tangible and intangible assets. Concerning the former, it refers to goods, tools and equipment acquired to establish the digital infrastructure needed to carry out project activities, such as smart meters, IoT sensors, hardware for energy monitoring, etc. Concerning the immaterial assets, it refers to the tailored applications and customizations of digital solutions developed in SYNERGIES specifically intended for demo sites use cases, including dedicated pipelines for algorithms personalization, specific models for smooth integration with the platform, collected data and processed in dat set, etc.

To elaborate a preliminary list of industrial package KERs, a dedicated methodology has been put in place to support demonstrators in their exploitation path. The first step has been the performance of an analysis internal to each demo site partner to map and identify the several advantages obtained thanks to the project involvement. This task has been carried out using an holistic approach that takes into consideration different dimensions to explore SYNERGIES impact on the company/institution from several angles. Thus, each demonstrators has defined the positive results and its added value arising from project experience at different levels in terms of:

- Operational improvements of both day-to-day activities and at strategic level
- Knowledge skills acquisition for technical, consulting and legal/regulatory aspects
- Hardware and software infrastructure and development

All this information has been collected in the table below for each demo site partners considering not only the present situation but also the next phase developments in order to pave the way to a concrete exploitation path.

Demo site	Involved partner	Part 1: Actions/Assets	Part 2: Future Exploitation
Greek Demosite	**HEDNO**	**Operational Improvements:** - TSO & DSO joint collaboration for balancing the grid//coordinated congestion management and voltage control - TSO & DSO joint collaboration for common flexibility use - Reduce distribution grid expansion/upgrade investment costs through flexibility at distribution level - Grid asset management and predictive maintenance of vegetation growth - Common use of standardized and interoperable tools and platforms - Optimized sizing and planning of the network's grid infrastructure and physical assets - Evidence-based decisions on future investments meeting decarbonization goals and incentivising larger RES penetration, storage and electromobility (through identifying and analysing proper penetration scenarios) - Valorisation and utilization of distribution level available flexibility resources through a proper (day-ahead) flexibility marketplace **Technical Skills:** - Seamless semantic interoperability of the data available to the data space knowledge gain - Marketplace functionality knowledge gain - AI Analytics platform knowledge gain - Federated Energy Data Space deployment **Consulting Skills:** - Supporting citizens empowerment and engagement in flexibility scenarios in collaboration with LECs/aggregators	**Operational:** - HEDNO can use the methodologies presented in SYNERGIES to measure grid investment possible reductions using novel, distribution-level flexibility procurement mechanisms and to enhance its operational scheduling based on that flexibility procurement. **Technical Skills:** - Can be re-used after the end of the project very rapidly - Lab creation since the infrastructure is already present. Use the knowledge to facilitate other EU projects rollout **Consulting Skills:** DSO is a critical partner in flexibility implementation discussions

	IPTO	**Operational Improvements:** - Strengthened TSO-DSO interoperability through advanced grid observability, (demand-side) distribution level flexibility (it can also come from the DERs located at the distribution network), and enhanced load management strategies. - Executed a paradigm shift towards open-source software and in-house development of software solutions for creating and accessing data pipelines. - Valorisation and utilization of distribution level available flexibility resources through a proper (day-ahead) flexibility marketplace **Infrastructure Deployment and Software Development:** - Deployment of a dedicated server to facilitate secure and localized access to IPTO's datasets, ensuring alignment with the federated deployment model of the SYNERGIES Energy Data Space - Developed custom scripts to automate data extraction, processing, and formatting, enabling seamless integration of IPTO's energy datasets into the SYNERGIES EDS. - Implemented automated APIs that ensure real-time synchronization of IPTO's data assets within the SYNERGIES platform, enhancing data accuracy and usability across stakeholders. - Nurtured the skills needed for software development and software deployment. **Non-technical Value** - Exposed the organisation to several associations that promote and establish the standards for Data Spaces - Exposure to the Legal and Regulatory requirements for the use and operation of Data Spaces	**Grid Intelligence Services:** - Enable real-time data insights, supporting advanced grid analytics, predictive maintenance, and integration with Synergies energy applications for optimized network monitoring. - Establish a scalable, secure, and regulatory-compliant framework for localized access to both historical and live energy data, empowering market actors with actionable intelligence. - Enhanced Interoperability: Facilitated seamless data integration across TSO-DSO ecosystems, promoting holistic grid management and fostering cross-sector energy innovations. Operational - Utilize part of the available (aggregated) flexibility products at the distribution level to address transmission level congestions and balancing

	COEN	**Hardware Infrastructure:** - Smart Meters & IoT Sensors deployment - Network infrastructure setup - Installation and maintenance equipment **Software & Digital Infrastructure:** - Customized IoT framework for energy monitoring - User interface development for community members - System architecture design and implementation - Security protocols Implementation All of these services aim to the enhanced monitoring, optimal scheduling and remote automatic operation of the flexible devices so as to maximize the available flexibility at the community level and trade it in the respective marketplaces. **Technical Skills:** - IoT system architecture expertise - Energy monitoring and management knowledge - System integration capabilities - Network infrastructure setup capabilities - Hardware installation and maintenance capabilities **Documentation:** - Project planning and coordination - Technical documentation development - Training materials creation - Standard operating procedures establishment **Legal & Administrative** - Legal toolkit development - Administrative procedures establishment	**Commercial Paths:** - Service Model: Offer infrastructure-as-a-service to new energy communities - Open Source Components: Share non-critical components - Consulting Services: Provide expertise in deployment and integration - Maintenance Contracts: Ongoing support and system maintenance - Integration Services: Professional services for system integration Revenue: - Service subscriptions - Implementation fees - Users Data - Flexibility valorisation and prosumer empowerment via the option of the LEC to act as an Aggregator participating in the flexibility marketplace and have some revenues from the local flexibility resources trading. (Proper) redistribution of these revenues to the members of the community **Knowledge Transfer & Capacity Building:** Educational Opportunities: - Training Programs: Knowledge transfer to new community operators - Best Practices Documentation: Create comprehensive guides - Workshop Series: Hands-on training sessions - Community of Practice: Build knowledge-sharing networks **Research & Innovation:** - Innovation Pilots: Living Lab for testing new technologies and approaches - Research Collaborations: Partner with academic institutions - Case Studies: Document successful implementations **Sustainability & Social Impact:** - Energy Efficiency Metrics: Demonstrate savings - Renewable Integration: Support clean energy transition - Environmental Reporting: Generate impact reports

			- Community Engagement: Foster active participation - Energy Democracy: Enable community decision-making - Energy Poverty Reduction: Support vulnerable consumers advocating COENs businesses model - Local Economic Benefits: Create local job opportunities - Knowledge Democratization: Share expertise widely

Spanish Demosite	**CUERVA**	**Operational Improvements** - Enhanced grid management: Coordinated use of grid flexibility and support for grid balancing through data-driven insights. - Predictive maintenance: Implementation of the Predictive Maintenance App to improve grid asset management and reduce operational costs. - Data integration: Seamless integration of real-time energy consumption, battery cycles, and WSN sensor data into the SYNERGIES Data Space. - Flexibility marketplace involvement: Contribution to the day-ahead flexibility marketplace, leveraging local flexibility resources from the Local Energy Community (LEC). - Advanced analytics: Utilize AI-driven analytics for grid optimization and predictive maintenance strategies. **Technical Skills** - Expertise in data interoperability and smart grid technologies. - Proficiency in energy data analysis using the SYNERGIES AI Analytics Platform. - Knowledge in the deployment of federated energy data spaces and real-time data integration through APIs. **Consulting Skills** - Guidance on energy efficiency and flexibility strategies for community members. - Support for prosumers to participate in energy markets and flexibility services.	**Operational** - Grid Optimization: Utilize the methodologies developed in SYNERGIES to improve grid investment strategies, focusing on reducing costs through flexibility procurement at the distribution level. - Predictive Maintenance Application: Extend the use of the Predictive Maintenance App for ongoing grid asset management, reducing operational costs and enhancing system reliability. - Data-Driven Decision Making: Continue leveraging real-time data analytics to support evidence-based investment decisions and infrastructure planning. **Technical Skills** - Replication of Infrastructure: Adapt the WSN systems, smart energy sensors, and battery management solutions developed in Fornes to other grids managed by Cuerva. - API Development and Data Integration: Maintain and expand the SYNERGIES Data Space capabilities, offering data services to third parties. - Lab and Testing Environments: Establish a Living Lab model, using the Fornes demo as a blueprint for testing new technologies in future EU projects. **Consulting Skills** - Act as a key partner in flexibility market discussions, providing expertise on distributed energy resources (DER) integration and community energy management.

	VERGY	**Operational Improvements** - Community growth and engagement: Developing strategies to expand the Local Energy Community (LEC) in Fornes and replicate the model in other regions. - Prosumers empowerment: Providing personalized insights and enhanced services to prosumers, promoting active participation in energy markets. - Data management: Supplying Cuerva with generation data from the photovoltaic plant, including real-time production and performance metrics. - User support: Acting as the primary liaison between the LEC, community members, and the Ayuntamiento de Fornes, ensuring smooth communication and data flow. **Technical Skills** - Proficiency in demographic data analysis and community management tools. - Skills in flexibility market integration and enhancement of prosumer experiences through SYNERGIES tools. - Experience in managing local flexibility assets, including EV chargers and renewable generation systems. **Consulting Skills** - Providing energy education to community members, fostering sustainability practices. - Developing communication strategies to increase community involvement in energy initiatives.	**Commercial Paths** - Service Model: Offer Community Management as a Service (CMaaS), providing support to other Local Energy Communities (LECs) looking to replicate the Fornes model. - Consulting Services: Provide expertise in the creation and expansion of LECs, focusing on prosumers' engagement, community growth, and demographic data analysis. - Integration Services: Offer professional services for data integration, including PV generation data, EV charger management, and user engagement platforms. **Revenue** - Subscription fees from energy community management services. - Implementation fees for replicating the LEC model in new locations. - Data services for academic and market stakeholders, including demographic insights and prosumer behaviour analytics. - Revenue sharing models with prosumers, promoting local flexibility trading and active market participation. **Knowledge Transfer & Capacity Building** - Training Programs: Develop guidelines and best practices for new community operators, offering educational workshops and knowledge-sharing initiatives. - Research Collaborations: Partner with academic institutions to explore new models of community engagement and flexibility valorisation. **Sustainability & Social Impact** - Community Empowerment: Enhance energy democracy by enabling community decision-making. - Economic Benefits: Drive local job creation through community expansion efforts. - Energy Poverty Reduction: Develop strategies to support

			vulnerable consumers, advocating for sustainable business models in community energy networks.

	FORNES	**Operational Improvements** - Administrative support: Managing permits, regulatory compliance, and legal processes needed to expand the Local Energy Community. - Facilitating communication: Assisting Vergy in disseminating information to residents and promoting the benefits of SYNERGIES. - Infrastructure collaboration: Coordinating the installation of public assets, such as EV chargers and photovoltaic panels, within municipal properties. - Data contribution: Providing municipal data that can enrich the SYNERGIES Data Space, particularly for community planning and engagement activities. **Technical Skills** - Experience in managing public assets and supporting community projects. - Administrative expertise in legal and regulatory frameworks related to energy communities. - Skills in public communication and community engagement initiatives. **Consulting Skills** - Offering guidance to residents on how to join the Local Energy Community. - Supporting Vergy in the development of community events and information sessions.	**Operational** - Administrative Excellence: Utilize the experience gained in SYNERGIES to streamline municipal processes for future energy projects. - Supportive Role in New LECs: Provide administrative support to new communities, acting as a regional reference for energy community development. - Public Communication: Enhance community engagement practices, sharing successful strategies used in the Fornes demo. **Educational Opportunities** - Workshops and Training: Organize local events to educate citizens on energy efficiency, renewable energy benefits, and participation in the LEC. - Documentation and Best Practices: Create comprehensive guides and manuals for other municipalities, promoting the development of LECs across rural areas. **Sustainability & Social Impact** - Environmental Leadership: Use data from the SYNERGIES Data Space to support environmental reporting, highlighting achievements in renewable integration and energy efficiency. - Community Engagement: Continue supporting Vergy in fostering participation, ensuring that local voices remain central to community energy projects. - Energy Democracy and Economic Impact: Promote community-driven decision-making and local economic benefits, demonstrating the value of community energy models in boosting local economies.

Danish Demosite	**BEOF**	**Hardware Infrastructure** - The project has provided knowledge and practical experience in installing IoT equipment in private homes equipped with renewable energy sources (RES) such as solar panels or wind turbines. - Understanding the technical requirements and challenges associated with integrating IoT equipment with existing energy systems. - Knowledge of interoperability between different technological platforms, which is essential for creating a cohesive and efficient energy system where data can be exchanged seamlessly between devices. **Software** - Understanding and insights into data governance, including ensuring data quality, data security, compliance, data management, and data architecture. - Insights into the integration of APIs for real-time and near real-time data. - Insights into existing user interfaces (Neogrid) that facilitate easy interaction with the system for the prosumers. **Commercial Pathways** - Insights into how flexibility in energy consumption can be managed and offered as a service, including the development of market models for flexibility customers and the identification of potential customers. - Insights into the regulatory frameworks for flexibility valorisation in Denmark, including analysis of how flexibility resources can be monetized and compliance with existing legislation. - Identification of various revenue streams, including subscription models for energy services, installation fees for IoT equipment, and data services.	BEOF does not plan to continue activities from the project, the insights and experiences gained can still be valuable: **Technological Insights** The project provided knowledge and practical experience in installing and integrating IoT equipment in homes with renewable energy sources. This understanding of interoperability and technical requirements can be applied in future projects. **Software Development** Experience with data governance, API integration, and user interface development has strengthened the company's software development skills. This knowledge can improve existing systems and aid in developing new solutions. **Commercial Pathways** Insights into flexibility as a service and regulatory frameworks for flexibility valorisation in Denmark have highlighted market potential. This knowledge may be useful if market conditions change or new business models are explored. **Legal and Regulatory Insights** The project provided a comprehensive understanding of legal and regulatory aspects of data sharing and requesting energy-related data, ensuring compliance and informing future decisions. **Citizen Engagement and Flexibility Scenarios** Experience with citizen engagement and flexibility scenarios has enhanced the company's ability to advise on energy-saving initiatives. These consulting competencies can improve customer service and engagement. **Communication** Improved communication skills with prosumers and technical

		Legal and Regulatory Insights - Knowledge of legal agreements related to the sharing of energy-related data. - Knowledge of legal agreements related to requesting energy-related data from private individuals. - Insights into regulations concerning Local Energy Communities (LEC) in Denmark. **Citizen Engagement and Support for Flexibility Scenarios** - The project's insights into flexibility enable BEOF to advise on energy-saving initiatives such as energy efficiency, flexibility strategies, and participation in energy markets. - Developed consulting competencies can enhance customer satisfaction within the company. - By collecting data from prosumers, BEOF gains valuable insights into their unique needs and motivations for installing renewable energy sources. **Communication** - Effective communication with prosumers regarding the citizen engagement process that took place in the SYNERGIES project. - Clear and precise communication with technical partners to ensure collaboration and understanding of the project's goals and outcomes. **Collaboration with Research Institutions** - The collaboration with research institutions has been significantly strengthened through this project. This partnership is crucial for bridging the gap between academia and industry.	partners can strengthen future collaborations and ensure clear information exchange.

	TENO	**Operational Improvements:** **Consumer Engagement & Data Ownership:** Introduce consumers as active data providers, enabling their participation in energy markets and fostering a more decentralized, data-driven energy ecosystem. **Enhanced Grid Management & Resilience:** Strengthen collaboration between TSO and DSO to enhance system resilience, optimize network operations, and improve real-time grid observability. **Data-Driven Flexibility Utilization:** Leverage energy data spaces to integrate renewable energy sources (RES), promote self-consumption, and optimize demand-side flexibility. **Efficient Asset Management:** Implement predictive maintenance models to reduce operational costs and extend asset lifespan using AI-driven data analytics. **Regulatory Insights & Policy Contributions:** Provide empirical evidence for future regulatory frameworks supporting energy data spaces and flexible energy markets. **Integration with Local Energy Communities (LECs)**: Support the development of LECs as aggregators and balance-responsible parties (BSPs), enabling community-based energy trading. **Technical Skills:** **Semantic Interoperability & Data Integration:** Facilitate seamless data sharing across sectors, ensuring compatibility and standardization across energy, mobility, and building infrastructures. Federated Energy Data Space Deployment: Implement and	**Impact & Future Prospects:** **Operational Excellence:** Utilize insights from SYNERGIES to refine asset management strategies, optimize network investments, and enhance distribution-level flexibility procurement. **Technology Leadership:** Establish TREFOR as a frontrunner in smart grid technologies, leveraging energy data spaces for next-generation energy services. **Sustainability & Green Transition:** Contribute to Denmark's decarbonization goals by integrating renewable energy, promoting self-consumption, and facilitating smarter energy use through digitalization. **Scalability & Replication:** Ensure that the methodologies and frameworks developed within SYNERGIES can be scaled and applied across other DSOs, energy markets, and EU-wide energy initiatives. TREFOR's participation in SYNERGIES aligns with its strategic vision of digital transformation and energy innovation, reinforcing its role as a key player in the future of energy data spaces and smart grid evolution.

		contribute to the development of a reference energy data space for SYNERGIES. AI & Advanced Analytics in Grid Operations: Utilize AI-based analytics for predictive grid maintenance, network expansion planning, and real-time grid performance optimization. Digital Marketplaces for Flexibility Services: Develop and refine marketplace functionalities for trading flexibility products at the distribution level. Cybersecurity & Data Privacy Measures: Implement security standards and access control mechanisms to ensure robust and compliant data handling within the energy data space. **Consulting Skills:** Stakeholder Collaboration & Knowledge Transfer: Work closely with policymakers, industry partners, and academia to foster innovation and best practices in data-driven energy management. End-User Engagement & Energy Literacy: Empower consumers with insights into their energy consumption patterns, enabling informed decision-making and participation in energy markets. Strategic Policy Influence: Contribute to regulatory discussions on the standardization and governance of energy data spaces at national and EU levels. **Commercial Paths:** Service Model: Develop data-driven services for energy communities, municipalities, and industry stakeholders, focusing on demand-side flexibility and energy efficiency.	

		Consulting & Integration Services: Offer expertise in digital energy solutions, interoperability frameworks, and data-driven decision-making to other DSOs and market participants. Revenue Streams: Explore monetization opportunities through data-driven services, predictive analytics for grid operations, and flexibility market participation.	

	EWII	**Operational Improvements** - Administrative support: Regulatory compliance, and legal processes needed to support Local Energy Communities. - Prosumers empowerment: Providing personalized insights and enhanced services to prosumers, promoting active participation in energy markets. - Facilitating communication: Assisting TENO in data sharing for the benefit of end users as well as the DSO and promoting the benefits of data sharing. - Data contribution: Assisting TENO in data sharing **Technical Skills** - Experience in managing public assets from LEC's and supporting community projects. - Administrative expertise related to energy communities. - Skills in public communication and community engagement initiatives regarding LEC's. **Consulting Skills** - Offering guidance to residents on how to start/join LEC's. - Guidance on energy efficiency and flexibility strategies for community members. - Support for prosumers to participate in energy markets and flexibility services. - Supporting energy data sharing.	**Commercial.** - Consulting Services: Provide expertise in the creation and expansion of LECs, focusing on prosumers' engagement, community growth, and demographic data analysis. - Integration Services: Services for data integration, including EV charger management, and user engagement platforms. To attract new customers. **Knowledge Transfer & Capacity Building** - Training Programs: Best practices for new community operators, and knowledge-sharing initiatives. - Research Collaborations: Partner with academic institutions to explore new models of community engagement and flexibility valorisation. **Sustainability & Social Impact** - Energy Democracy and Economic Impact: Promote community-driven decision-making and local economic benefits, demonstrating the value of community energy models in boosting local economies. - Community Engagement: Ensuring that local voices remain central to community energy projects. - Environmental Leadership: Use data to support environmental reporting, highlighting achievements in renewable integration and energy efficiency.

Table 4. Industrial Package Exploratory Exploitation Analysis

This preliminary work will lay the foundation for the next phase consisting in the elaboration of the KER list and the definition of the exploitation route not only internal to each partner but also in agreement with other involved partners in case of joint results, mainly concerning IT providers.

The demosites experience will contribute to the dissemination of project achievement by boosting the joint exploitation. The pilots experience represents a valuable know-how not only in terms of testing and assessing digital solutions developed within the project period but also considering its impact on the company and local communities at a higher level. For this reason, industrial partners plan to profit from the project involvement applying the achieved results and developed assets to other contexts. From a TSO/DSO internal point of view, this could refer to specific departments for operations efficiency, work planning, organization improvements and linked benefits. If we consider exporting SYNERGIES experience to prosumers, it could encourage the SYNERGIES solutions uptake of local energy clusters of citizens. Thus, the post project exploitation strategy of demonstrators can play a relevant role in the project scalability process and also in the joint exploitation path.

For this reason a special focus on the industrial package exploitation will be dedicated in the following months and revised after the launch of the 2nd demonstration phase in parallel with the completion of the 1st iteration of testing and validation activities and the 2nd release of the SYNERGIES solutions.

4.2 IPR Analysis and Strategy

This chapter provides the Intellectual Property Right analysis and strategy of SYNERGIES, starting from the normative principles foreseen in accordance with the Consortium Agreement. The SYNERGIES Consortium Agreement has been signed between consortium members and is the main reference for ownership of results, joint ownership, transfer of results, access rights, etc.

This Consortium Agreement is based upon Regulation (EU) No 2021/695 of the European Parliament and of the Council of 28 April 2021 establishing Horizon Europe – the Framework Programme for Research and Innovation (2021-2027), laying down its rules for participation and dissemination (hereinafter referred to as "Horizon Europe Regulation"), and on the European Commission's General Model Grant Agreement and its Annexes.

The present section provides the guidelines to manage the intellectual property generated during the course of SYNERGIES project. The protection and management of Intellectual Property and access rights for Foreground generated within the project, being it for further research or for commercial use and exploitation, is an essential issue, to which this Consortium is going to devote great attention aiming at clearly identify and address all the relevant concerns, such as ownership and suitable protection mechanisms to be applied to the project results. Aim of this chapter is to provide a detailed report on the deep work done by consortium partners on IPR management and results based on the following information:

- IPR principles on which the IPR assignment are based (principles are reflected in the Consortium agreement as well);
- IPR Roadmap describing the process of IPR management along the 42 months of the project
- IPR Registry listing exploitable results and associated IPR and IPR Repository place where the exploitable results are described. These 2 elements converges in the KERs Database as described in chapter 4.1.1

The IPR is governed by the Consortium Agreement and Grant Agreement, which ensures fair exploitation rights for all partners. The overarching objective is to set up, collect and monitor the IPR dimension of the project´s results. The specific scope is to seek IP protection in cases where:

- The project results are clearly open to commercial and industrial application;
- The protection of the result is reasonable;
- The potential economic benefits clearly outweigh the financial cost of seeking such protection.

4.2.1 IPR Principles

All partners are dedicated to contributing their expertise to ensure the success of the project. They will uphold mutual respect for each other's background intellectual property rights. Any partner holding patents, copyrights, or other protected intellectual property necessary for achieving project objectives will offer them under fair and reasonable terms. Products, information, source code, or other protected items owned by one partner will only be used by another partner under clearly communicated licensing conditions for project use and exploitation.

Regarding intellectual property resulting from project activities (foreground), partners will mutually agree on co-ownership based on their respective contributions to design and development. Co-owning parties will adopt appropriate intellectual property measures. If necessary, the consortium will engage services from the EC IP Helpdesk, specifically the Horizon IP Scan91 service, to facilitate the development of a joint IP management strategy, anticipate potential IP conflicts, and bolster the plan for exploiting project outcomes.

Partners have also committed to respecting each other's rights during the dissemination of project results. The decision to publish research findings and undertake Technology Transfer will carefully balance the need to safeguard specific foreground within the consortium to ensure future protection. Partners will notify the consortium and the Management Team of planned publications or activities that could disclose sensitive information to the public. Such activities may be delayed until appropriate protection measures, such as patent filings, are in place.

Two critical issues require careful consideration: i) ensuring "freedom to operate," ensuring SYNERGIES and its individual components can be utilized without infringing existing patent claims, and ii) evaluating the potential patentability of project innovations. The patent search conducted (section 1.3.3) indicates that the core functionalities of the SYNERGIES Energy Data Space (including associated energy services and apps) have not been patented or otherwise protected to date. This provides ample opportunity for the consortium to secure protection and deter competition. Partners will explore the feasibility of patenting project foreground in key national markets of interest.

The IPR strategy has been defined in compliance to the Consortium Agreement articles and the following IPR principles agreed by all partners:

- **Open Source Licenses Handling**. The project promotes open source licenses to strengthen the project's results sustainability, empower innovation and allow third parties to get inspired, extend research, maintain and utilise the SYNERGIES outcomes through customisations, without though hampering the partners' commercialization opportunities. This indication is valid for part of its software results while its baseline and trained AI models must not be open for security safeguarding reasons. To this direction, the consortium preferably utilises available open source components for the implementation of the SYNERGIES components monitoring, managing possibly conflicting open source licenses. As such, the consortium evaluated the compatibility of the license of each component to be integrated keeping in mind alternative elements if the open source first choice presented criticalities or wasn't aligned to IPR principles.
- **IPR Management at Consortium Level**. The project's execution generates not only technical results, but also a large amount of know-how from all the partners. The Consortium Agreement defines the kind of results to be generated in the scope of project and how such results are managed within the Consortium. During the development of the relevant implementation tasks, the project partners analyse the different ways of protecting the corresponding property rights according to the type of the result obtained.
- **Ownership of Foreground**: Regarding ownership of the foreground, it is agreed that foreground is the property of the beneficiary carrying out the work generating that foreground. Where several beneficiaries have jointly carried out work generating foreground (e.g. methodology, software components, integrated platform) and it is not possible to separate such joint invention, design or work for the purpose of applying for, obtaining and/or maintaining the relevant patent protection or any other intellectual property right, the Parties have joint ownership of this work. The joint owners negotiate in good faith the terms and shall establish a written separate joint ownership agreement regarding the allocation of ownership and terms of exercising, protecting, disseminating, the division of related costs and exploiting such jointly owned Results on a case by case basis.
- **Access to Background**: In the Consortium Agreement, the Parties have identified and agreed on the Background for the Project and have also, where relevant, informed each other that Access to specific Background is subject to legal restrictions or limits; any Party may add further own Background to the CA during the Project by written notice to the other Parties. Access rights to foreground and background is granted to the other beneficiaries, if it is needed to enable those beneficiaries to carry out their own work under the project and/or to use their own foreground provided that the beneficiary concerned is entitled to grant them. Such access rights are free of any administrative transfer costs and is granted on a non-

exclusive basis unless otherwise agreed by all beneficiaries in a specific agreement. All access rights and IPRs of the background knowledge are retained by the corresponding consortium partners upon the project end. Other beneficiaries may not utilize background knowledge for exploitation or commercial purposes.

- **Access Rights**: The granting of access rights depends on the acceptance of specific conditions that aim at ensuring that these rights are used only for the intended purpose, for the predefined time and that appropriate confidentiality obligations are in place. Access Rights to Results if Needed for Exploitation of a Party's own Results shall be granted on Fair and Reasonable conditions. No guarantees or warranties regarding fitness for purpose or updates, unless bilaterally agreed. No obligation for such Party to grant access rights to results involving confidential information. Access rights to Results for internal research activities shall be granted on a royalty-free basis. No guarantees or warranties regarding fitness for purpose or updates, unless bilaterally agreed. No obligation for such Party to grant access rights to results involving confidential information.
- **IPR protection regarding dissemination**: dissemination activities shall be compatible with the protection of intellectual property rights, confidentiality obligations and the legitimate interests of the owner(s) of the foreground. A prior notice of any dissemination activity will be given to the other beneficiaries concerned in advance (in an agreed, pre-defined time period), including sufficient information concerning the planned dissemination activity and the data envisaged to be disseminated. The time for objections is also defined, and objections may stop or postpone dissemination. With regard to scientific publications regarding foreground published before or after the final report, should be provided as open access. The consortium will use Zenodo (https://zenodo.org/) as open access platform. The parties undertake to cooperate to allow the timely submission, examination, publication and defence of any dissertation or thesis for a degree that includes their foreground or background. All details related to disclosing of "confidential" information, such as period of usage, modalities and conditions of usage, rights to disclose it to the third party, return to the provider etc., are defined in the Consortium Agreement.

4.2.2 IPR Roadmap

The IPR Roadmap has been created according to project planning and deliverables and milestones achievement and it is checked and updated (if necessary) every six months during project general meetings. The roadmap defines how the IPR are managed, where they are stored and the history of different versions elaborated during the project.

The roadmap identifies 3 major steps corresponding to the three phases of the exploitation roadmap at M30 (D6.2), M42 (D6.3) and post project period:

- In the present document (M30) IPR process is depicted based on the preliminary identification of the ownership percentage for each exploitable result of the project. The result is stored in the KER Database.
- In D6.3 (M42) project results and their ownership will be updated in relation with the new elements arising from M31 to M42 and packaged in exploitable packages. The ownership identification will be detailed on new results and updated on the specific work share. The registry KERs Database will be updated accordingly to reflect the new scenarios.
- In the post project phase the IPR principles will be followed and the IPR plan will be implemented and finalized with the final version of the IPR Registry including all the results and all the licenses of the elements. Special focus will be given to the joint results management in accordance with the joint exploitation and the parties agreement for future commercial exploitation of generated results.

4.2.3 IPR Registry

For each SYNERGIES KER, the IPRs are carefully assessed, in order to create a favourable environment for respecting the intellectual property aspects and guarantee a sound approach by participants. For this reason, the IPR Repository within the KERs Database described in section **Error! Reference source not found.** will constitute the main tool, continuously updated during the implementation phase of the project in order to have a clear vision of ownership, co-ownership, possible licensing issues, conflicts etc. As SYNERGIES defines assets as tangible or intangible results, regardless of their nature, the exploitation team is set to identify and analyse any assets or combination of elements with specific exploitation potential resulting from the project activities.

During the preliminary and final IPR analysis, the exploitation team will identify the cases of sole or joint ownership for the foreground developed during the project. In the case where the contribution of multiple beneficiaries cannot be established, a joint ownership agreement must be concluded which stipulates the efforts invested by each partner.

The objective is to collect all the relevant and necessary information about the exploitable assets during the implementation and post-project stage in order to provide a complete overview of all the assets generated, tracing their ownership, helping the project partners to recognize their IP assets and ascertain the existence of third parties' rights. Thus, the database is based on the following template:

- type and description of the asset;
- ownership;
- license scheme;
- other proprietary components involved;
- possible license issues

For this reason, related to each KER table, an additional format was shared among partners (see template below) to describe IPR related aspects such as ownership of results, type of license and involved background proprietary asset. As for the KER table, also in the case of the IPR single partners templates are reported as Annex 2 in attachment at the present document.

As the project will progress, this tool will be updated constantly in order to check the status of the identified assets, to filter the ones with market potential and to appropriately manage the intellectual property rights of all the assets in order to develop a clear IPR portfolio.

Exploitable Asset	ID	Exploitation Package	Type of result	Responsible Partner/s	Involved partners	Ownership	Type of Source
Energy Data Space (SYNERGIES EDS)	TP-1	Technological Package	Software	SUITE5	Maggioli, Ubitech, ROESOFT and TXT	SUITE5	Closed source
Network of Sectorial Data Models	TP-2	Technological Package	Software	SUITE5	UOP	SUITE5	Closed source
Energy Services marketplace	TP-3	Technological Package	Software	ETRA	none	ETRA	Closed source
AI Analytics On-Demand Service Platform (AISP)	TP-4	Technological Package	Software	SUITE5	none	SUITE5	Closed source
AI (Energy) Analytics Solutions	TP-5	Technological Package	Software	SUITE5	TXT, ICCS, CIRCE, ETRA, Ubitech, Maggioli, DTU	TBD	Closed source
Prosumers and Aggregator Energy Analytics Toolset	TP-6	Technological Package	Software	ETRA	ETRA, IES	This ER is subdivided into three modules, each with its own IPR ownership: • Community Digital Twin for Local Energy and Flexibility Management Optimization:	Closed source

						owned by IES 100%. • Prosumer Digital Twin for Optimized Management and Control of Individual Prosumer and Building Assets: owned by IES 100%. • Prosumer Energy Analytics and Smart Building Application: owned by ETRA 100%.	
EV Fleets Analytics Toolset	TP-7	Technological Package	Software	ETRA	ETRA, IES	This ER is subdivided into three modules, each with its own IPR ownership: • Community Digital Twin for Local Energy and Flexibility Management Optimization: owned by IES 100%. • Prosumer Digital Twin for Optimized Management and Control of Individual Prosumer and Building Assets: owned by IES 100%. • Smart Charging Application for EV fleets: owned by ETRA 100%.	Closed source
TSO-DSO Operation Optimisation and Flexibility Management Toolset	TP-8	Technological Package	Software	ICCS	ICCS, DTU	ICCS	Closed source
End-User Flexibility Pooling Services and Smart Contracting	TP-9	Technological Package	Software	Ubitech	Ubitech, IES	Ubitech	Closed source
Mid-to-Long Term Network Planning & Green Investment Assessment Toolset	TP-10	Technological Package	Software	ICCS	ICCS	ICCS	Closed source

Network Asset Management & Maintenance Assessment Toolset	TP-11	Technological Package	Software	CIRCE	CIRCE, ICCS	CIRCE	Closed source
Stakeholder Engagement Methodology	CP-1	Consultancy Package	Methodology	PI	none	PI	Closed source
Data Processing Legal Compliance Toolkit for Energy Communities	CP-2	Consultancy Package	Methodology	COEN	-	COEN	Closed source
IoT Platform for Energy Communities	TP-12	Technological Package	Software	COEN	-	COEN	COEN investigates the possibility to publish it as an open-source repo
Impact assessment methodology	CP-3	Consultancy Package	Methodology	VTT	Suite5, ICCS, ETRA, DTU, IES, CIRCE, Ubitech	VTT	Open source

4.3 Market analysis

In this chapter the preliminary market analysis is provided. The first chapter is focused on the background and legal framework identifying the targeted market for the SYNERGIES Energy Data Space, completed by a competition analysis. PEST and SWOT updated analysis complements the analysis.

4.3.1 Market analysis

Background and targeted market. The SYNERGIES Energy Data Space is a groundbreaking Data-as-a-Service (DaaS) product, featuring secure and trustworthy mechanisms for data transactions between data owners and consumers. It offers a suite of advanced AI-powered energy services, digital twin solutions, and energy applications. These services will be available on an ad-hoc basis to stakeholders aiming to optimize energy management and operations throughout the entire energy system.

Enabled by blockchain, data marketplaces are **expanding** rapidly across various domains. Accenture[13] estimates a potential market value of over $3.6 trillion by 2030. The SYNERGIES Energy Data Space is targeting the global Data as a Service (DaaS) market, which was valued at USD 5.4 billion in 2021 and is projected to grow at a **CAGR** of 14% from 2021 to 2030, reaching USD 30 billion globally. The DaaS market is anticipated to grow from USD 21.0 billion in 2024 to USD 75.2 billion by 2032, with a compound annual growth rate (CAGR) of 17.23% throughout the forecast period (2024-2032). Furthermore, the DaaS market size was valued at USD 18.0 billion in 2023. The swift adoption of subscription-based services is fueling the growth of the DaaS market.[14]

Data and data sharing can significantly lower carbon footprints and energy consumption by easing traffic congestion, as well as boosting the energy efficiency of buildings and vehicles. Factories, farms, and construction companies can refine production lines and supply chains by utilizing data on industrial equipment performance. Farmers can use satellite and sensor data to manage water resources and crops more effectively, improving overall productivity. With the increasing integration of distributed energy resources and IoT devices into energy networks, there is a rising demand for data platforms that manage diverse datasets and encourage data sharing among various entities within the energy data value chain.

The development and **implementation** of innovative big data management and data-sharing technologies rely heavily on commercial arrangements and regulatory frameworks that align top-down directives (such as European and national policies) with bottom-up initiatives (local projects and applied innovations).

Historically, the regulatory environment and the techno-economic status quo have resisted or not favored energy data exchange among different business entities. However, **barriers are gradually being removed**, and new regulatory frameworks, such as the approved Data Governance Act, address the need for establishing Data Spaces in various sectors, including energy. Several European associations are collaborating to establish new rules that promote data exchange among different business entities, such as European DSO associations working with ENTSO-E, GAIA-X and its working group on Energy, and others. Beyond data sharing, the increasing volume of data and the need for multi-party access and service provision are paving the way for the establishment of data and services marketplaces.

The **Commission** expects the data economy in the EU to grow from €301 billion in 2018 to €829 billion in 2025. Europe's global competitors, the US and China to name a few, are innovating quickly and expanding data access and use. To lead the data market, the EU should find a way to grow its potential

[13] https://www.accenture.com/us-en/services/applied-intelligence/data-value - Assessed in July 2024
[14] https://www.mordorintelligence.com/industry-reports/data-as-a-service-market- Assessed in July 2024

and set standards. To increase data sharing in the EU, Parliament and the Council adopted the Data Governance Act on April 6, 2022, setting the legal framework for data. The Act aims to expand data availability and reinforce trust in data sharing and in intermediaries and will be in force from September 2023. Furthermore, in March 2023 Parliament adopted its position on the Data Act, which will make it easier for businesses to access large amounts of high-quality industrial data.[15]

The **Parliament** aims to boost data sharing in the EU, so that companies and start-ups will have access to more data that they can use to develop new products and services. Access to big data is crucial to exploiting the potential of artificial intelligence. Building on the Data Governance Act, in November 2023 Parliament approved the Data Act, which will make it easier for businesses to access large amounts of high-quality industrial data, especially coming from the Internet of Things, making it safer and easier as well ensuring it is in line with data protection legislation. This will be achieved through a range of technical solutions such as anonymisation and data pooling to legally binding agreements by the users.

The new **legal framework** will enable data collected in some public sector areas to be better used. They also allow the creation of common European data spaces for important areas: health, environment, energy, agriculture, mobility, finance, manufacturing, public administration and skills. The new rules for data marketplaces – like the one originated by the Synergies project - will help new intermediaries to be recognised as trustworthy data organisers.[16]

The **European data as a service (DaaS) market** is the world's second-largest owing to the massive amounts of technology and digitizing data. Likewise, the increasing adoption of cloud-based big data analytics software is increasing revenue growth in this region. In addition, the rapidly growing demand for DaaS in the region's government, manufacturing, consulting, and financial services segments is estimated to thrust market income growth during the projection period. The U.K. data as a service (DaaS) market held the majority of market share, and the France data as a service (DaaS) market was the fastest-growing market in Europe.[17]

In addiction to this, in the past years, **energy prices** have been raising and Europe has now entered an **'energy crisis'**. While the war in Ukraine is a significant factor, it is not the sole reason for the current situation in the European energy market. Energy prices are influenced by a variety of economic, social, political, and environmental factors. Data can assist Europe in navigating the energy crisis by providing access to open, reliable, and accurate energy information, enabling policymakers to make informed decisions to help countries manage the side effects of the crisis. Additionally, this data can guide the market in transitioning toward more sustainable energy production and consumption. Accurate and accessible energy data plays a crucial role in guiding Europe through the current energy crisis. These insights enable the market to navigate towards more sustainable energy production and consumption patterns, fostering a transition aligned with long-term environmental goals. [18]

In the sector of energy data & services marketplaces, competition has been consistently growing in the past years.

This positions SYNERGIES as a superior alternative for organizations seeking a robust and versatile energy data management solution. In the **energy data & services marketplaces**, there is ample opportunity for innovation and market penetration due to the limited number of market-ready services, such as **Re.alto Marketplace** by the Elia Group, **Nord Pool Power Data Services**, and the **n3rgy Marketplace** in the UK. Competition is still limited, and regulations around Energy Data Spaces and data sharing across the EU is growing. This presents a unique opportunity for SYNERGIES to

[15] https://data.europa.eu/en/publications/datastories/value-energy-data-and-its-role-market - Assessed in July 2024
[16] https://www.capgemini.com/wp-content/uploads/2022/01/Digital-Transformation-for-Grid-Operators.pdf
[17] https://www.marketresearchfuture.com/reports/data-as-a-service-daas-market-6057
[18] https://data.europa.eu/en/publications/datastories/value-energy-data-and-its-role-market

penetrate the market and achieve significant market shares in a promising but relatively immature sector.

Re.alto, a startup originating from the Elia Group, launched its Marketplace for the exchange of data and services in the energy sector in 2021. The platform facilitates data exchange and connectivity for energy devices, focusing on B2B players active in the energy sector. While specific revenue figures are not publicly disclosed, re.alto has raised a total funding amount of €5.5 million as of their last funding round in September 2021. This indicates a significant investment and trust in the potential of their marketplace and services.[19]

N3rgy marketplace: n3rgy is a company that aims to make energy data accessible to all through its innovative Software as a Service (SaaS) platform and services. On June 21st, 2022, n3rgy was acquired by Smart Metering Systems at a valuation between $1.71M and $2.68M. The company's revenue is reported to be less than $5 million. They offer a Software as a Service (SaaS) platform and services to facilitate the success of organizations working with energy data.[20]

Nord Pool, which operates the leading power market in Europe, is reported to have a revenue of 16.9 million. They offer a range of services including day-ahead and intraday markets, and their power data services provide access to real-time and historical power market data.[21]

4.3.2 Positioning

The **SYNERGIES offering** is distinguished by its comprehensive feature set, encompassing data management, quality assurance, security, interoperability, and sharing services, thus addressing the entire lifecycle of energy data. This advanced solution surpasses existing ones that often focus on specific data types, struggle with interoperability, or provide data sharing services without improving data quality. Additionally, SYNERGIES includes energy analytics, digital twins, and various applications, making it a one-stop shop for data and energy services.

The SYNERGIES Energy Data Space **positions itself as a state-of-the-art Data-as-a-Service (DaaS)** solution tailored for the energy sector. It combines secure, trustworthy data transaction mechanisms with a suite of advanced AI-enabled energy services, digital twin solutions, and energy applications. By managing the full lifecycle of energy data, SYNERGIES sets itself apart from existing solutions that may narrowly focus on specific data types or face interoperability issues. SYNERGIES **differentiates** itself through a holistic feature set that spans data management, quality assurance, security, interoperability, and data sharing services. This comprehensive approach ensures that users can manage, share, and analyze their energy data seamlessly and securely. Unlike other market offerings that might specialize in one aspect or struggle with interoperability issues, SYNERGIES provides an integrated, end-to-end solution that enhances data quality and usability.

Through SYNERGIES, data owners can engage in data trading. The revenue model consists of retaining a **5% fee** from the value of each transaction (estimated average of €500 per transaction). Considering the scale of deployment, the data to be handled, and the services used, a layered pricing policy will substitute **annual subscriptions** to SYNERGIES services (**average license cost of €55,000**). More additional services (consultation, implementation, training) will be offered at a cost of **€400 per hour** and are expected to increase revenues by 4%.

SYNERGIES will focus on building a compelling **product brand**, crafting and implementing an effective marketing and communication strategy, and securing necessary capital for the commercialization phase. This approach aims to successfully launch the SYNERGIES Energy Data Space into the DaaS market and achieve at least a 0.1% global market share within four years post-launch, translating to approximately €26 million in revenue. This corresponds to a 0.5% share of the EU market, estimated

[19] https://www.crunchbase.com/organization/re-alto-energy
[20] https://www.cbinsights.com/company/n3rgy/financials
[21] https://rocketreach.co/nord-pool-profile_b5c73063f42e0d3e

to be 20-25% of the global market. The commercialization strategy includes costs for transforming SYNERGIES into a market-ready product, with further optimization and initial marketing expenses estimated at €2,000,000 for the first twelve months post-project. The goal is to secure a 0.01% share of the global DaaS market within the first year after the project concludes in 2027 and reach 0.1% by 2030 (0.5% of the EU market). Projections account for marketing costs at 15% of revenues, operations costs at 22% of revenues, and maintenance costs at 30% of revenues.

SYNERGIES aims to be the **leading platform** for energy data management and services, capturing at least 0.1% of the global DaaS market within four years of its launch, equating to approximately €26 million in revenues and a 0.5% share of the EU market. By continuously enhancing its offerings and focusing on innovation and customer needs, SYNERGIES is set to establish new benchmarks in the energy data sector and deliver substantial value to its users.

4.3.3 Pestel analysis

Political

- The European Union is supportive of initiatives related to energy data sharing
- EU Regulations on data sharing
- Increased interest in consumers who also produce energy (prosumers) participating in energy data sharing and flexibility markets
- There is a global push towards optimizing networks and enhancing energy efficiency
- New regulations in the EU and US require energy optimization and the integration of renewable energy sources (RES).

Economic

- Increasing energy costs drive demand for energy efficiency solutions
- The economy is increasingly being shaped around the collection and use of smart energy data
- Smart technologies help reduce the operational costs of smart grids and allow for deferred investments by cutting down energy costs
- Venture capital investment is growing in the fields of big data and energy data
- Advances in machine learning and artificial intelligence are enhancing the operations within the energy sector

Social

- Citizens are increasingly empowered and engaged in markets related to data sharing
- There is a rising trend of consumers actively participating in energy and flexibility markets
- The EU is promoting the establishment of local energy communities
- There is a growing trend towards the personalization of services
- Investment trends are strongly leaning towards green and sustainable solutions
- Mitigation of climate change is a significant driver for energy efficiency initiatives

Technological

- Big data management and sharing solutions, such as blockchain, are maturing
- Ensuring secure and reliable big data sharing is crucial for advancing a data-driven energy economy
- Solutions focused on human needs and behaviours are becoming significant in encouraging prosumer participation in flexibility transactions
- The liberalization of energy markets necessitates solutions that provide flexibility for optimizing energy networks

4.3.4 Swot analysis

Strengths	Weaknesses
- Deep knowledge of the market domains involved - Consortium covering entire value chain and already established in the respective international markets - Innovative solutions with clear differentiation, unique features - Growing market	- Long term development (3-5 years project) - Need for additional investment by potential clients - Integration of different technologies increases complexity - Established energy company activating a similar service
Opportunities	**Threats**
- Data sharing and data spaces at the centre of the political and industry interest around the EU - Increased need for data driven energy optimization solutions - High growth potential of the smart grid and big data and energy analytics markets - Increasing costs of energy demanding efficiency - The Data Governance Act, adopted by Parliament on 6 April 2022, boosting data sharing in the EU - AI regulation (EU AI Act)	- Regulatory framework around flexibility markets unclear/non-favourable in several EU countries - Fragmentation of the energy sector in terms of data and difficulty to change the mentality of actors - Growing competition

4.4 Exploitation strategy

4.4.1 Objectives

Overall objectives of the exploitation task are fostering exploitation by ensuring contacts to stakeholders, collecting needs and requirements, identifying challenges for implementation, summarizing impact, and developing the exploitation plan and the exploitation strategy.

The work concerning the exploitation is included in WP6 and more specifically Task 6.3 “Exploitation and Business Innovation Planning” and T6.4 “New data sharing-driven business models for prosumers and local energy communities” whose main objectives respectively are to:

- Roll out Exploitation Strategies for exploitation routes definition from a joint and individual perspective (T6.3)
- Development of the final SYNERGIES business model (T6.3)
- Ensure the replication of SYNERGIES experience and approach for commercial and non-commercial purposes on a long-term horizon supported by dissemination activities (T6.2)
- Leverage on prosumers and local communities engagement (T6.1) for the identification of specific Business Models based on data sharing for target users (T6.4)

To achieve these objectives, recognized methodologies and tools that fit the profile of SYNERGIES has been selected and will be adopted throughout the project, being revised in an iterative process (as explained in detail in section Methodology). Dedicated templates have been shared among the Consortium members and will be constantly updated to collect the KERs' commercial features, the individual exploitation ideas and the joint exploitation point of view supporting the involvement of

the Consortium towards a strategic exploitation plan with strong partnerships and a clear path paving the way to the market penetration.

4.4.2 Partners Characterization

Towards realizing the project goals, SYNERGIES brings together four distinct but, at the same time, overlapping, knowledge areas: (i) Energy systems & Services, (ii) Big Data Management, Interoperability, Security & Analytics, (iii) Business Innovation & Energy Markets and (iv) Social Sciences and Humanities, with focus on citizen engagement and legal issues. Taking into consideration the mentioned four knowledge and expertise areas, the consortium has been built with the aim to cover the whole value chain and provide the competencies, knowledge and expertise needed for its successful implementation. The SYNERGIES consortium involves partners with multi-domain expertise and interdisciplinary knowledge. This knowledge overlapping enhances the effectiveness of the work because it helps to break the "language and terminology" barriers that appear when working in teams with different backgrounds. In terms of competencies and ability to address the technological and innovation goals of the project, the consortium is composed by 23 partners from 11 countries, covering the overall value chain of the project: applied research with a strong focus on making research results available in public through the adoption of open science practices (i.e. VTT, DTU, ICCS, CIRCE, UoP, through both self-archiving and green access provision, as well as, gold access provision by publishing results in the Open Science Cloud and other open repositories), big data governance, security and management, data marketplaces and sharing mechanisms, AI analytics experts, energy services practitioners, communication and stakeholder engagement experts, legal experts, along with business stakeholders and demo/industrial partners.

Type/ role	Consortium Partners	Role in a SYNERGIES	Consortium partner
Large industry	TXT, ETRA, MAGGIOLI	Energy systems and services	SUITE5, ETRA, ICCS, IES, DTU, VTT, CIRCE, HEDNO, CUERVA, IPTO, VERGY, BEOF, TREFOR/EWII
SMEs	SUITE5, IES R&D, UBITECH. CG SOFTWARE	Big data management, Interoperability, Security & Analytics	TXT, SUITE5, UBITECH, DTU, ETRA, ICCS, CIRCE, IES, VTT, VERGY, UoP, MAGGIOLI, CG SOFTWARE
Research	ICCS, CIRCE, VTT, UoP, DTU, ARTHUR'S LEGAL, PROSPEX INSITUTE	Business Innovation and Energy Markets	TXT, SUITE5, UBITECH, ETRA, IPTO, HEDNO, CIRCE, CUERVA, PROSPEX INSTITUTE, ARTHUR'S LEGAL, VTT, TREFOR/EWII, MAGGIOLI
Demonstrators	HEDNO, IPTO, CoEn, CUERVA, BEOF, TREFOR/EWII, FORNES, VERGY	Social Sciences and Humanities	PROSPEX INSTITUTE, ARTHUR'S LEGAL, RICE

Table 5. SYNERGIES Consortium composition in terms of dimensions and role of the partners

As outlined in table above in order to clarify the role of each partner in joint initiatives, the consortium has been organised in four groups, namely: Technological Partners, Academic and Research, Industrial Partners and Local Communities facilitators.

- Technological Partners: focused on software product and services. These companies have different peculiarities but their expertise is in engineering of software and similar fields;

usually get almost all funds from sales of product/services and from investors. In the project there are:

- 3 ICT Large Enterprise (LE): TXT, ETRA, MAGGIOLI
- 4 ICT Small Medium Enterprise (SMEs): SUITE5, IES R&D, UBITECH, CG SOFTWARE

- Academic and Research: the consortium members are universities, research centres or public/semi-public institutions focused on theoretical research and methodology. These institutions get money partially form government and partially form consultancy services to private companies. In particular, the consortium academic members can be classified as follows with respect to their main commercial source:
  - Focus on public research: ICCS, CIRCE, VTT, UoP, DTU
  - Focusing on consultancy: ARTHUR'S LEGAL, PROSPEX INSITUTE
- Industrial Partners: the consortium members are the project end-users providing the energy sector knowledge to evaluate SYNERGIES results These partners are involved in the project as end-users to experiment and validate research, innovation and IT offering. Within SYNERGIES, 3 demonstration sites are established. In 3 different European countries:
  - Greek demo site: HEDNO (DSO), IPTO (TSO), CoEn (Local Energy Community)
  - Spanish demo site: CUERVA (DSO), FORNES (Local Authority), VERGY (Local Energy Community Operator)
  - Danish demo site: TREFOR/EWII (DSO), BEOF(Local Utility and Energy Community Operator)

  In this context, the exploitation focus is on usage of project outputs starting from the experimental experience performed in the framework of the demonstration sites, in order to strengthen the replicability of the solutions.

4.4.3 Exploitation Roadmap

The Exploitation activities aim at transforming the project's outcomes to answer the needs of target market segments, and to prepare market entry in the European manufacturing industry. The overall Exploitation strategy and objectives are summarized in the figure below following the same approach firstly depicted in 4.1.2. The planning has been conceived in order to be aligned with the project Work Plan, phases and delivery of results.

Figure 25: SYNERGIES Exploitation Roadmap

The detailed activity plan for each phase is here outlined:

1. *First Phase: Exploitation exploration (M1 to M30)*

In the First Phase, covering the first year of the project, the work was carried out with the following goals:

a) Have an initial definition of the main KERs: To make sure the assets will always be up-to-date and in line both with the project evolution and the market and needs, SYNERGIES partners have set-up a 'KER Database' intended to be a live tool easy to update and monitor and described in Section **Error! Reference source not found.**. The database also s erves as tool to define and monitor the IPR and its management, and it will follow the evolution of the KERs during the project.

b) Analize the Market trends: starting from the key topics of energy, flexibility market and data space, the main technology drivers have been identified and the evolution of the target market sectors is reported in order to position the project results within the respective guidelines and assess their actual correct market placemen

c) Draft a preliminary SWOT Analysis: we analysed the strength such us the novelty of the SYNERGIES solutions in terms of advanced data-driven models in similar energy domains; along with the weaknesses, among which the critical issues represented by the lack of focus on a single innovative product. The opportunities, primarily linked to the creation of a vibrant ecosystem around Dataspace applications, have been identified alongside the threats represented by the resistance and low acceptance of digital solutions managing confidential data.

d) Define an Exploitation Strategy: as described in more detail in section 4.4.4, we defined a strategy structured in a stepwise approach, which started with the identification of the KERs and will carry on throughout the whole project lifespan in the form of crucial activities, such as a market analysis and competitors study and their positioning, the identification of exploitation business models and the evaluation of their sustainability, the consolidation of relationships with stakeholders involved in the sector of interest and, finally, the identification of financial support to facilitate the adoption the SYNERGIES solutions.

e) Identify preliminary individual Exploitation paths and Joint Exploitation picture: in collaboration with the whole consortium, each project partner drafted an initial plan for their post-project exploitation intentions, including any KER linked to this plan and the partner role in its development. This is subject to modification should any change of plans occur; however, this boosted the development of a first approach to a SYNERIGES Joint Exploitation picture, where all partners contributed clarifying their role and interest in the use of the technological results of the project.
f) Identify the preliminary Data Sharing driven business models: in this period, we discussed the business roles played by the different actors and agreed on the main Synergies business scenarios have been confirmed; thus, 7 data-sharing driven business model have been identified (further detailed in section 5)

2. *Second Phase (M31 to M42)*

In the second phase of the project, all exploitation activities will be strengthened and directed towards the main objective of maximizing the impact on the KERs' market and ensuring their sustainability even after project completion. The main focus will be on the assets and exploitation intentions validation with the elaboration of the final list of KERs in accordance with the individual commercialization path. On the other hand, a major effort will be made to detail the ultimate joint exploitation strategy for the success implementation of the go to market phase. The activities carried out in this step will lay the foundation for the market launch stage starting from the final definition of SYNERGIES market value proposition and positioning. More in detail, the main tasks revolve around:

a) Revision and consolidation of the KERs list with detailed description of competitive advantage and main features highlighting potential joint results
b) Elaboration of the ultimate individual exploitation intentions providing key information on value proposition, target market, expected cost and revenues streams. The goal is to align the expectations, and the outcomes achieved with the plan and the activities to be executed in the last phase of the project in order to be as effective as possible.
c) Finalization of IPR and license management especially in case of joint results
d) Performance of definitive SWOT analysis to define the internal and external opportunities or challenges
e) Agreement on the definitive joint exploitation path including partners role allocation and responsibilities
f) Business model and plan for the exploitation vehicle using the business model canvas tool to present the UVP, business channels, key resources, costs and revenues projections
g) Final definition of the data-sharing driven business models in collaboration with all partners according to their different role in the projects and in the energy value chain
h) Set up of a scale up and replication strategy, to outline a more defined path to the post project exploitation activities and ensure a higher success rate of the market uptake of the project results.

3. *Third Phase (5 year after project end)*

The final phase is dedicated to the go to market task based on the work performed in the previous phase and the agreement between partners. More in detail, during the first year after the end of the project, the phase "Product to European Market" will be in place. During this phase, the feedback received from the first users of the SYNERIGES solutions, i.e. the project demo sites, will provide a crucial support to strengthen the established channels and scout new ones for SYNERGIES to hit the market. Initially the European markets will be targeted as defined by the final business studies targeting the major European actors in the energy sector, and the relevant coupled industrial sectors

addressed by some specific SYNERIGES solutions (i.e. building and e-mobility). The plan for strategic collaborations with Stakeholders will be fully implemented and all the business opportunities will be evaluated and implemented. This phase will also include promotion of SYNERGIES solutions through social media, website and consortium's networks in order to maximize the impact of project results. As outlined in the Business Models presented in section 4.6.1, the targeted customers mainly consist in energy sector companies (DSO, TSO, market operators) and prosumers (Local energy Communities) that are interested in adopting data-sharing driven applications for business improvements related to costs reduction, energy efficiency, etc. SYNERGIES exploitation vehicle addresses this specific energy sector in order to overcome actual challenges of energy efficiency that are still widely spread, mainly due to the lack of sharing of crucial data among the main stakeholders of the energy sector, which could all contribute to a better energy management in a trusted and collaborative environment. The tailored digital solutions deployed within the project will be leveraged to reach European energy actors and stakeholders, both companies and prosumers (especially though LECs), to make the energy sector more efficient, democratic and resilient. In addition to the specific energy market, the SYNERGIES solutions target the more general Data as a Service (DaaS) market, as data and data sharing are crucial to optimise energy production and energy consumption, managing peaks and overall lower carbon footprints and. Since the demo cases are placed in Europe, the geographic limitation to the European business ecosystem is preferred. All these actions are aligned with the goals to promote SYNERGIES as a reference implementation for a European Energy Data Space and to democratize energy markets through the provision of innovative solutions and novel business models for the transparent engagement of prosumers in energy markets and the viable fostering of energy communities.

In the subsequent years the phase called "Rest of World" (4+) will take place. During this stage the technology will be disseminated throughout the rest of the world, and, in addition, the effort will be directed towards the further penetration of the technology in the global DaaS market and new and innovative markets. The goal is to ensure a replicability path that leads to successful project results uptake from a market and technology sustainability perspective that includes the cooperation between all involved parties. The maximization of any of these steps will provide the organization with a competitive advantage over potential competitors by relying on the key exploitation packages. As for the 1 year post project period, the demo sites included Industrial Package will play a major role in the portability of pilots not only by internally adopting and replicating the developed digital solutions but also as reference success stories.

More in detail, the 3rd phase will be implemented according to the following steps:

e) *Definition of a business sustainability strategy* based on a long-term perspective to ensure that the innovation arisen from SYNERGIES has a financial support for further improvements and contributes to company resilience against market fluctuations proving a continuous viability. This planning implies not only the availability of internal funds for R&D but also external sources such as national and European funding opportunities (as described in the last point)
f) *Industrialisation of SYNERGIES Assets* to promote integration and further development of these KERs in company Commercial offering to support the business sustainability strategy. The outcomes emerging from the project will be a part of the company/institution services/products catalogue according to the individual exploitation plan defined at the end of the project. The aim is not only using these results as a stand-alone asset but to make them a crucial asset of the company business backbone integrated with other key elements of the commercial offering.
g) *Marketing campaign for SYNERGIES Energy Data Space* to increase visibility and interest in the energy and DaaS domain. The planning and implementation of the marketing strategy will follow the work carried out in WP6.

h) *Exploration of Funding Opportunities* for project results enhancing researching and identifying potential funding sources, including grants and public funding. In parallel with the planning of internal investment for R&D, an important financial support could be guaranteed by accessing national or European commission funds.

i) *Strengthen collaboration with sisters' initiatives* due to their relevance in the exploitation strategy. These sister projects are DATA CELLAR, EDDIE, ENERSHARE, OMEGA-X; the collaboration among all sister projects is coordinated in the framework of the int:net project. other relevant initiatives such as BRIDGE, ETIP SNET, EnTEC, IDSA, DSSC, and the first joint activities were successfully completed.
The activities with these groups focused on topics such as: background and analysis of Energy Data Spaces definitions, definition of minimum requirements for the Common European Energy Data Space (CEEDS), interoperable data exchanges validation and definition of an interoperability testing framework, elaboration of business models around energy data spaces, enabling consumer and citizen engagement in energy transition and leveraging energy data spaces for flexibility markets and transactions.
For the full description of each initiative and how SYNERGIES is connecting and collaborating with them, please refer to D7.1.

4.4.4 Exploitation Strategy

The strategy followed throughout the project is closely interconnected with the Key Exploitable Results analysis. More in detail, the exploitation strategy of SYNERGIES project is based on a stepwise approach and, in line with the exploitation roadmap presented in the previous section, a set of activities which span throughout the project duration is defined.

These activities firstly involve Consortium members and secondly project stakeholders and target groups leveraging on not only dissemination activities but also and mainly on the LLs organization and planning. The exploitation strategy is based on the following key actions:

1. the identification, the evolution and the finalization of the Key Exploitable Results, whether these are technological components or services (such as the Energy Data space and Data Marketplace, the AI Analytics Platform and the Energy Service Marketplace) and methodologies (such as the Stakeholders engagement and Impact Assessment Methodology). As the KERs evolve and become increasingly comprehensive and meaningful, the economic and business-related information associated with them will be updated according with dedicated templates and tools in the final version of this deliverable.
2. the conduction of a thorough market analysis which aims at the identification of the market towards which SYNERGIES is targeted, its segmentation. The competitors and their positioning, the similar solutions and their added value and all the emerging trends will be constantly analysed and updated. In this regard, the SWOT and Pestel analysis reported in Section 4.3.3 and 4.3.4 will be updated in the final version of this deliverable (M42).
3. the analytical identification and definition of all possible commercial and non-commercial exploitation paths both already available or new implementation deriving from project involvement and experience. This include both an thoughtful analysis internal to each partner of added competitive value generated by the project and the joint exploitation possibilities with project partners in the post project phase.
4. the definition and the evaluation of the sustainability and viability of possible business models and alternative solutions that may be followed for the provision of the project solution and services to the identified stakeholders, including licensing schemes, pricing, etc., and the corresponding tactical revisions as deemed necessary throughout the project

lifecycle. The goal is to envision a sustainability business plan to ensure project replicability on a long term basis.

5. the consolidation of relationships of trust with all the actors involved and target groups thanks to the activities carried out in T6.1, who can facilitate the quicker adoption of the KERs and provide valuable feedback which can be used in the commercialization phase.
6. the identification of financial support, including new R&D projects, that can be used to support direct and/or indirect the adoption of SYNERGIES solutions helping energy sector companies in their digital transformation pathways and prosumer engagement in the flexibility market.

The organization of the ER according to their type is a fundamental action to help on the definitions of strategic decisions considering different markets and value propositions. The constant refining process of the exploitation plan provided the detailing of the critical streams that address the design of the Individual and Joint Exploitation initiatives.

A preliminary set of 12 exploitable results has been duly identified in chapter 4.1.3 and detailed in the annexes of this document. The identification of SYNERGIES strategic results packages is based on the categorization provided in chapter 4.4.2 where fine granularity results have been packaged into high-level strategic results. The main exploitable results related to the technological packages concern the Energy Data space and data Marketplace, covering the data assets; the AI Analytics platform, comprising the several components related to AI and data services, the AI algorithms used by the platform (both baseline and trained); and the Energy Service Marketplace, including Energy Apps and Digital Twins. Strategically different results have different targets: the main exploitable results, Energy Data space and Data Marketplace, the AI Analytics Platform and the Energy Service Marketplace, are the drivers for the overall project joint exploitation providing a complete solution to the customer. On the other side, the fine granularity results, referring to the several components included in this 3 major KERs, target niche improvements in customers to solve specific problems and are more suitable to be integrated with existing solutions and individual exploitation of project partners.

In addition to the tangible assets, during the execution of project activities, partners are generating a know-how that can be capitalized on in different market contexts according to internal strategy. More in detail, this includes: knowledge about software implementation, best practices and lessons learned about the SYNERGIES concept application, methodological approach to embed explainability in digital assets and the analysis of demonstrators' experience based on the pilots' feedbacks on SYNERGIES use. All this intelligence represents a very important element to be exploited because the generated know-how is a critical competitive advantage that project partners will gain thanks to both individual outcomes and joint results. The potentialities related to the arising expertise contributes to expand the exploitation strategy of each member of the consortium according to its specialization, from consultancy services to innovative software creation/ application, from improvement of production process to integration of already operative bundles.

In this section, an update of the preliminary analysis of Exploitation Routes Plan is outlined. The actions to be followed have been identified and elaborated from the beginning, in collaboration with the dissemination and communication planning, to enable the most extensive use of the project outputs and the maximization of the project impacts.

The exploitation paths have been defined starting from the classification of partners role and expertise that drive and determine not only individual exploitation intentions but also the overall approach to after project results dissemination and commercialization.

In accordance with the various identified profiles and their needs, the exploitation of the results can follow two main streams:

- Commercial exploitation of SYNERGIES solutions under different Business Models including, for example:
  - New Products /Services: introduction of the SYNERGIES KERs to the market according with the IPR management.
  - Consultancy Services: introduction of Impact Level Assessment, Methodology for engaging different types of stakeholders and the elaboration of Data Processing Legal Compliance Toolkit for Energy Communities.
- Scientific exploitation of SYNERGIES outcomes through continue participation in events to promote project results, such as workshops, seminars, conferences and publication of joint articles, case studies in the scientific journals.

More specifically, it is possible to classify the exploitation routes by dividing them into two main categories: direct and indirect.

These direct routes consist of straightforward ways of taking advantage of the Project results:

- Commercialization of a new product or service: Introduce new products or services to market,
- Contract research to other clients: provides support to others in the form of research services outsourced on a contract basis,
- New research project: contribute to other research projects,
- New course: Provide new knowledge responding to specific stakeholders and societal and environmental needs

The indirect routes consist of ways indirectly taking advantage of the project results:

- License agreement: One or more companies enter into a licensing agreement that allows them to use each other's IP in return for payment in the following terms:
  - Benefits by making the license reward for the use of the owned IP.
  - Benefits the license by giving them a product or technology better than the competitor.
  - Allow the licensee (depending on the terms of the license) to take legal action against others who copy the idea.
- Business Partnership: formulation of a business contract as a result of the innovations developed by individuals or teams.
- Contribution to standards/policy: produce new standards or contribute to ongoing procedures, particularly relevant for the activities carried out in WP7

For the purposes of SYNERGIES, following the identification in the analysis of the Key Exploitable Results the best exploitation route for each case will be defined in its final version.

To strengthen the exploitation path definition and implementation, SYNERGIES plans to apply to Horizon Exploitation Booster initiative to contribute bringing a continual stream of innovation to the market and maximizing the impact of public funded research within the EU. The aim of the activity is to better structure the exploitable results about envisioned consultancy services with the final goal to strengthen value proposition definition and accelerate the entry to market timing. More in detail, the planned tasks to carry out within HRB concern on the following aspects:

- review of the key exploitable results of the project;
- revision, integration and clarification existing exploitation plans of project results and/or outline exploitation paths of results;
- definition of most suitable techniques to identify all relevant stakeholders in the exploitation value chain;
- support in performing a risk analysis related to the exploitation of results.

According to partners preferences and the progress of technical advancements, the consortium will select the most suitable Service and define which asset will undergo the process based on their relevance in terms of joint exploitation.

Indeed, the exploitation activities vary in intensity based on different factors: the delivery of the KERs, the definition of methodologies and know-how, the evolution of the technology drivers, the emerging of innovative issues to be considered. The activities will be intensified prior to the delivery of the final project results with the identification of the post project business and exploitation strategy to be followed for each KERs. These activities will reach their peak prior of the project final results when also the project dissemination activities will be intense, attracting new LECs, interested TSOs/DSOs and so new customers.

4.5 Individual exploitation

The individual exploitation is the process by which each project partner takes advantages based on the foreground produced in the project. It aims to exploit autonomously the results of the project by creating new services (e.g.: consultancy) or software assets to be integrated with existing software offers, contributing to increase the company value. As part of the exploitation planning, each partner has elaborated on the potential impact of the project and the commercial/societal value that the outcomes will have in its company strategy. The description of the Individual exploitation carried out by each partner is depicted in section 6 with a detailed identification of the competitive advantage gained through project execution in baseline products/services and the exploitation intentions consisting in market targeting, price definition, expected time to market and revenues, estimated cost to commercialization.

Considering the diverse nature of the Consortium, different needs arise regarding the potentialities and impacts of exploitation actions:

a. **RTO** → Research Centres and Universities are interested in maximizing the impact of their research outcomes, fostering technology transfer and commercialization opportunities, and ensuring the sustainability and long-term benefits of their innovative services, algorithms and methodologies in the market. They aim at: providing consultancy services starting from the analysis performed and the knowledge acquired in supporting pilots' activities; creating scientific publications related to the results arising from use cases experimentation; and developing new interdisciplinary research lines by taking advantage of knowledge complementarity and cross fertilization;
b. **Technology and Service Providers** → Technology providers are interested in improving their solutions and selling them, leveraging their intellectual property to secure licensing agreements, establishing strategic partnerships for a wider market reach, and maximizing revenue through the successful commercialization of their technology solutions. Additionally, enhancing brand visibility and maintaining a competitive edge in the technology market are key considerations for technology providers engaged in exploitation activities. Service providers are interested in optimizing the deployment and performance of their AI solutions, expanding their client base through strategic collaborations, capitalizing on data-driven insights to enhance their offerings, and ultimately ensuring the widespread adoption of their AI services in diverse industries. Overall, partners are interested in selling software licenses and services by integrating results in the existing portfolio with the goal to provide new opportunities to customers while strengthening market positioning. Where exploitation opportunities are present, these partners aim at exploiting different granularity of results from packages to single assets which might be relevant for their clients/business partners
c. **Demonstrators** → Experiments are interested in validating and showcasing the success of their use cases, demonstrating the scalability and replicability of their solutions, and

leveraging lessons learned to inform and improve future project phases or similar endeavours. Partners are planning to exploit SYNERGIES solutions for their own usage and, if possible, to extend it to other organizations connected to their business, such as their suppliers or partners, in addition to internal replication in similar department, productions lines or branches. The main focus is to primarily support its internal processes improving human decision support, process efficiency and product quality by leveraging on the existing asset created within the project and/or its further additional developments in the post project phase

To concretise and update these ambitions, partners' preliminary exploitation interest and intentions were collected in the first half of the project and are attached at the present document as Annex 1. These plans will evolve during the project lifetime as the technical results develop and, updated versions will be reported also in the following version of this deliverable in D6.3 on M42.

4.6 Joint Exploitation

The joint exploitation is the process by which consortium partners agree, organize a structure and collaborate to jointly exploit the project as a whole. The roadmap is based on individual partners interests, project role and research and development activities taking into consideration all internal and external variables. The final goal of the joint exploitation is to define and implement a framework agreed by all partners defining the business strategy on selected project results in different market segments, European regions and defining rules for engagement among partners. SYNERGIES industrial results will be commercially exploited by the industrial partners of the consortium targeting value chains in the end-user sectors. The joint consortium strategy is very important for facilitating the exploitation and deployment of SYNERGIES based solutions for the real industrial businesses.

In order to come up with a realistic plan for commercialising the outcomes of the project, the consortium partners have examined the several alternatives for exploiting the project results both directly, through commercially offering the energy data space itself and/or the developed AI assets and indirectly through the provision of services on top of the SYNERGIES technical offerings. All the technological outcomes of the project are planned to reach TRL 7, including solutions adopted for each demonstration site; therefore, commercialising the developed assets is something that requires from at least the technical partners of the consortium to further invest after the end of the project in order to transform the adopted solutions to market-ready offerings. However, in depth analysis of the design specifications of the individual demo sites are being carried out (as described in sub section 4.1.4.2 dedicated to the industrial package) also taking into considerations the standards for the sectors they belong in; this will be very from a business point of view: in such business environments the introduction of any solution requires the completion of strict verification and validation processes and this guarantees that both the SYNERGIES solutions which are developed and piloted will be of high maturity and reliability. Given that, the consortium is confident that the effort required getting from the phase of developing and validating of the SYNERGIES exploitable assets, up to bringing them to the actual market is rational, as the technical partners of the consortium have identified that there is a real opportunity from a business perspective.

Through dedicated workshops, the consortium addressed the joint exploitation topics leading to the elaboration of its structure that is depicted in the figure below that summarize the three exploitation packages as described in section 4.1.4. More in detail, a specific focus on the technological package is performed being the collector of three key joint results of this bundle:

- Energy Dataspace and Data Marketplace (result owned by SUITE5)
- Energy AI Analytics Platform (result owned by SUITE5)
- Energy Service Marketplace (result owned by ETRA)

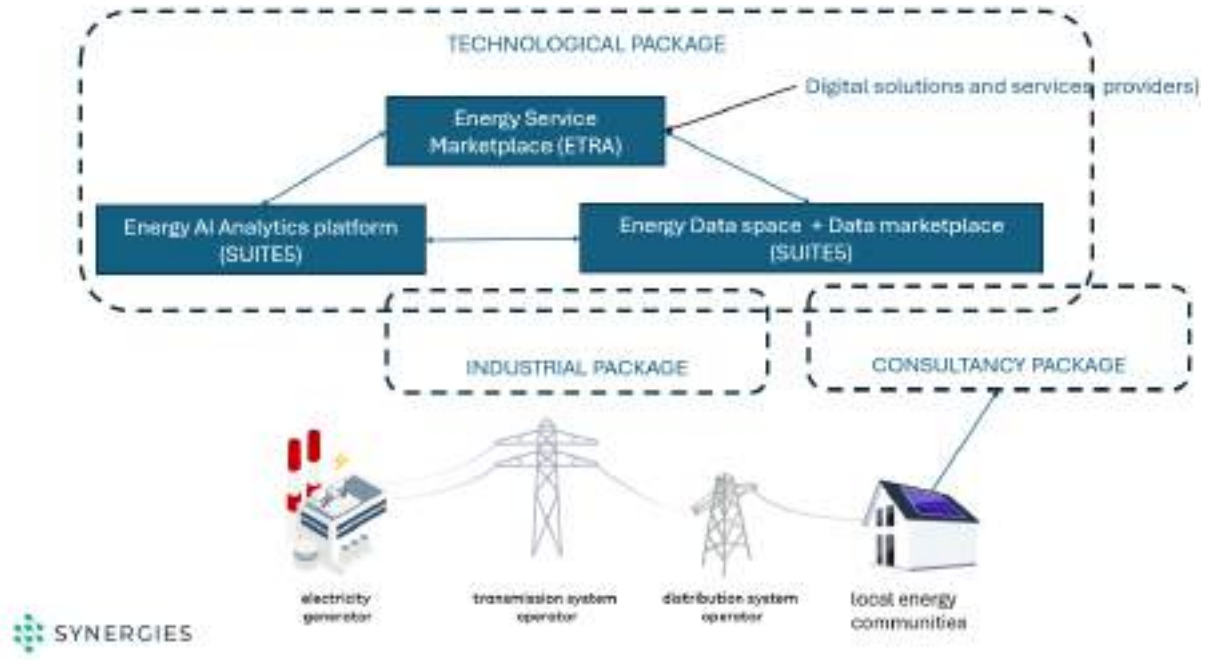

Figure 26. SYNERGIES Joint Exploitation Overview

For each of these key joint results a specific Business Model has been developed and is presented in the sub-section below.

4.6.1 Business Model Canvas

A business model is a plan describing how a business is developed by defining the customer base, the value delivered and the related details of financing. Since it's a strategic and immediate management tool, it represents different fundamental aspects of a business. Given the level of maturity of the platform and related components, this document presents a preliminary Business Plan that will be further revised in the next deliverable versions as deployment activities progress with a final roadmap considering a long-term perspective. To clarify the platform value proposition from a user angle, the traditional Business Model Canvas, as proposed by Alexander Osterwalder based on his Business Model Ontology, was chosen due to its simplicity and versatility being applicable to any business, regardless of size, history, or budget[i]. This tool is used to perform a first analysis of market positioning with respect to the key business aspect involved in a successful replication.

In the following subsections a specific BMC for the Energy Service Marketplace and the Dataspace and Data Marketplace and Energy AI Analytics Platform. Since the Dataspace and Data Marketplace and Energy AI Analytics Platform are strongly interconnected and have the same owner, a single BMC has been elaborated for both results.

4.6.1.1 Energy Data Space, Data Marketplace and Energy AI Analytics platform

The Energy Data Space & Data Marketplace and the Energy AI Analytics platform are two of the main SYNERGIES KERs which constitute the backbone of the project joint exploitation.

More specifically, the Energy Data Space (EDS) and Data Marketplace jointly consist in a secure and isolated data sandbox environment that is provided to or is available by each stakeholder (from the

energy data value chain and its interrelated, coupled sectors) through different modalities in order to collect, monitor, control, analyse and share (and trade) their data in their own terms and to obtain access to and use external data (from other value chain stakeholders, legacy systems, data lakes and external data spaces).

On the other hand, the SYNERGIES Energy AI Analytics Platform empowers traditional energy stakeholders, prosumers, and energy communities with data-driven intelligence to optimize energy use, self-consumption, and flexibility management, while offering the opportunity to innovative technology providers to introduce themselves into a fragmented value chain and deliver cutting-edge AI-powered solutions that can be effectively adapted to the business context of the energy data value chain stakeholders and significantly optimize their operations and benefits. Namely, it allows users to:

i. design and execute their own data analytics pipelines including data preparation, manipulation (e.g., filters and aggregations), experimentation with alternative algorithms and application of machine learning (ML) and deep learning (DL) models;
ii. acquire and utilize pre-trained and re-usable analytics models/ offerings that can be easily re-trained and adapted to the unique problem they want to resolve;
iii. execute them across federated and/ or centralized environments and EDS deployments;
iv. visualize the results of the analyses in custom diagrams and assess the performance of the models through respective metrics, prior to utilizing them in their existing or 3rd party business applications and tools.

The SYNERGIES Data Marketplace complements the EDS and AI platform by enabling secure data (and results) exchange and monetization. Users can buy, sell, and leverage high-value energy data and derivative results, fuelling AI-driven insights and new business opportunities. Together, they create a trusted ecosystem for efficient, sustainable, and data-driven management of the energy system across its edges and the various assets and components involved in a complex operational landscape, by removing fragmentation of data in isolated silos, increasing outreach to previously non-accessible data and enabling the extraction of valuable knowledge for improving business operations across all value chain stakeholders, while engaging them in a collective process (powered by data and intelligence sharing) for ensuring the resilient and decarbonized operation of highly de-centralized energy systems.

Therefore, given the strongly interrelated nature of the two solutions, one single BMC has been drafted which includes these two building blocks of the SYNERGIES joint exploitation. The related Business Model Canvas is presented in the figure below.

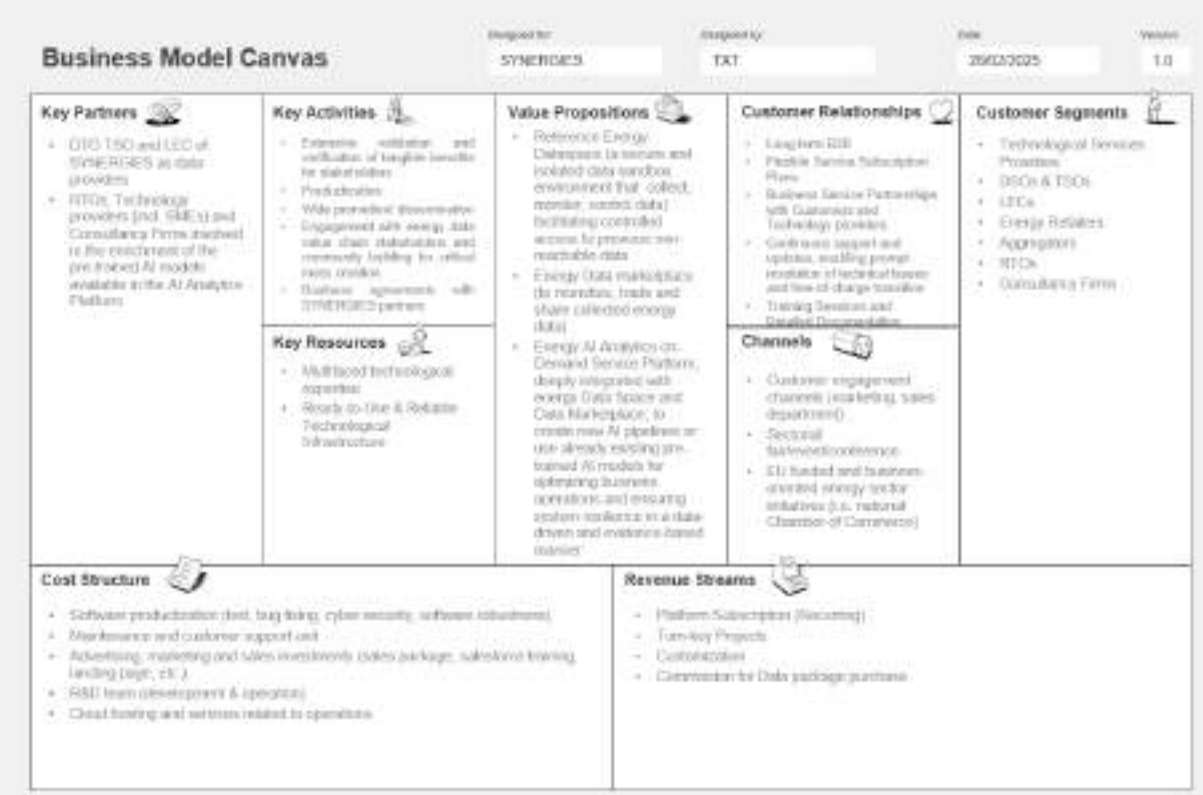

Figure 27: BMC for the Energy Data Space & Data Marketplace and the Energy AI Analytics platform

The analysis performed focuses on the nine building blocks foreseen in the Business Model Canvas methodology as follows:

- ***Value Proposition***

The SYNERGIES EDS & Data Marketplace and the Energy AI Analytics Platform empower energy stakeholders with data-driven intelligence and monetization opportunities.

The Energy Data Space represents an innovative implementation of a secure, controlled environment for data collection, monitoring, and analysis, ensuring privacy and regulatory compliance, while enabling the transformation of raw energy data into AI-ready data and a tradeable commodity. Meanwhile, the Data Marketplace allows users to trade, monetize, and share high-value energy data, fostering collaboration and new business models.

The Energy AI Analytics On-Demand Service Platform, seamlessly connected to the Energy Data Space and Marketplace, enables users to create or apply pre-trained AI models tailored for the energy sector. This allows the extraction of valuable insights that can be ingested in existing systems (to improve their optimization and decision-making capabilities) or utilized in new added-value services and apps for improving internal business functions and operations of customers, while creating a sound basis for collectively safeguarding the resilient and secure operation of energy systems and networks.

By bridging AI-driven analytics, secure data management, and market-driven data exchange, SYNERGIES accelerates innovation, sustainability, and efficiency across the energy sector.

- ***Key Partners***

Each consortium member brings an established network of stakeholders, allowing SYNERGIES to engage not only project partners but also external business players interested in commercial collaboration.

Key partners for the EDS & Data Marketplace and the AI Analytics Platform include **DSOs, TSOs, and LECs (involving a wide array of prosumers, as well)**, which, not only provide essential requirements for the development of the respective results but also act as essential data providers within the data marketplace. Data are crucial to enable the elaboration of advanced AI pipelines that can in turn deliver added value insights and knowledge across the value chain for resilient/ flexible network operation, evidence-based operational efficiency improvement and infrastructure planning, local energy communities sustainability and engagement in energy markets, as well as, consumer empowerment and obtainment of significant benefits from their active engagement in local flexibility markets and energy management strategies.

The role of **RTOs, Technology Providers/ SMEs and consultancy firms**, as key partners, is also considered essential, since they are contributing to the population and further enrichment of the AI solutions offered through AI Analytics Platform, consisting in pre-trained AI models and pipelines that can be effectively acquired by the targeted customers (energy data value chain stakeholders), retrained with new data and operationalized in diverse business contexts for value creation.

- ***Customer segments***

The SYNERGIES EDS & Data Marketplace and the Energy AI Analytics Platform are designed to serve key players in the energy sector, providing them with advanced tools for data analysis, AI-driven insights, and a secure environment for data exchange.
The core customer segments involved in the exploitation and commercialization of the SYNERGIES solutions are:

- *Energy data value chain stakeholders,* acting as **Data Owners/ Providers**, offered with the possibility to subscribe to the Data Management, Data Analytics and Data Sharing services of the SYNERGIES offering
- *Energy data value chain stakeholders,* acting as **Data Recipients**, offered with the option to get involved in data sharing models over the SYNERGIES Data Marketplace.

The relevant Energy data value chain stakeholders, primarily targeted by SYNERGIES, are summarized in the following:

a) **DSOs & TSOs**, and more specifically their data analysis departments, offered with a powerful tool to extract meaningful insights from vast amounts of energy data. By analysing grid performance, forecasting energy demand/ generation, promptly identifying congestion/ violation points and analysing the flexibility that can be provided by the demand side, they can proactively devise highly-efficient and cost-effective strategies for the resilient operation of their assets and networks, thus reducing congestion/ violations frequency and size and minimizing flexibility acquisition costs through obtaining access to cost-efficient flexible assets offered by aggregators and the demand side.
b) **Local Energy Communities (LECs),** offered with the capability to obtain valuable insights and knowledge that can allow them to realize their decarbonization targets (reducing RES curtailment and increasing local self-consumption), while safeguarding their sustainable operation by optimizing their positioning in energy markets and long-term PPAs, and generating new revenue streams through their effective and evidence-based (based on accurate forecasts) involvement in flexibility markets.
c) **Energy Retailers,** the SYNERGIES solutions offer access to previously non-reachable real-time smart metering data and their further analysis towards accurately forecasting demand and

generation in the short-term can significantly improve their positioning in day-ahead markets, minimize their bids in costly intra-day markets and profoundly reduce imbalance charges attributed to their current poor forecasting results.

d) **Aggregators,** enabled to access to highly granular data from flexible assets and the capability to receive novel insights on their flexibility profiles and forecasted capacity, is expected to lead to new revenue creation from flexibility services from aggregated demand volumes (in replacement to costly traditional flexibility sources linked to industrial sites)

Additional Customer segments targeted by the EDS, Marketplace and AI platform, include:

- **Technological Service Providers**, such as TXT, benefit from the platform by integrating their solutions into a robust AI-driven ecosystem. They can develop, test, and deploy innovative analytics applications while leveraging the data marketplace to enhance their services and reach new customers. Moreover, they can exploit the solutions to deliver turn-key projects for specific commissions.
- **Research and Technology Organizations (RTOs)** are able to conduct cutting-edge research in energy systems and AI-driven optimization. With access to a secure data sandbox and marketplace, they can access valuable data that was previously out of their reach and test hypotheses, develop new models, and support research and innovation in the energy sector.

By bringing together these stakeholders, SYNERGIES creates a collaborative energy data ecosystem where companies and researchers can exchange knowledge, develop new solutions, and drive the future of sustainable energy.

- ***Customer Relationships:***

The EDS & Data Marketplace and the Energy AI analytics platform adopt various approached to create strategic collaboration and tailored engagement models with key stakeholders:

a. Long-Term B2B Engagement: The platform builds sustainable, trust-based relationships with businesses by offering continuous value-added services, reliable data access, and tailored support, ensuring long-term collaboration and innovation.
b. Flexible Service Subscription Plans, enabling customers to select the optimal plan for them according to their specific needs and competencies.
c. Business Service Partnerships with Customers, allowing them to request for tailored data engineering and data analytics services (in absence of relevant expertise intra-organization) or custom development services for new functionalities that respond to their emerging requirements.
d. Business Partnerships with Customers & Technological Providers, enabling them to enrich the pre-trained analytics models of the AI Analytics Platforms and benefit from their trading towards other interested customers.
e. Continuous support and updates, enabling prompt resolution of technical issues and free-of-charge transition to refined and performant versions of the selected services.
f. Training Sessions and Detailed documentation, ensuring smooth familiarisation of customers with the various features and functionalities and maximization of the value they can obtain through the SYNERGIES offering.

Through these strategies, the Energy Data Space & Marketplace and the AI Analytics Platform ensure a dynamic, cooperative, and forward-thinking ecosystem in the energy sector.

- ***Key Activities***

To deliver the desired objectives and functionalities (value proposition) foreseen for EDS & Data Marketplace and Energy AI Analytics platform, the following key activities need to be performed:

a. Extensive Validation and Verification of the value and benefits obtained by the various involved stakeholders/ customers: Demonstration and validation of the EDS, Data Marketplace and AI analytics platform in real-life conditions and diverse contexts to obtain unbiased feedback and valuable findings for optimizing the performance of the solutions, fine-tuning their functionality, while verifying the value they can offer to the involved stakeholders in terms of data governance efficiency, business operations improvement and data monetization.
b. Productization: transforming the solutions into market-ready solutions, which are solidly included into the offer of the owner's line of business
c. Wide promotion and dissemination through various communication channels to reach out to relevant stakeholder communities and increase awareness on the benefits they can obtain by engaging into the SYNERGIES-powered energy data ecosystem.
d. Engagement with energy data value chain stakeholders and community building: Expanding the network of companies, DSOs/TSOs, RTOs, and technology providers to ensure a rich, diverse, and actionable data environment, maximizing the platform's value.
e. Business agreements with SYNERGIES partners, addressing their transparent remuneration for the AI solutions they offer through the SYNERGIES AI Analytics Platform.

- ***Channels***

Targeted outreach channels are leveraged to connect with key stakeholders in the energy sector, fostering collaboration and adoption of the EDS & Data Marketplace and Energy AI analytics platform:

a. Customer Engagement Channels (Marketing & Sales): A dedicated marketing and sales approach ensures direct interaction with potential clients and partners through digital campaigns, personalized outreach, and tailored demonstrations, maximizing awareness and engagement.
b. Sectorial Fairs, Events & Conferences: Participation in energy-focused industry events provides opportunities to showcase the solutions, exchange insights, and build strategic partnerships with key market players, policymakers, and innovators.
c. EU-Funded & Business-Oriented Energy Sector Initiatives: Collaboration with initiatives like the national Chamber of Commerce and EU energy programs strengthens SYNERGIES' presence in the market, enabling access to funding opportunities, regulatory insights, and business networks.

By integrating these channels, SUITE5 effectively reaches, informs, and collaborates with stakeholders, driving adoption, growth, and impact in the energy sector.

- ***Revenue Streams***

The SYNERGIES EDS & Data Marketplace and Energy AI analytics platform generate revenue through diverse streams, ensuring its own financial sustainability and value creation for its stakeholders:

a. Platform Subscription (Recurring): a membership-based model providing business partners and clients with continuous access to the platform and its value-added, including data analytics, tools, and collaborative features, ensuring long-term engagement.
b. Turn-Key Projects: stakeholders such as technology providers exploit (under payment) the solutions to develop and deliver custom order-based solutions tailored to the specific needs

of clients, including DSOs/TSOs and energy companies, delivering fully implemented and operational systems.

c. Customization: revenue from tailored developments, allowing clients to request bespoke features, integrations, and enhancements to meet specific operational or research needs.
d. Commission for Data Package Purchase: monetization of high-value data sets, enabling stakeholders to buy specific energy-related data packages for analysis, research, and decision-making.

- ***Key Resources***

Specific cutting-edge technology and expertise are leveraged to ensure a robust, secure, and efficient development and maintenance of the EDS & Data Marketplace and Energy AI analytics platform:

a. Multifaceted Technological Expertise: A dedicated team of specialists (software engineers, data scientists, cybersecurity engineers, energy domain experts and business analysts) ensures the alignment of the solutions with emerging value chain needs and compliance with industry and regulatory standards; moreover, it allows for the continuous maintenance, update and refinement of the solutions, the elaboration of new analytics services (according to customer needs) and the prompt response and support to technical issues encountered by the customers.
b. Ready-to-Use & Reliable Technological Infrastructure: The bundle of the SYNERGIES solutions are built on a secure-by-design, already existing high-performance architecture, ensuring a more efficient resource management for maintenance, consistent service availability, further developments and integration activities. Nonetheless, it supports the customers trust towards the solutions as well as facilitates adaptability to evolving market needs.

By combining expert knowledge with a robust infrastructure, the owner is able to offer a trusted, high-value energy data ecosystem, driving efficiency, collaboration, and digital transformation in the energy sector.

- ***Cost Structure***

The cost analysis is focused on evaluating the expenditures related to the activities foreseen to deliver the EDS & Data Marketplace and Energy AI analytics platform value propositions, as well as the ancillary relevant activities (creating and maintaining customer relationships, scouting and exploiting the necessary channels…). In addition, the cost structure reflects the investments required to ensure the constant platform use without downtime or disruption while providing customer satisfaction. Software productization costs cover testing, bug fixing, cybersecurity, and ensuring the platform's robustness for reliable operation. A dedicated maintenance and customer support unit ensures ongoing customer satisfaction and smooth platform performance. Significant investments in advertising, marketing, and sales support the promotion and growth of the platform, including sales packages, salesforce training, and digital assets like landing pages.

Indeed, the R&D team is crucial for continuous development and operations, driving innovation and improvements. Finally, cloud hosting and services are essential for maintaining the platform's infrastructure, ensuring scalability, security, and performance for end users. Together, these elements ensure the platform's long-term success and sustainability.

The following workflow diagram provides an easily digestible snapshot of the Business Model associated to the SYNERGIES EDS, Marketplace and AI Platform exploitation, as comprehensively analysed in the previous paragraphs:

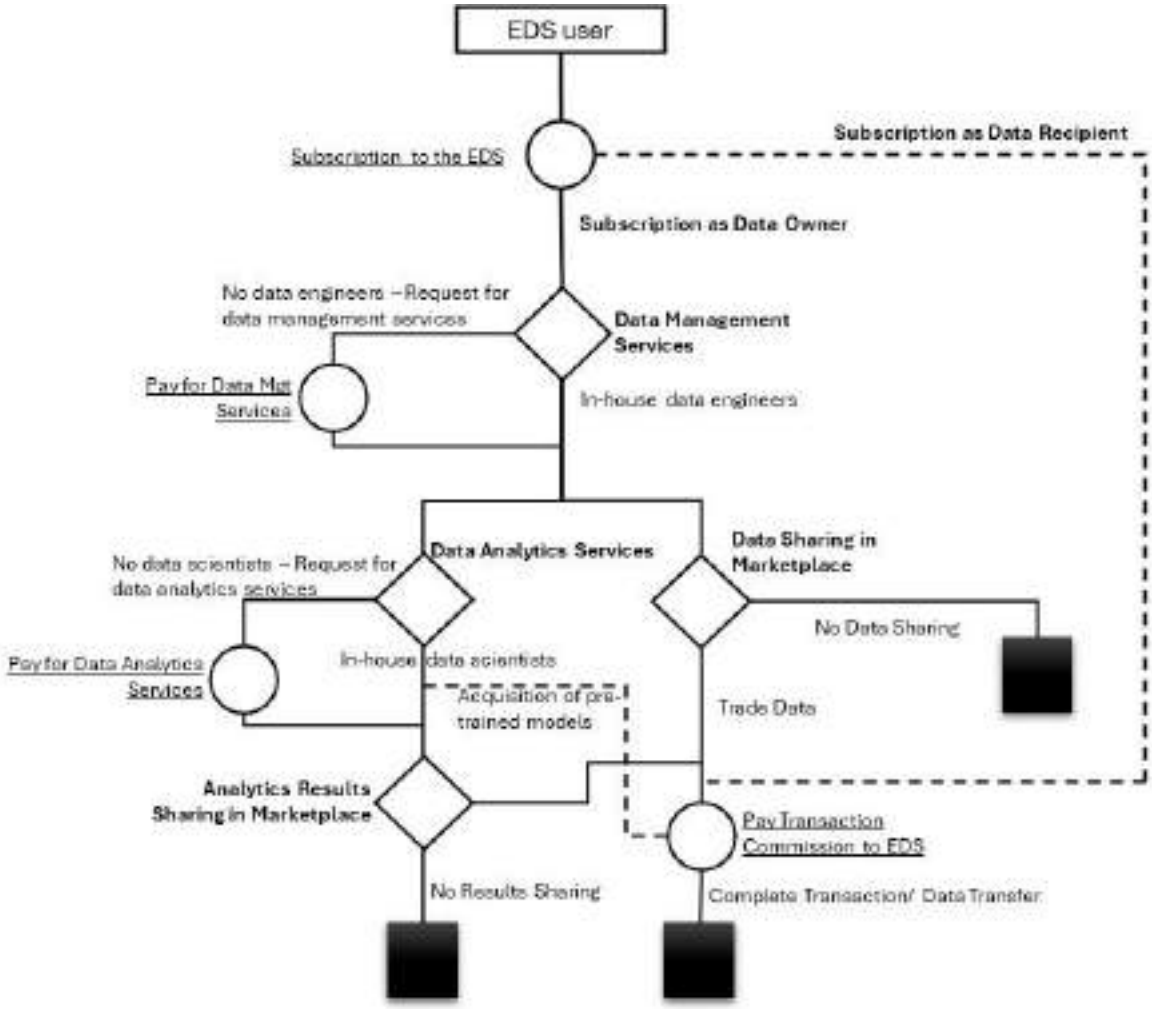

Figure 28 Energy Dataspace and Data Marketplace and AI Analytics Platform Workflow Diagram

4.6.1.2 Energy Service Marketplace

The SYNERGIES Energy Service Marketplace constitute the second main technological Key Exploitable Result of the SYNERGIES joint exploitation. It connects stakeholders across the energy value chain to innovative solutions and services. It includes:

- the Contract Manager that manages and secures transactions between buyers and sellers, leveraging an external API for efficient monetization;
- the Apps Requirements Engine gathers and communicates the specific service requirements to buyers, ensuring clarity and successful implementation;
- the Services Register Engine allows sellers to easily publish and manage their offerings, broadening their market reach.

The Energy Service Marketplace is owned by ETRA.

A dedicated Business Model Canva is presented in the figure below.

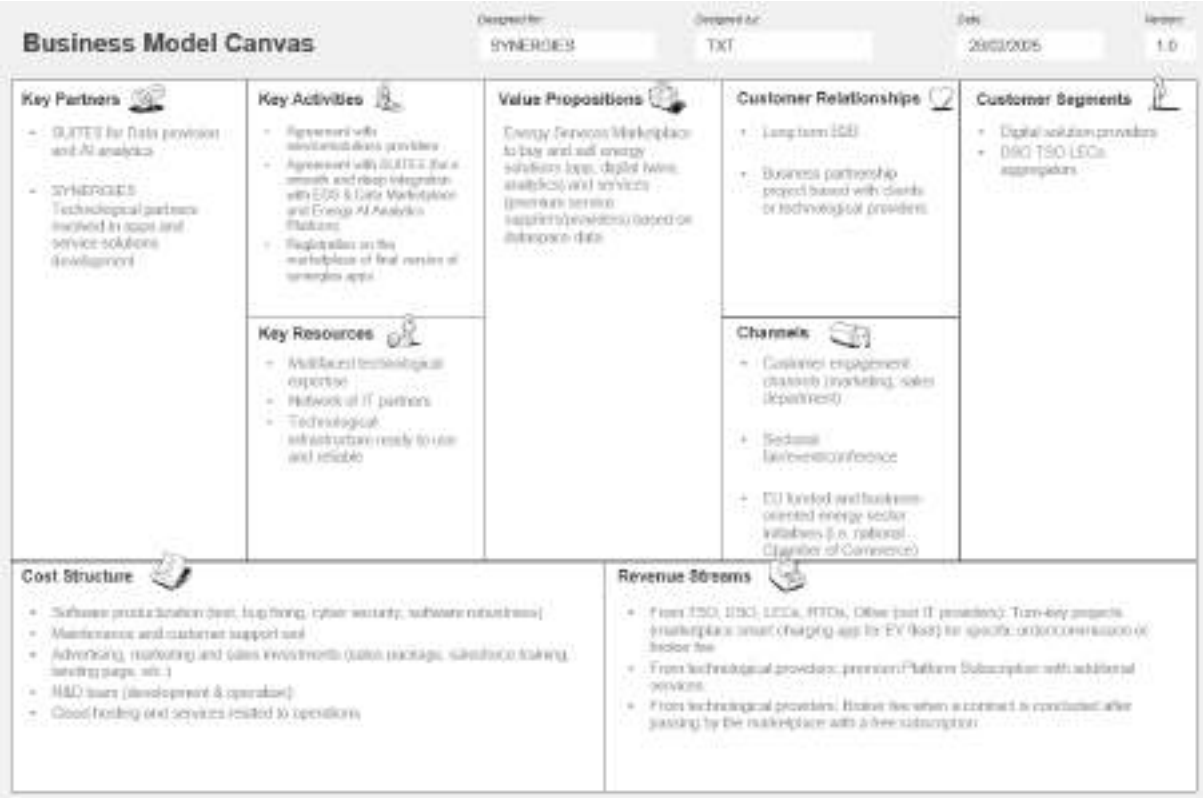

Figure 29: BMC for the SYNERGIES Energy Service Marketplace

The analysis performed focuses on the nine building blocks foreseen in the Business Model Canvas methodology as follows:

- ***Value Proposition***

The **value proposition** of the SYNERGIES energy service marketplace is to provide a comprehensive platform where users can **buy and sell energy solutions** such as apps, digital twins, and analytics, alongside a wide range of **services** offered by premium service suppliers and providers. The marketplace is built on **dataspace data**, ensuring that all solutions and services are fuelled by reliable, real-time data, enabling final users to make data-driven decisions.

This platform offers **access to cutting-edge technologies**, fostering innovation in the energy sector by connecting providers with customers seeking advanced, tailored energy solutions. Whether it's through app-based solutions or complex analytics, the Energy Services Marketplace delivers a streamlined, efficient way to meet the evolving needs of the energy industry, all within a trusted, data-driven environment.

- ***Key Partners***

The key partners of the SYNERGIES energy service marketplace include **SUITE5**, which is the owner of the EDS & Data Marketplace, and consequently support the streamline of essential data and AI analytics to enhance the Energy Services Marketplace capabilities.

Another critical partner group is the **SYNERGIES technological partners (DTU, ICCS, Ubitech, IES, CIRCE and ETRA)**, who are involved in the development of apps and service solutions. These partnerships enable the continuous innovation of the platform, ensuring it offers cutting-edge technologies and services that meet the evolving needs of the energy sector. Together, these key partners play a crucial role in ensuring the Energy Service Marketplace remains innovative, efficient, and competitive.

- ***Customer Segments:***

The customer segmentation of the SYNERGIES energy service marketplace includes **Digital Solution Providers**, who are interested in being part of the Energy Services Marketplace to gain visibility for their solutions and benefit from the rich pool of contacts (potential customers) that they could reach though the Energy Services Marketplace.
On the other hand, **DSOs, TSOs, and LECs aggregators** are interested in utilizing the Energy Services Marketplace to scout for new and innovative solutions to optimize grid operations, manage data, and enhance their service delivery based on their own data, offering improved flexibility and efficiency.
Each segment accesses tailored services that help enhance operational efficiency, data analysis, and resource management in the energy sector.

- ***Customer Relationships:***

The customer relationship model of the SYNERGIES Energy Service Marketplace is cantered on **long-term B2B** engagements, fostering trust-based and strategic partnerships with clients and technological providers, by offering continuous value-added services, reliable data access, and tailored support. This model encourages continuous collaboration, with a focus on mutual growth and long-term success. For technological providers, this means benefitting from the visibility gained from the Energy Marketplace and from the value-added serviced offered by the Marketplace to promote their technological solutions and pursuit market expansion. For clients (final users of the solutions), it means ongoing access to innovative energy solutions tailored to their evolving needs, ensuring continuous operational efficiency and sustainability.
This long term B2B relationships can occur in several declinations, among which:
- Exclusivity agreement: When registering their services, developers must sign an exclusivity contract to ensure they do not sell the same service directly to customers who contact them through the marketplace.
- Standardized smart contracts: To provide security for service buyers.

These partnerships are based on trust, expertise, and shared goals, enabling tailored solutions that meet the unique requirements of each partner.

In addition, the Energy Service marketplace foresee the opportunity to engage stakeholders through **Business partnership projects:** technological partners can leverage the **marketplace to** carry out projects commissioned by final users (e.g. DSOs, TSOs, and LECs aggregators); alternatively, such final users can engage with the Service Marketplace to scout for technology providers to commission their project. The goal is to build a foundation for growth, with both clients and providers benefiting from a reliable channel that supports the continuous evolution of the energy market. By focusing on long-term collaborations, the Energy Service Marketplace helps drive innovation and sustainability across the energy sector.

- ***Key Activities***

The key activities to put in place an effective Energy Service Marketplace true to its value proposition include in the first place establishing **agreements with service and solutions providers** to ensure a wide range of innovative offerings are available to customers. These

partnerships are essential for creating a robust Service marketplace that meets the diverse needs of the energy sector.

Another important activity is securing an **agreement with SUITE5**, in light of their ownership of the EDS & Data Marketplace and Energy AI Analytics Platform, ensuring smooth integration and functionality across different technological building blocks. This agreement ensures that the marketplace operates seamlessly and supports the needs of both providers and customers.

Lastly, the **registration of the final version of SYNERGIES apps** on the marketplace is a critical activity for the robustness of the marketplace itself, allowing users to access the most up-to-date tools and solutions. This ensures that the platform remains current, functional, and relevant to the evolving demands of the energy market. These activities collectively ensure that the Energy Service Marketplace delivers high-quality services and maintains a competitive edge in the industry.

- ***Channels***

To reach potential customers, the SYNERGIES energy service marketplace uses a variety of **customer engagement channels** designed to build awareness and drive collaboration.

The effort of **marketing and sales departments** plays a key role, using targeted campaigns and direct outreach to connect with a large and various range of stakeholders across the energy sector. These endeavours ensure that both clients and technological providers are aware of the platform's offerings and the value it can bring to their operations.

The marketplace also leverages **sectorial fairs, events, and conferences** to showcase its capabilities and engage with industry professionals. These events offer valuable opportunities to network, demonstrate solutions, and gain insights into market trends, helping to expand the platform's reach and influence.

Additionally, SYNERGIES and its key partners are actively involved in **EU-funded and business-oriented energy sector initiatives**, such as partnerships with national Chambers of Commerce. These initiatives help to strengthen the marketplace's visibility, foster collaboration with key industry players, and create opportunities for strategic growth. By tapping into these channels, the owner of the Owner of the Service Marketplace effectively connects with a broad range of potential customers, ensuring its services remain relevant and accessible in an ever-evolving energy landscape.

- ***Revenue Streams***

After the project, ETRA's exploitation strategy will focus on further developing energy services for clients, as this is its core market role, while also maintaining the Energy Services Marketplace. This will generate two revenue streams: first, revenue from selling services through the marketplace, similar to other energy service providers; and second, income from fees charged to developers for registering on the marketplace and for transactions with end-users when selling a service.

More specifically, the SYNERGIES Energy Service Marketplace generates revenue through various streams tailored to different customer segments. For **TSOs, DSOs, LECs, RTOs**, and others (excluding IT providers), revenue is earned through **turn-key projects** (e.g. custom

solutions for smart charging apps for EV fleets). These final users engage with the Energy Marketplace (and the technological providers that offer solutions in its framework) to carry commission this kind of projects; these projects are commissioned on a specific order or commission basis, or through a broker fee for facilitating the deal though the Service Marketplace.

Technological providers can register to the platform for free. However, the Energy Service marketplace offers a **premium subscription** that provides access to value-added services and enhanced features, helping providers maximize the value of their offerings. This premium subscription model supports continuous innovation and service delivery within the marketplace. Additional services may include premium services like a quality certification for an energy service issued by the Service Marketplace (and based on users' review) upon payment of a fee. Moreover, a Five-star rating system can be set-up for premium users, in order to ensure service reliability and increase visibility and trust. Only customers who purchase the service can rate it, which also encourages developers to sell their services through the marketplace.

Additionally, **broker fees** are collected from technological providers when contracts are successfully concluded through the platform, even for those with a **free subscription**. This commission-based model ensures that SYNERGIES remains a key player in driving energy service transactions, while providing value to all stakeholders involved.

- ***Key Resources***

The key resources to launch and maintain the SYNERGIES energy service marketplace include in the first place a **multifaceted technological expertise**, ensuring the platform can handle complex energy solutions and provide innovative services to clients. This expertise is crucial for maintaining a high level of service and supporting the continuous evolution of the marketplace.

A strong **network of IT partners** is also vital, providing the technical support and collaboration necessary for the marketplace's growth and functionality. These partnerships enable the Energy Service marketplace to expand its service offerings and stay at the forefront of technological advancements.

Finally, the platform relies on **technological infrastructure that is ready to use and reliable**, ensuring a seamless user experience for both service providers and customers. This infrastructure supports the scalability and security of the marketplace, making it a trusted and efficient platform for energy service transactions.

- ***Cost Structure***

The cost structure of the SYNERGIES energy service marketplace includes several key elements that are crucial for its development and maintenance.
Above all, **software productization** involves costs for testing, bug fixing, cybersecurity, and ensuring software robustness. These investments ensure the marketplace remains secure, reliable, and performs optimally for all users.

A dedicated **maintenance and customer support unit** is also essential, providing ongoing assistance and ensuring the platform operates smoothly for both providers and customers. This team addresses user queries, resolves technical issues, and ensures a seamless experience.

Significant **advertising, marketing, and sales investments** are made to promote the energy Service Marketplace and attract new users. This includes costs for creating sales packages, training the salesforce, and developing marketing materials such as landing pages to drive engagement and awareness.

The **R&D team** focuses on continuous development and operational support, driving innovation and ensuring the marketplace remains at the forefront of technological advancements in the IT and energy sector.

Lastly, **cloud hosting and related services** are a critical component of the cost structure, enabling the energy Service Marketplace to scale efficiently and support its operational needs, ensuring reliable service delivery to users. These costs are vital for maintaining the platform's infrastructure, security, and scalability.

The following workflow diagram provides an easily digestible snapshot of the Business Model associated to the SYNERGIES EDS, Marketplace and AI Platform exploitation, as comprehensively analysed in the previous paragraphs:

Figure 30. Energy Service Marketplace Workflow Diagram

Business Plan Preliminary Analysis

The analysis presented in the previous two subsections (4.6.1.1 and 4.6.1.2) is the starting point for the project Business Plan definition and go to market strategy implementation according to the principles and timing presented in the section 4.3 and 4.4 of the present deliverable. SYNERGIES partners will target the long-term viability and sustainability of the asset portfolio considering that in the first years of network operation additional investments will be required on top of resources and investments on the existing infrastructures. From a high-level perspective, costs estimation will be based on an average project cost based on operations size considering the effort required for delivery. As presented in the above mentioned sub sections, the costs are associated to:

- Operational costs for providing the service including not only design and implementation but also maintenance. These expenditures are related to both enabling cloud computing costs and senior and software engineer or consultancy experts
- Marketing costs and business expert consultancy to support project/service scale up. This could be related to internal staff dedicated to the new asset commercialization or in form of subcontracting costs
- Staff costs related to experienced and administrative support personnel that will be in charge of delivering and supporting the innovation management services with expertise in digital manufacturing
- Other expenses include travels for networking with stakeholders or clients, costs for legal support, publications or conferences attendance

The costs forecast based on these expenditures categories will drive the investment break even point by projecting the identified costs per numbers of years of operations. This analysis will be performed to ensure financial and operational sustainability on the long term horizon.

5 Data-sharing driven Business Models

This chapter is devoted to report the initial activities done in task T6.4 “New data sharing-driven business models for prosumers and local energy communities” from M10 to M30. In this period the business roles played by the different actors have been discussed and agreed. In addition, the main Synergies business scenarios have been confirmed. Based on them and the potential of the data sharing for energy consumers, prosumers and energy communities a preliminary proposal of suitable Business Models around the energy data spaces has been formulated, presented and discussed with relevant actors. The main outcomes of these activities are reported hereby.

5.1 Synergies business landscape: Objectives, actors and roles

The energy data sharing and trading enabled by the Synergies energy data space offers a new wide range of possibilities to energy actors to obtain tangible benefits that can be monetized, either through direct participation in open energy markets or through the obtention of energy and economic savings. These savings can be achieved by relying on a more efficient energy management or by intensively using the demand flexibility potential.

Any energy consumer or producer can be a beneficiary of the Synergies business models. Consumers and producers of energy can save energy or be flexible in the way they handle their energy. When doing it, they generate data (metering mainly, but not restricted to it), that can be used to design optimal energy management strategies and unleash the potential of the demand flexibility for grid and congestion management.

In Synergies there are three main business actors related to the energy data spaces: Consumers (prosumers), Local Energy Communities (LECs) and network operators (DSOs, TSOs).

5.1.1 Consumers / Prosumers

Consumers and prosumers represent the most important role in the Synergies energy data spaces. They consume and produce energy and provide the data necessary for the delivery of value in the energy domain. They are the main beneficiaries of the Synergies business models, either as individuals or collectively as members of an energy community. They provide the data, receive the advanced data-driven services and enjoy the possible energy efficiency and optimal energy management savings. On the demand management side, they provide the demand flexibility and are remunerated for it by demand side aggregators operating in open markets. They can be building residents but also companies or energy consuming entities. They can also be energy producers and prosumers.

Their role is to generate and share data in the common energy data space, contract or subscribe to advanced energy services and obtain direct savings or market retribution for data sharing. They can directly participate in energy markets or indirectly through LECs, acting as demand flexibility dealers.

5.1.2 Local Energy Communities

A Local Energy Community is a collective association of prosumers that share energy and data among them in a grouped manner benefitting from community services such as energy management or demand flexibility aggregation and trading services. Combined efforts of prosumers enable larger synergies for shared investments and further flexibility opportunities of commonly managed DERs.

In Synergies, LECs play the role, not only of coordinating the efforts of local prosumers towards a wiser use of energy, but also they are meant to take the role of demand flexibility aggregators, allowing to represent individual prosumers in flexibility markets and aggregating larger amounts of energy flexibility in response to network operator signals. LECs can sign contracts with the community members and use their metering data to assess flexibility potential and aggregate it to place commercial bids and obtain remuneration for the flexibility triggered in short-time events for grid management. They can also play the role of ESCO and use advanced analytics to provide joint energy management strategies to achieve savings at community level.

5.1.3 Network Operators

Network operators are entities, usually companies, that own, manage, invest and maintain electricity grids to distribute energy locally in determined geographical areas. Distribution (DSO) and Transport System Operators (TSO) can also generate their own grid metering and node status data, collect data from their customers and share these data on a peer-to-peer basis for the sake of a better and more optimal management of the networks, thus allowing for investment deferral in further network extensions, avoidance of curtailment and penalties for congestion and supply failures to the users. Moreover, they can use specific data to generate predictive maintenance strategies and reduce their maintenance costs. Additionally, they can infer in future investment decisions to dimension correctly the future networks due to the fast-changing pace of today's energy market trends and the long-time investment periods of any network expansion.

5.1.4 Data providers

Data providers are those entities that are in charge of ensuring data availability and data quality, either with or without data enhancement and enrichment operations. They may or may not own the data they treat and make available in the energy data space. They are accountable for the use of the data and can operate under contractual liabilities signed with data owners. They are the intermediaries between data owners and the energy data space managers and comply with the rules of the open energy data space.

5.1.5 Data Analysis providers and technical solution providers

They are the actual data consumers and develop the technical solutions and Apps that enable the provision of the data-driven services. They may be the business promoters of the business models or be a third-party external vendor providing the technology and technical support to the BM execution.

5.2 Preliminary proposal of data-sharing driven business models

The Synergies business models are conceptually designed to monetise the value of data for consumers, prosumers and energy communities, driven by IT companies and solution developers. The key principles for the development of the innovative Synergies' business models are:

- Prosumers shall monetize data-sharing for flexibility services.
- LECs shall transform into local demand aggregators to improve benefits for themselves and allow community members to benefit from their explicit flexibility.
- Hybrid approach. The business models shall combine value of data sharing (knowledge) and flexibility services.
- Network operators shall share data on a peer-to-peer basis to improve DSO-TSO coordination and grid management savings.

With these principles in mind, the following list of business models have been proposed and discussed among partners.

- Prosumers as beneficiaries:
  - Transparent and fair entry of prosumers in flexibility markets
  - Prosumer lock-in avoidance and engagement with multiple energy service vendors for increased energy autonomy and independence from energy price fluctuations
- LECs as beneficiaries:
  - Local Energy Community transformation to Flexibility Aggregator
  - Energy-as-a-Service for Local Energy Communities
- Network operators as beneficiaries:

- TSO-DSO Data Bartering for Collaborative Flexibility-based Network Management
- Data Intelligence-driven Predictive Maintenance for Network Assets
- Crowdsourcing for evident investment planning in RES and Flexibility Assets

A detailed description of each BM follows.

5.2.1 BM1 Transparent and fair entry of prosumers in Flexibility markets

This business model proposes the use of prosumers' data to work out their demand flexibility potential on a continuous basis through suitable flexibility analytics run by aggregators and flexibility analysis providers and allow them to participate in flexibility markets, obtaining a fair remuneration for that participation. Flexibility may come from smart home appliances and equipment, renewable generation facilities, electric vehicles and batteries owned by these prosumers. Benefits would come from data trading revenues and from flexibility service remuneration.

Table 6. BM1. Transparent and fair entry of prosumers in Flexibility markets

Beneficiaries: Prosumers	
Data Providers	**Data Consumers**
Prosumers	Aggregators Flexibility Analysis Providers
Benefits	**Costs**
Data Revenues Flexibility Services Remuneration	Data Services (Quality, Interoperability, Hosting, etc) Smart Home Service Provision (Demand Response) from Aggregator/ LEC Smart EV Charging Service Provision Commission to Data Space for data transactions

5.2.1.1 Enablers

Technology providers, Smart prosumer and EV charging platforms, PVs, BESS, EVs, HVACs, Data Spaces, flexibility revenues, AI Analytics, Smart Meters.

5.2.1.2 Barriers

Lack of regulation framework for flexibility remuneration, prosumers reluctance to share sensible data, lack of awareness or interest from prosumers in general.

5.2.2 BM2 Prosumer lock-in avoidance and engagement with multiple energy service vendors for increased energy autonomy and independence from energy price fluctuations

This business model also places prosumers as main beneficiaries of the use of their self-generated data to provide energy savings through optimisation of self-consumption and flexibility-based energy management. These savings also derive in lower energy consumption and network charges and lower energy costs coming from ToU tariffs and self-sufficiency maximisation. ESCo, LECs and Energy Analysis Providers would be possible relevant data consumers and service providers remunerated proportionately to the saving achieved.

Table 7. BM2 Prosumer lock-in avoidance and engagement with multiple energy service vendors for increased energy autonomy and independence from energy price fluctuations

Beneficiaries: Prosumers	
Data Providers	**Data Consumers**
Prosumers	LECs Energy/ Flexibility Analysis Providers Energy Service Providers (app developers)
Benefits	**Costs**
Data Revenues Energy Savings (self-consumption + flexibility-based energy management) Minimization of network charges Avoidance of charges due to billing readjustments clause	Data Services (Quality, Interoperability, Hosting, etc) Smart Home Service Provision (Energy Management, Self-consumption) Smart EV Charging Service Provision Commission to Data Space for data transactions

5.2.2.1 Enablers

Technology providers, Smart prosumer and EV charging platforms, PVs, BESS, EVs, HVACs, Data Spaces, AI Analytics, Smart Meters.

5.2.2.2 Barriers

Investment costs, many prosumers have fixed prices in their tariffs being insensible to energy prices fluctuation.

5.2.2.3 Comments

ESCOs should be considered as Data Consumers.

5.2.3 BM3 Local Energy Community transformation to Flexibility Aggregator

This business model is addressed to LECs, that take the role of demand flexibility aggregator for the community members and share a part of the market retribution as a payment of the aggregation and trading services. LECs would use the individual prosumers' data to provide them an aggregation service that entitles them to take part in open demand-response markets run by DSOs and TSOs for grid management.

Table 8. BM3 Local Energy Community transformation to Flexibility Aggregator

Beneficiaries: LECs/Aggregators	
Data Providers	**Data Consumers**
Prosumers (for raw data) towards LECs LECs (for flexibility analysis and VPPs) towards DSOs/TSOs	Aggregators (for prosumer data) DSOs/ TSOs (for Flexibility Analysis provided by aggregators)
Benefits	**Costs**
Data Intelligence Monetization (Flexibility Analysis sharing to DSO/ TSO) Flexibility Service Remuneration (from DSO/TSO) Smart Home Service Provision (towards prosumers) Smart EV charging Service Provision (towards prosumers)	Data Acquisition (from prosumers) Data Analysis Data Services (Interoperability, Hosting, etc) Flexibility Service Remuneration (to prosumers) Commission to Data Space for data transactions

5.2.3.1 Enablers

Technology providers, Smart prosumer and EV charging platforms, BESS, DERs, Data Spaces, AMI.

5.2.3.2 Barriers

Lack of regulation framework for flexibility remuneration, prosumers reticence to share sensible data, lack of awareness or interest from prosumers in general, in some countries, lack of legislation for LECs.

5.2.3.3 Comments

Retailers are also beneficiaries in the flexibility provision value chain, receiving benefits from offering flexibility of their clients.

5.2.4 BM4 Energy-as-a-Service for Local Energy Communities

In this business model, the beneficiary actor is the LEC that takes up a role of ESCo, consuming data from the prosumers (Community Members) to optimise the use of energy at community level through self-consumption maximisation and flexibility-based energy management for community-owned assets such as buildings, EV charging stations, shared PV generation facilities, …). LECs can obtain revenues from the energy savings at community level and from the excess generation trading to energy markets (day-ahead, intra-day).

Table 9. BM4 Energy-as-a-Service for Local Energy Communities

Beneficiaries: LECs	
Data Providers	**Data Consumers**
Prosumers	LECs
Benefits	**Costs**
Energy Savings (self-consumption + flexibility-based energy management for community-owned assets e.g. public buildings) Minimization of network charges (for community-owned assets) Smart Home Service Provision (towards prosumers) Smart EV charging Service Provision (towards prosumers) Revenues from excess generation trading to energy markets (day-ahead, intra-day)	Data Acquisition (from prosumers) Data Services (Interoperability, Hosting, etc) Data Analysis Commission to Data Space for data transactions

5.2.4.1 Enablers

Technology providers, Smart prosumer and EV charging platforms, BESS, DERs, Data Spaces, AI Analytics, AMI.

5.2.4.2 Barriers

Unincentivized adoption of technological tools necessary for such services.

5.2.5 BM5 DSOs-TSOs Data Bartering for Collaborative Flexibility-based Network Management

This Business model benefits network operators, Distribution and Transport companies, to obtain savings and revenues from a smarter management of their networks by sharing data about the network status upstream and downstream in a collaborative approach. Data would be peer-to-peer shared or even bartered minimising the cost of the service, allowing the companies to draft flexibility-based strategies to reduce operation and congestion management costs and penalties, reducing energy losses and lowering the medium- to long-term network expansion.

Table 10. BM5 DSOs-TSOs Data Bartering for Collaborative Flexibility-based Network Management

Beneficiaries: DSOs/TSOs	
Data Providers	**Data Consumers**
Prosumers Aggregators DSOs (to TSOs) TSOs (to DSOs)	DSOs TSOs
Benefits	**Costs**
DSOs Reduced congestion management costs Reduced penalties for congestion events Lower energy losses Avoidance of investments for network expansion and reinforcement to manage an ever-increasing number of DER	**DSOs** Data Acquisition costs (from prosumers) Analytics Acquisition Costs (from aggregators) Data Services (Interoperability, Hosting, etc) Data Analysis Costs Commission to Data Space for data transactions Penalties for non-compliance to bartering requirements
TSOs Reduced balancing costs Reduced penalties for capacity allocation Lower energy losses Lower economic investment for network expansion Resource savings from better operational efficiency.	**TSOs** Data Acquisition costs (from prosumers) Analytics Acquisition Costs (from aggregators) Data Services (Interoperability, Hosting, etc) Data Analysis Costs Commission to Data Space for data transactions Penalties for non-compliance to bartering requirements

5.2.5.1 Enablers

The key enablers for this business model are regulatory compliance and data standardization to ensure interoperability between system operators and stakeholders.

Standardization ensures seamless data exchange between DSOs and TSOs, even if they have different IT systems. Without it, data exchange would be cumbersome and error-prone, hindering the entire business model.

Another enabler is IT security. A trusted environment is essential for data exchange, as it protects sensitive information from cybersecurity threats. This fosters trust between DSOs, TSOs and the predictive maintenance analytics providers.

For the energy data value chain to procure benefits for all participating parties, advanced analytics tools should be developed for system operators to be able to provide service that guarantee valuable insights on the grid or consume such services from technology providers.

Finally, incentive mechanisms should be in place. All parties should receive fair value for their data contributions as well as alternatives to data purchase such as bartering etc.

5.2.5.2 Barriers

The major blocking point of this Business model are data privacy and security concerns. System Operators, managing critical infrastructure on a national level and overseeing the operation of national assets such as the transmission or distribution grid, are very sensitive on security issues. Sharing delicate grid data can raise concerns about privacy and security. TSOs and DSOs might be hesitant to participate if they lack confidence in the security of the data sharing platform or the ability of analytics providers to protect sensitive information.

Another issue is the data governance and ownership under the concept of data spaces. Clear data ownership and governance policies need to be established to determine who owns the data, how it can be used, and who is responsible for its security. Without clear policies, data sharing agreements can be complex and hinder participation. To sum up, costs related to data services hosting, data analysis execution and commission to data space for data transactions must be taken into account.

A critical point in the successful design of this business model are standardization challenges. Standardizing data formats and protocols across different TSO and DSO IT systems can be a significant hurdle. The lack of standardization can make data integration and analysis difficult and expensive.

Compliance with local and national energy regulations poses a significant hurdle. Navigating complex energy policies and standards requires extensive coordination and adaptation.

Finally, with the present state of power systems, fluctuations in demand, renewable energy generation, and potential equipment issues are hard to tackle if the velocity of data exchange is not satisfactory. To effectively manage these changes and maintain grid stability, TSOs need access to real-time or near real-time data from DSOs. Delays in data exchange can lead to outdated information, hindering the ability of TSOs to make informed decisions regarding grid flexibility.

5.2.5.3 Comments

Recent changes in (Greek) legislation have laid a new environment for data exchange between TSO-DSO and Significant Grid Users. The Business Model has to take this into consideration to achieve regulatory compliance and improve data exchange processes.

Proactive engagement with regulatory authorities and policymakers is crucial. Advocating for supportive policies and streamlining regulatory processes can help overcome regulatory challenges. Additionally, fostering closer collaboration between stakeholders and regulatory bodies can facilitate smoother project implementation and compliance.

5.2.6 BM6 (Business Model Innovation) Data Intelligence-driven Predictive Maintenance for Network Assets

This is a business model innovation that opportunistically takes advantage of the Synergies energy data space to allow network operators to reduce their operational and maintenance costs through predictive maintenance analytics. Additional indirect revenues may come from the savings obtained from the enhancement of the quality of power in the network (avoidance of the need for additional services for frequency and voltage regulation) and the reduction of power losses.

Table 11. BM6 Data Intelligence-driven Predictive Maintenance for Network Assets

Beneficiaries: DSOs/TSOs	
Data Providers	**Data Consumers**
DSOs TSOs	Predictive Maintenance Analytics Providers
Benefits	**Costs**
Lower operation and maintenance costs Indirect revenues (savings) from the enhancement of the quality of power in the network (avoidance of the need for additional services for frequency and voltage regulation) and the reduction of power losses (more power delivered)	Data Services (Quality Interoperability, Hosting, etc) Data Analysis Execution

5.2.6.1 Enablers

Oftentimes legacy equipment of the power grid is hindering monitoring of the power system assets. To enable the business case for predictive maintenance data, legacy equipment has to be supplied with state-of-the-art infrastructure which can collect and transmit data on the spot.

Deploying edge computing capabilities closer to physical assets allows for real-time data processing and analysis. This enables faster identification of anomalies and facilitates early intervention for potential equipment failures. Additionally, integrating AI algorithms at the edge can further enhance predictive capabilities by autonomously learning from sensor data and identifying subtle patterns indicative of future issues.

Reinforcing this necessary infrastructure with sensors even legacy equipment can be modelled. Creating digital twins of physical assets provides a virtual representation that can be used to simulate real-world conditions and predict potential equipment behavior. This data can seamlessly be integrated with existing IoT platforms and, by extension to the Energy Data Space, that would allow for centralized data collection and analysis as well as incentive possibilities. This unified view facilitates a more holistic approach to predictive maintenance, enabling providers to identify potential interactions and dependencies between different pieces of machinery.

5.2.6.2 Barriers

Predictive maintenance relies on analyzing historical and real-time data to identify potential equipment failures. Delays in data exchange can lead to outdated insights, potentially causing missed equipment issues and hindering the effectiveness of preventative maintenance strategies. That way, the TSO would not have a comprehensive view of the grid in real-time, hindering its ability to manage

flexibility effectively. This could lead to inefficiencies in power flow management and increased risks of grid instability.

Sensor data is prone to errors and gaps in the data due to the nature of sensor data collection. The effectiveness of predictive maintenance hinges on the quality of the data being analyzed. Inconsistent data formats, missing data points, or sensor malfunctions can lead to inaccurate predictions and hinder the ability to identify true equipment issues. Ensuring consistent high-quality data across DSO and TSO systems can be a challenge. Roll out and cost of initial investments in grid infrastructure (e.g. sensors, smart meters) as well as training of skilled personnel hinders BM's implementation.

Interoperability issues from different devices and vendors involved and particularities of data quality and integration, data security and privacy and all related costs to data services hosting and analysis execution must be taken into account.

Legacy equipment is certainly true for the physical assets but can also be true for IT systems. The software in use might not be readily interoperable with modern data analytics tools. Upgrading these systems can be costly and time-consuming, creating a hurdle for seamless data integration.

5.2.6.3 Comments

The potential benefits of predictive maintenance (reduced downtime costs, extended equipment lifespan) can be difficult to quantify precisely upfront. Detailed CBA would be an enabler in TSO participation and convincingly prove that investments on this front are worth the risk.

To mitigate some of the financial risks involved, risk-sharing agreements should be possible. For example, analytics providers could share some of the financial burden if their insights fail to prevent equipment failures. On the other hand, shifting towards value-based pricing models could incentivize participation. Under this approach, the TSO would pay a fee based on the actual value derived from the predictive maintenance insights, such as cost savings from avoided outages or extended equipment lifespan.

To address these barriers and optimize the effectiveness of data intelligence-driven predictive maintenance, stakeholders should prioritize investments in research and development to advance predictive analytics capabilities and enhance data quality assurance processes. Additionally, fostering collaboration among stakeholders and regulatory bodies can facilitate the development of standardized protocols for data exchange and interoperability, promoting seamless integration of predictive maintenance solutions across the energy network.

Finally, asset management system must establish connectivity with DSOs existing systems, including GIS, SCADA and ERP systems in order to eliminate the need for manual interventions.

5.2.7 BM7 (Business Model Innovation) Crowdsourcing for evident investment planning in RES and Flexibility Assets

This is again another Business model Innovation for DSOs that can utilise the data provided by LECs and prosumers to infer future investments in new DERs and use modelling analysis tools to forecast the impact of these new DERs in the Grid. As a result of these impact calculation, they can recommend and influence on investment decision makers (prosumers and LECs) to lower down future operation OPEX and network expansion and reinforcement CAPEX, while focusing investment planning more wisely.

Table 12. BM7 Crowdsourcing for evident investment planning in RES and Flexibility Assets

Beneficiaries: DSOs	
Data Providers	**Data Consumers**
Prosumers (raw data) LECs/ Aggregators (raw data and Flexibility Analysis)	DSOs
Benefits	**Costs**
Savings from avoidance of (future) congestions Avoidance of network expansion/ reinforcement investments Revenues from tailored service provision to LECs/ Prosumers	Data Acquisition costs (from prosumers, LECs) Analytics Acquisition Costs (from LECs/ aggregators) Data Services (Interoperability, Hosting, etc) Data Analysis Costs Commission to Data Space for data transactions

5.2.7.1 Enablers

Leveraging raw data from prosumers and LECs/Aggregators empowers DSOs to get valuable insights for investment planning.

5.2.7.2 Barriers

The reluctance of the community to engage in flexibility services is the main problem to implement this BM, since their collaboration is crucial.

Insufficient expertise within DSOs to effectively engage the communities through workshops and forums, questionnaires or any other partnership with local organizations. This role may be more effectively performed by local communities, but DSOs could themselves take on the role of coordinator, facilitator, or consultant.

Last but not least, all related costs to initiatives aimed at raising public awareness and expenses related to commissions for data platforms and data services hosted on cloud or hybrid platforms are still unclear. Ensuring data quality, interoperability, and privacy across diverse sources may present technical and operational obstacles.

5.2.7.3 Comments

As this business model is novel and innovative, improvements cannot be identified at this stage. Further discussions with specialized personnel from DSOs are necessary to explore potential enhancements.

Addressing these challenges requires a concerted effort. Stakeholders should prioritize investments in data quality assurance processes and interoperability standards. Establishing collaborative frameworks to define clear guidelines for data exchange and privacy protection fosters transparency and trust. Moreover, exploring cost-sharing mechanisms and providing incentives for data contributors can foster broader participation and facilitate more accurate investment planning and decision-making.

5.3 Business model development and validation roadmap

5.3.1 Workshop

A preliminary Business Modes Workshop (T6.4) was held on 28th February 2024 gathering all business partners involved in the Synergies project. The stakeholders that participated are:

- VTT
- HEDNO
- Prospex Institute
- ETRA
- Entersoft (CG Software)
- CoEn
- Arthurs Legal
- Ubitech
- Maggioli
- ICCS
- TXT
- Suite5
- CIRCE

The workshop aimed at presenting the preliminary proposal of Synergies BMs to the business partners and request relevant feedback about the suitability of the business models in today's energy market context in Europe and how the deployment could create new revenue opportunities or jeopardize the current position of the actors in the markets they play.

The session was recorded so all the relevant partners that hadn't the chance to participate could be updated and provide feedback. The requested feedback, mainly consisted of finding out, for each proposed BM, the following information:

- Which are the BM enablers?
- Which are the BM barriers?
- How to improve the BM?

The feedback collected in the session and in subsequent analysis and communications has been included in the BM description in section 5.2. This feedback is now to be thoroughly analysed and incorporated in a new revision of the fine-tuned BMs.

Figure 31 Snapshot of workshop session held on February 28th, 2024

5.3.2 Business Model Canvas

The Business Model Canvas serves as a template for strategic management, designed to aid in the creation of new business models and the documentation of current ones. It presents a visual diagram featuring components that detail a company's or product's value proposition, infrastructure, customer base, and financial situation. This tool helps companies coordinate their operations by showcasing possible compromises.

Alexander Osterwalder first introduced the nine foundational components of what is now known as the Business Model Canvas in 2005, setting the groundwork for this strategic planning tool.

The Business Model Canvas is structured into four primary sections. At its core, it outlines the value proposition intended for delivery. On the left side, essential elements such as key partners, key activities, and key resources are highlighted, outlining how value is created. The right side focuses on customer engagement, covering interactions before, during, and after a sale, detailed through customer relationships and channels. It also specifies the target customer segments, emphasizing understanding the customer's needs and problems. The financial aspects are laid out at the bottom, detailing both expenditures and revenues in the "Cost structure" and "Revenue streams" sections, respectively.

While there's no universally prescribed method for completing a Business Model Canvas, a widely accepted strategy involves initially identifying the target customer segments and their needs or problems. Following this, the value proposition is defined, along with the channels and customer relationships to be developed. The modeler should then pinpoint the primary sources of revenue that will fund the business model. After establishing these elements, the focus shifts to identifying the necessary resources, partnerships, and activities for success. Finally, the cost structure is determined based on the information gathered earlier.

Figure 32 Canvas description and completion order

5.3.3 Next steps

In the subsequent months CIRCE will start working in the detailed description of the BMs, to be shared with relevant partners in the following months.

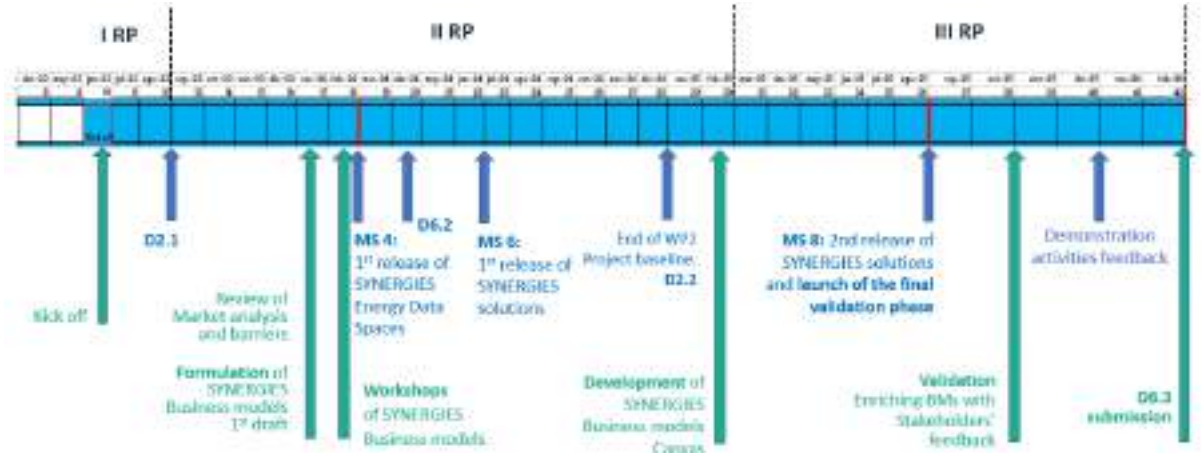

Figure 33 Tentative Gantt Chart for T6.4

The summary of the high-level next steps to take are listed below:

- Analyse, make corrections and fine tune the current proposal according to feedback provided by business partners having taken part in the February's workshop
- Develop CANVAS models for every Business Model
- Follow up of demonstration activities and real-environment feedback collection
- Validation of Synergies BMs in the living labs and BM refinement and enrichment with partners' feedback and learnings from demonstration activities
- Documentation in D6.3

6 Conclusions and Next Steps

This report presents the updated report of WP6 activities carried out in M13-30 period considering all tasks involved.

Concerning LLs activities, a detailed description of performed events has been provided along with the planning for next period which will be crucial for the successful implementation of the prosumers engagement. This includes not only the organization of physical and remote workshops but also the promotion of dedicated initiatives for external actors to disseminate project results, collect feedback, elaborate best practices and support validation tasks.

Concerning communication and dissemination activities, the reporting of actions performed and materials released in this period has been provided, highlighting the results achieved in terms of KPIs and impact. The focus for next period will be mainly on two key elements:

- strengthening project visibility with the goal of both ensuring project results continuous dissemination and supporting exploitation activities in the post project phase;
- progressing with sister projects and relevant initiatives collaboration to increase project messages spread and consequently reach a wider stakeholders pool

Concerning exploitation activities of T6.3, the KERs listing and categorization in 3 major exploitation packages has been performed in its preliminary version, leading to individual and joint exploitation paths depiction. According to the agreed exploitation strategy and roadmap, next period tasks will be dedicated to performing further revision of exploitable assets integrating the database with additional exploitable outputs of the project following technical activities progress and achievements. This is particularly relevant for the Technological Package and the Industrial Package because the technological developments and their validation through the various test cases of the project will play a pivotal role in the final exploitable results listing.

More in detail, leveraging on the defined strategy on how SYNERGIES project results can be exploited for future developments taking into account Sustainability and IPR issues, the first step will consist in further analysing how these results can be described from a business perspective in order to enrich the technical information available in WP3, WP4 and WP with market's features. Second step is assigned to identify relevant target market for the KERs since it allows to understand if the project's results answer to the market needs, if they represent emerging needs and which are replicability conditions even after the project. The post project exploitation path needs to be feasible to implement on a long term basis, so the exploitation plan must be linked to a business sustainability strategy that identify resources required to sustain outcomes, consider IPR issues, and determine funding opportunities. The next major effort will be indeed to strengthen both the individual and joint exploitation plan in order to improve its business model by clearly identifying key aspects such as competitors, promotion channels, costs and revenues stream and business partners. This will also affect the design and implementation of a business plan that will prove to be successful for go to market phase especially in the after-project phase.

Finally, concerning the data-sharing driven BMs activities, a dedicated analysis has been performed to firstly define the energy actors involved in these actions as a target group to which the different BMs are addressed to. The goal is to determine the different aspects for energy stakeholders to obtain tangible benefits that can be monetized, either through direct participation in open energy markets or through the obtention of energy and economic savings. In Synergies 5 main business actors related to the energy data spaces have been identified: Consumers (prosumers); Local Energy Communities (LECs); network operators (DSOs, TSOs); data providers; and data analysis and technical solution providers. Following the first BMs presented in this deliverable, the next months will be focused on

the revision of these preliminary models to provide in the final version a more detailed description of each BMC segment, highlighting user benefits coming from the adoption of data-sharing applications.

Since it is an iterative process, the described key aspects will be further explored and updated in the following and final deliverable D6.3 "SYNERGIES Business Innovation Plan" at M42 that will present:

- The reporting of LLs activities with the description of organized workshops and their impact to define lessons learned for a successful stakeholder engagement
- the final version of the final version of individual exploitation, including not only achieved results but also the consolidation of all project exploitable assets and commercial packaging offering;
- the final plan and roadmap for the post-project period to support the exploitation of the SYNERGIES KERs
- SYNERGIES joint exploitation business model and plan from a long term time horizon for scaling up and replication the project concept at larger scales as well as knowledge transfer of developed assets and infrastructure to other energy applications;
    - The final version of the 7 data-sharing BM with a detailed depiction of the key aspects for data valorisation for consumers, prosumers and energy communities, TSOs, DSOs and network operators

[i] Osterwalder, Alexander. (2004). The Business Model Ontology – A Proposition in a Design Science Approach.