Executive summary

SYNERGY aims to create the conditions and develop the necessary infrastructure in order to facilitate a meshed network of energy data producers and consumers and transform the traditional top-down energy market business model, to a more inclusive one, where business decisions and system optimization are based on interconnected data assets and direct or indirect collaborative interactions amongst the stakeholders across the electricity value chain. To that end, SYNERGY brings innovation in two major sectors, namely the ICT and Energy which, combined, aim to create a new mentality for the electricity data value chain built on sharing data assets. This deliverable focusses on the definition of the SYNERGY Business Scenarios and Use Cases (UCs) and ends-up to the extraction of respective high-level user requirements for the SYNERGY platform. It contains as such:

i) **SYNERGY's Business Scenarios,** which represent complete descriptions of novel business concepts and/or business problems followed by suggested solutions, indirectly highlighting the benefits from the SYNERGY adoption by the targeted stakeholders. These business scenarios constitute the basis for the development of the SYNERGY's business models (under WP10).

ii) **SYNERGY's Use Cases**, which materialize the defined business scenarios by breaking them down into distinct interactions to be performed in the overall SYNERGY platform (i.e. the big data platform and AI analytics marketplace, as well as the energy apps) by the different stakeholders. Such Use Cases typically elaborate on specific objectives (stakeholder-specific or cross-stakeholder) and the means of their realization through SYNERGY in order to ensure a common understanding of the SYNERGY vision. The UCs are functionality-based and are subsequently directly linked to SYNERGY's business requirements.

iii) **SYNERGY's business and user requirements**, which further substantiate the UCs and serve as the main input for the design of SYNERGY platform's architecture and for the actual development of the various components and functionalities of the platform. The requirements practically reflect real-world needs for the whole electricity data value chain.

The methodological approach for the implementation of T2.1 as a whole was designed with the aim to facilitate and benefit from the productive interaction with multiple other tasks and WPs of the project:

- Interactions with other tasks of WP2:

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- T2.2 ("Analysis of socio-economic and regulatory obstacles to innovation") is a task evolving in parallel with T2.1. In the framework of T2.2, valuable feedback was provided for the refinement of business scenarios and use cases reported in this document.
- T2.3 ("Ex-Ante demo surveys, data landscaping and deployment planning"): The interaction of T2.1 with T2.3 was mainly centered around the alignment of the results of the data landscaping process performed under the latter with the elicitation of business and user requirements reported in the current deliverable.
- T2.4 ("Detailed architecture design, protocols and interfaces specifications for Big Data-enabled Energy Services"). Preliminary work performed in this task during their simultaneous evolution with T2.1, provided an important feedback loop affecting the results of both tasks.

- WP3 ("End-to-end Interoperable Big Data Management Platform") and WP4 ("Big Data Analytics and Data Sharing Mechanisms") serve as the necessary underlying infrastructure for the realization of the energy services. Simultaneously the resulting relevant UCs (and any potential update on them during T2.1), serve as input to WP3 and WP4.
- WP5 ("Advanced Grid-level Analytics for Optimized Network and Asset Management Services and Applications"), WP6 ("Portfolio-level Analytics for Energy-as-a-Service (EaaS) Applications for Electricity Retailers and Aggregators") and WP7 ("Building/District-level Analytics for Optimized Energy Performance Management") will build upon the fundamental tools and mechanisms of the SYNERGY platform that WP3 and WP4 will provide, in order to deliver Innovative Energy Services (IES) for various types of stakeholders of the electricity value chain.
- The interaction with WP9 was centered around T9.1 ("Living Lab Setup and Activities Planning"), evolving in parallel with T2.1. Since this deliverable is a living document, the interaction between these tasks is considered on-going until the conclusion of T2.1.
- The interaction with WP10 was primarily centered around T10.1 ("New business models driven by data sharing approaches between energy market actors") which was also simultaneously evolving with T2.1. The information flow between T2.1 and T10.1 was bidirectional.

For the elicitation of the project's UCs and platform's requirements, a hierarchical approach was adopted whereby leaders of the WPs that are dedicated to the various technical objectives of the project -both platform and energy-services related, namely (WP3 to WP7), were allocated as the main

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drivers of the process, under the supervision of SYNERGY's Technical Coordinator and the T2.1 leader. This process naturally involved the interaction with the project's demo partners, the contribution of which was critical for the derivation of the final list of UCs and requirements at this stage of the project. In order to promote an interactive approach amongst the partners contributing in the development of this deliverable's assets, "live" collaborative tools and platforms were utilized, thus enhancing the quality of the final outcomes by enabling partners to constantly keep an open eye on the results during their developments.

The Business Scenarios developed within this task, reflect high-level, contextual business value for each of the actors of the electricity value chain. A total of 19 Business Scenarios were derived covering both Horizontal Business scenarios (data related) which represent baseline, cross-stakeholder scenarios, as well as Vertical Business Scenarios, which are stakeholder-specific and address the whole spectrum of the energy market establishing a set of innovative objectives for aggregators, retailers, DSOs, TSOs, building/facility managers, ESCOs, RES operators, city authorities and consumers/prosumers. Below, an overview of these Business Scenarios is presented:

Horizontal Business Scenarios (Data related):

1. **HRZ-BS1**: Electricity data value chain stakeholders to attach value to their own data assets.
2. **HRZ-BS2**: Electricity data value chain stakeholders to gain new insights over their data assets.
3. **HRZ-BS3**: Electricity data value chain stakeholders to share and trade their own data assets in a trustful, legitimate manner.
4. **HRZ-BS4**: Electricity data value chain stakeholders to enjoy the benefits of the reuse of their own data assets.

Vertical Business Scenarios (IES related):

5. **AG-BS1**: Aggregators to optimize their positioning in flexibility markets and hedge their risks through fine-grained flexibility segmentation, classification and clustering towards VPP configuration for human-centric demand response.
6. **RE-BS1**: Electricity retailers to increase their profitability and improve their business sustainability through their transformation into energy service providers (rather than pure commodity providers) with the use of advanced portfolio analytics.

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7. **RE-BS2**: Electricity retailers to increase competitiveness of their tariff schemes and increase revenues and profits through advanced energy analytics that facilitate the establishment of GPPAs
8. **CA-BS1**: City authorities to optimize their long-term planning and achievement of sustainability goals through accurate forecasting-driven urban planning.
9. **DSO-BS1**: Distribution system operators to reduce OPEX and safeguard security of supply and quality of service through improved DER forecasts and flexibility analytics in the frame of Flexibility-based network management and collaborative flexibility scheduling with TSOs.
10. **DSO-BS2**: Distribution system operators to reduce total cost of ownership and effectively safeguard network availability and resilience through advanced network asset management analytics (incl. predictive maintenance, network planning and sizing).
11. **ESC-BS1**: ESCOs to increase the attractiveness of renovation investments and reduce EPC risks, through enhancing the accuracy of Energy Performance Simulations at the design phase and as a means to reduce the gap between anticipated and actual energy performance of buildings.
12. **ESC-BS2**: ESCOs to generate new income through improving existing Energy Performance Certification services and complementing them with Smart Readiness Certification offerings on the basis of highly-granular, real-time energy analytics.
13. **PRS-BS1**: Prosumers to enjoy significant energy costs savings and safeguard their well-being through fine-grained edge analytics facilitating the deployment of personalized energy management and human-centric automation services, properly balancing energy efficiency and human comfort.
14. **BMG-BS1**: Building managers/ Prosumers to generate new income by monetizing their flexibility in local flexibility and energy market transactions through advanced flexibility analytics and trading marketplaces.
15. **BMG-BS2**: Building Managers/ Facility Managers/ Prosumers to enjoy significant energy cost savings and reduce dependency on the grid through individual and coordinated flexibility-based control of building energy systems (generation, storage, demand) for self-consumption maximization.

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16. **TSO-BS1**: Transmission system operators to reduce OPEX and safeguard security of supply and quality of service through improved DER forecasts and flexibility analytics in the frame of Flexibility-based network management and collaborative flexibility scheduling with DSOs.
17. **TSO-BS2**: Transmission system operators to reduce total cost of ownership and effectively safeguard network availability and resilience through advanced network asset management analytics (incl. predictive maintenance, network planning and sizing).
18. **RES-BS1**: RES Plant Operators to reduce LCOE (Levelized Cost of Energy) of the RES plants along with the O&M costs, while increasing RES technology reliability, availability and efficiency through advanced asset management and predictive maintenance analytics.
19. **RES-BS2**: RES Plant Operators to improve their revenue stream and increase profitability in the short- and long-term through advanced generation and flexibility analytics for increasing accuracy of bids in energy markets, promoting long-term GPPAs and getting involved into flexibility market transactions.

The deliverable presents **46 UCs based on the IEC 62559-2 standard,** which constitute the backbone of the project's goals focusing each time on specific beneficiaries and involved actors. The bundle of the SYNERGY UCs comprises 18 platform-oriented UCs which address fundamental principles, functionalities and mechanisms of the SYNERGY Big Data Platform & AI Analytics Marketplace, and 28 IES related UCs that are directly associated with the objectives of WPs 5, 6 and 7 for the creation of the SYNERGY Energy Applications. Going one step further in the analysis of the defined UCs, they can be classified under more specific categories which elaborate on either platform-oriented and IES-oriented aspects. Naturally, due to the versatile nature of the UCs, most them fall under more than one of these fine-grained categories. The result of this analysis is illustrated in Figure 1. As presented, 12 of the platform-oriented UCs focus on data collection, data management and security aspects (WP3) while 8 are related to data analytics and data sharing. Regarding the IES-related UCs, Figure 1 presents their distribution among the various types of energy stakeholders that they focus on. As indicated in the latter categorization, an indirect correlation of the IES-UCs with the relevant WPs is provided, since each of WP5, WP6 and WP7 focus on the development of energy apps for specific stakeholders.

The formality of each IES-oriented UC, is such that contains the description of a novel application that either addresses certain "pains" for the main actors involved, expands their arsenal of solutions in specific domains or even promotes a whole new business area. They further provide information about

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the data synergies and exchanges among the actors that are necessary for the realization of the UC. The document provides further analysis on the distribution of IES-oriented UCs among the different types of stakeholders as well as a weighted evaluation of the various design principles, necessary supported functionalities and mechanisms pertaining to the platform's scope, which derive from the platform-oriented UCs.

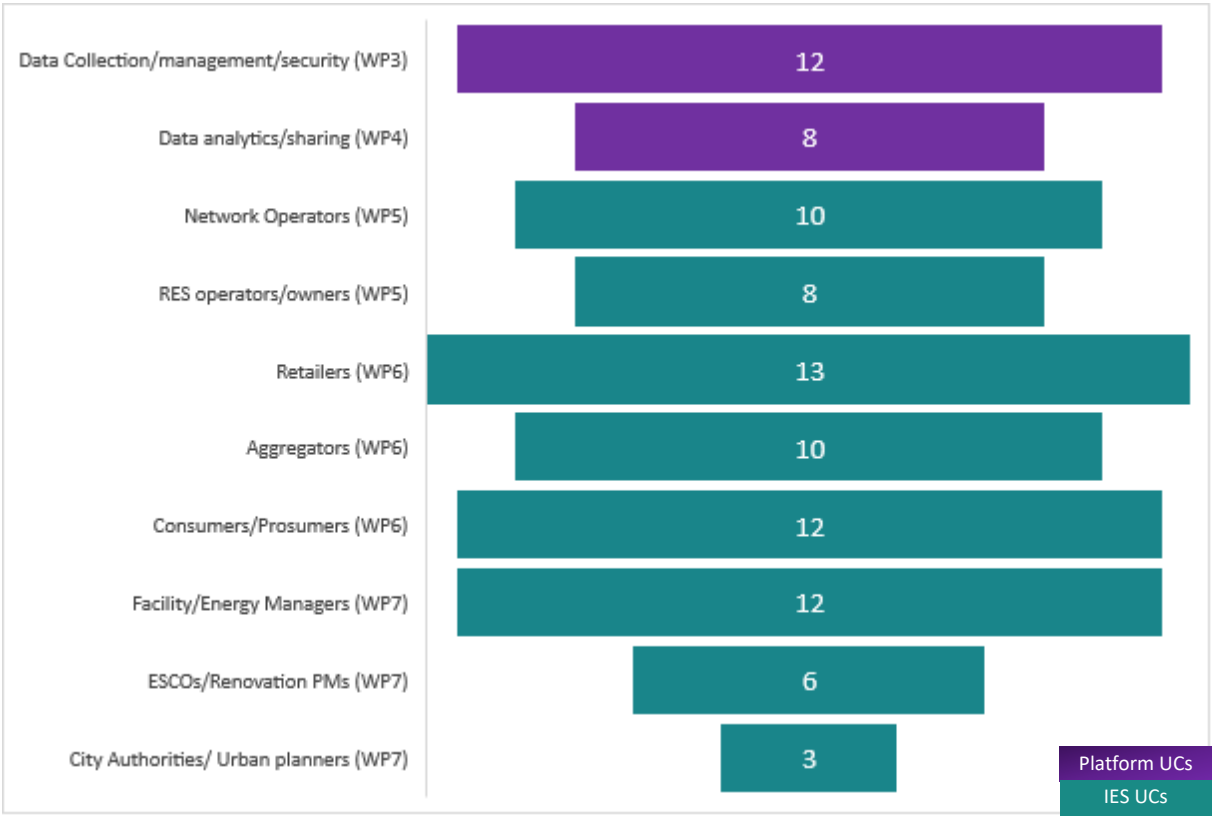

Figure 1: Categorization of platform-oriented UCs (WP3-WP4) and IES-oriented UCs (WP5-WP7)

Our work on Use Cases developed towards the elicitation of the SYNERGY platform's business and user requirements which are provided herewith. These requirements materialize the UCs of the project and as such their elicitation was governed by the respective WP leaders, thus following the same hierarchical approach adopted for UCs. A total of 932 requirements were derived, covering mainly functional and data needs of the platform but also addressing other aspects such as the scope of the product, facts and assumptions, security, operations, look & feel and more. The majority of the requirements are characterized as of top priority for the development phase, however their distribution spans across all levels of prioritization.

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A continuous validation of the outcomes of this deliverable is a major aspect of this task throughout its duration. As such, the collaborative Living Labs framework of SYNERGY was utilized from the early stages of this task in order to internally keep an open eye on the credibility and alignment of developments, namely the elicitation of business scenarios, UCs and requirements, with the project's set objectives. As such, appropriate collaborative platforms were utilized for the definition of UCs and requirements while internal validation activities, such as focus groups and workshops, were organized to ensure alignment to the adopted standards and protocols. In order to further ensure that the project reaches a European-wide industry value, external validation activities were also carried out, which included dedicated interviews with representative electricity data value chain stakeholders beyond the SYNERGY consortium in order to acquire feedback on the SYNERGY platform's functionalities regarding data analytics and sharing, as well as the energy apps that build on the SYNERGY-acquired data intelligence.

The work conducted in T2.1 is on-going. As such, the continuation of the validation processes through the Living Labs and furthermore, the early development and testing of the SYNERGY platform and applications in WP3-WP7, will provide additional feedback on the SYNERGY vision as shaped up by the business scenarios, use cases and requirements. Both these next steps of the T2.1 workplan will be used to devise the final lists of use cases and requirements of SYNERGY and will be reported in the next version of this deliverable.

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