VPP4ISLANDS

Virtual Power Plant for Interoperable and Smart isLANDS

VPP4Islands

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AI: Artificial Intelligence **API**: Application Programming Interface **D&C**: Dissemination and communication **DL**: Deep Learning **DLT**: Distributed Ledger Technology **DMP**: Data Management Plan **DR**: Demand Response **DSO**: Distribution System Operator **DT:** Digital Twin **EC**: Energy Community **EI**: Expected Impact **EO:** Expected Outcome **ESCO:** Energy Service Company **EU**: European Union **EV:** Electric Vehicle **FAIR:** Findable, Accessible, Interoperable and Reusable	**IP**: Intellectual Property **KB:** Knowledge Base **KPI:** Key Performance Indicator **DSS**: Decision Support System **NGO**: Non Governmental Organisations **OA**: Open Access **PV**: Photovoltaic **QAP**: Quality Assurance Plan **R&I**: Research and Innovation **RES:** Renewable Energy Sources **ROI**: Return of Investment **RTO**: Research and Technology Organisation **SDG:** Sustainable Development Goals **SME**: Small and Mid-size Enterprise **SPT**: Smart Planning Tool **TRL**: Technology Readiness Level

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GDPR: General Data Protection Regulation **GHG**: Greenhouse Gas **KPI:** Key Performance Indicator	**TSO**: Transmission System Operator **WP**: Work Package

1. Executive summary :

The deliverable D8.5 "Business model, exploitation strategy plan and activities" represents the activities carried out in Task T8.4 "Tailored business models, services and results exploitations" of WP8 from the H2020 project VPP4ISLANDS. In this document, a depth state of the art (SoA) of the business models was provided in relation to the major use cases defined in WP2. RDIUP worked closely with the partners to develop business models and provide the templates for the canvasses and surveys to gather the exploitation activities initiated by the VPP4ISLANDS consortium. Business model canvases were developed for the two use cases (self-sufficient energy community and aggregation of the Grid flexibility) and for the Smart Planning Tool (SPT). D8.5 aims to carry out the following activities:

- preparing surveys and questionnaires to gather information about the exploitation activities done by partners.
- organizing interviews and brainstorming's with key partners responsible for the KERs and technical development.
- creating surveys and canvases for the business models and value propositions.
- defining a preliminary business plan for the spin-off "VPP4I Factory".
- identifying financing opportunities and providing a first investment schema.
- analysing the answers from the different surveys about the individual and joint exploitations.

Various studies[1], public deliverables[2,3] were analysed to better understand the barriers and enablers of a sustainable business and go-to-market strategies of VPP4ISLANDS. Concretely, this deliverable D8.5 intends to maximize the impacts of the technical and scientific developments and ensure the continuity in the post-project through a clear business plan and exploitation roadmap. Interactions of these actions with other technical WPs will be detailed and highlighted in this document. In this direction, various potential discussion and brainstorming meetings were carried out between RDIUP and key contributors to analyse their actions.

In section 2, this document starts by introducing the business models and exploitation strategies related to the Virtual Power Plant (VPP), then, we present in section 3 the main objectives of the D8.5. Also, business and value propositions canvases are defined in section 4 and a business plan of the VPP4I Factory are detailed in section 5. Moreover, a specific section 6 is devoted for the preliminary exploitation of results. Finally, lessons learnt and conclusions are given respectively in section 7 and section 8.

[1] "PESTLE ANALYSIS of Barriers to Community Energy Development" LECo project
[2] D6.1 Detailed PESTEL and PORTER analysis of the CHEST system" CHESTER project 764042
[3] D6.4_SISCODE_Business_Model.pdf

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2. Introduction:

As shown in the Figure1, the results from WP2 (VPP4ISLANDS services, specifications, use cases and scenarios), the technical/scientific findings from the WPs 3, 4, 5 and 6 and the outcomes from the online workshops and stakeholder's interviews (done by RDIUP) feed the task T8.4 to define business cases and joint exploitations of the major KERs. These activities will be tested and demonstrated in the WP7 "VPP4ISLANDS" solution testing and validation.

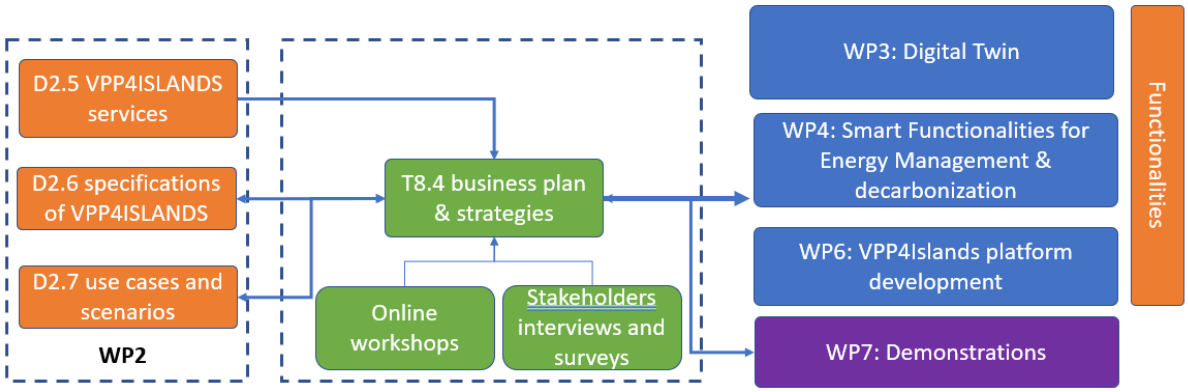

Figure 1: Interactions between WP8 and other WPs

Our main business exploitation is to create a spin-off "VPP4I Factory" which is an entity that creates new VPPs or optimizes existing portfolios of energy systems to be transformed into improved VPPs. Also, VPP4I factory will continuously assist and support the different clients to propose remunerated digital-based and flexibility services[4] (Grid aggregation business case). Also, we will generate revenues from VPP4IBox selling and monitoring of different installations. The key to any marketplace is user trust. In this direction, we will evaluate the possibility to adopt the "willing to pay" especially for the business case related to the Energy Communities (ECs). Concretely, the main objective is to share fair profits with all stakeholders and ensure the loyalty of our VPP4INodes. During the project (2020 to 2024), the VPP4Islands technologies will reach TRL8. In addition to each partner's individual exploitation strategy (Section 6), the consortium will develop and implement a joint strategy for transitioning the VPP4Islands solutions to market-readiness (TRL9) and for commercializing the technologies (2024- 2025) to ensure the long-term sustainability VPP4Islands. Therefore, our main strategy is to create a start-up (VPP4I Factory) to exploit the KERs and commercialize the proven products and services. RDIUP as start-up maker will work closely with key partners as responsible for these activities too.

2.1 Introduction of business Model and Canvas

A business model is defined as a methodology to maximise the impacts and the values in order to clearly determine target customers or groups of customers and how solutions will be commercialised. The Business Model Canvas[5] is a strategic management template used for developing new business models and documenting existing ones. It offers a visual representation with elements describing solutions' value proposition, resources, customers, and revenue streams, assisting businesses to align their activities by illustrating potential trade-offs. Also, the business model canvas basically showcases the business model and emphasizes the customer values studied, how to reach and to deliver it. Because of

[4] https://www.rescoop.eu/uploads/rescoop/downloads/Flexibility-services-for-energy-cooperatives.pdf

[5] Osterwalder, Alexander; Pigneur, Yves; Clark, Tim (2010). Business Model Generation: A Handbook For Visionaries, Game Changers, and Challengers. Strategyzer series. Hoboken, NJ: John Wiley & Sons. ISBN 9780470876411. OCLC 648031756. With contributions from 470 practitioners from 45 countries.

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its clarity, it is very well suited to analyse the consistency of a business model regarding the improvement towards said customer value and the processes surrounding it. The proposed business cases usually are a quantification of the whole business model related to the VPP4ISLANDS outcomes. Value proposition is at the heart of the business model concept as a central element and its definition depends on the target segmented customers as well as beyond the existing alternative products or services. This reflection implicates the customer expectation not considered specifically a canvas competition. Thus, all other aspects within the canvas should support this value to the customer (customer value). By demonstrating the set of parameters to describe the canvas, while keeping the customer value in mind, this value is maximized, as is the chance that the business model described in the canvas will eventually lead to new business with a positive business case. Therefore, in a business model canvas, the value proposition is positioned in the center, with a description of the intended customer on the receiving part, surrounded by the description of the key processes, necessary key resources, partners and suppliers, customer relation, channels (to market as well as communication), cost structure and revenue streams. The value proposition, central in the canvas, is supported by all the other factors in the canvas. An effective synergy can lead to a consistent proposition and satisfied customers.
Regarding our smart solution we will use these tools to optimize the profit and to better understand the market to give the best result to our client and investors.

2.2 Introduction of exploitation strategy

The Exploitation Strategy is a plan containing the definition of target groups, user requirements, the activities each partner in the Consortium is committed to carrying out, how the project's results will be exploited, and ultimately used by principal beneficiaries and end-users. Our main strategy is to create a specific spin-off that will exploit the key solutions and services provided by VPP4ISLANDS.
VPP4Islands will develop an overall exploitation roadmap including the exploitation strategy of the involved industrial partners. The roadmap will be able to support the attraction of different stakeholders at national and international levels. It will identify those project milestones which are particularly suitable for outreach towards key stakeholders. The roadmap will also incorporate guidance for dissemination on the regional and national level, notably which dissemination activities could be undertaken in order to enhance their own visibility and the visibility of the project in general. Exploitation will be categorized in short-term, medium-term and long-term opportunities. The expected project results and related exploitation potential are summarized in section 6. below. One exploitation expected to apply to all participants is to take part in further development activities to raise the technologies beyond a TRL of 8.
In task T8.5, we defined and circulated surveys and interviews in order to gather and assess the individual exploitations and the joint ownership of proven solutions developed by partners. Also, we develop some surveys to deeply understand the exploitation activities of each partner to gather maximum information to demonstrate the important task of the work of all partners.

3. Objectives of D8.5:

The specific goal of VPP4ISLANDS is to create a new concept of VPP that combines small distributed sources to act together as one power plant to store energy, one we have excess and release energy when is needed by the grid. In order to concretize and achieve this major objective and be able to commercialize the proven solutions developed in technical WPs (services/products), RDIUP is leading the task 8.4 “Tailored business models, services and results exploitation” in work package 8 (WP8). To define tailored business and exploitation strategies and maximize the impacts of VPP4ISLANDS in the post-project, key actions were done in WP8. Therefore, according to the SO8 in the proposal, the main outcomes of the deliverable D8.5 are:

- Better understand the VPP’s markets and identify customers’ trends to facilitate our market entrance for Islands, through Market, SWOT and PESTLE analysis.

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- Construct the most suitable business models (by using Business canvas) for sustainability and competitiveness of solutions and offer novel answers for the market requirements and needs.
- Gather the individual/joint exploitation activities carried out or planned by all partners through surveys and direct meetings.
- How can Smart Planning Tool (WP4) be used to expand the reproducibility of our plan and enlarge the implementation of RES?
- Reach agreements among the partners for fairly conducting the exploitation of the results while ensuring a fast market uptake.
- Define a detailed roadmap to implement the co-designed business cases and exploitation strategies.
- Finally, co-create with all partners a business venture (spin-off) VPP4I Factory that will be launched at the end of the project.

4. Business strategy

4.1 Market analysis

This subsection provides a detailed analysis of VPP's global market size[6], regional and country-level market size, segmentation market growth, market share, competitive study, sales analysis, impact of domestic and global market players, value chain optimization, trade regulations, recent developments, opportunities analysis, strategic market growth analysis, product launches, area marketplace expanding, and technological innovations. Growing penetration for renewable energy in the power generation sector coupled with changes in dynamics of power grids from centralized to distributed is expected to drive the virtual power plant market growth. Further reduction in energy cost and easy accessibility of energy storage will boost the market demand. For instance, Tesla[7] reported in their recent virtual power plant project 70% decrease in grid consumption, while bills have been reduced by up to 30%.
Additionally, VPP is more efficient and flexible to deliver the peak load electricity in a short notice period compared to conventional power plants set up that will further drive the market growth. Flexibility in trading with Virtual Power Plants (VPP) due to price volatility attracted a lot of new participants. Customers can sell excess energy at trade markets as well as buy energy at lower prices. Such features of virtual power plants are expected to further fuel the demand. However, high-frequency of electromagnetic and radio waves leads to health concerns in infants and old people, which may hamper this growth. Nonetheless, stringent government regulations regarding eco-friendly power generation will further enhance the market for renewable energy, thus fueling the demand for virtual power plant market.

Firstly, the global Virtual Power Plant (VPP) market size (according to Latest Report from Valuates Reports[8]) is expected to gain market share is projected to reach US€ 2708.3 million by 2028, from US€ 601.3 million in 2021, at a CAGR of 23.7% during 2022-2028.

Concerning the market segmentation, the Virtual Power Plant market is split by type, by application and by region. For the period 2015-2025, the growth among segments provides accurate calculations and forecasts for sales by Type, by Application and by regions in terms of volume and value. This analysis can help you expand your business by targeting qualified niche markets.

[6] Global Virtual Power Plant Market 2020 by Company, Regions, Type and Application, Forecast to 2025 "Market study report"
[7] https://sites.google.com/a/valuates.com/energy-and-power-industry/virtual-power-plant-vpp-market
[8] https://reports.valuates.com/market-reports/QYRE-Auto-11G9196/global-virtual-power-plant-

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The main idea behind VPP technology is to develop and package flexibility into energy generation and consumption. There are two types of conventional VPP models:

1. Operational Control (**OC**) model focuses on direct operational control of single assets. The goal here is to simply control and manage assets.
2. Functional Management (**FM**) model focuses on the management and aggregation of distributed energy sources. The goal here is to optimize the few connected assets while taking into consideration other factors such as cost, heat generation, and energy market prices.

By application, Virtual Power Plant has been segmented into two main domains: firstly Industrial and Commercial applications and secondly residential use cases especially for energy communities.
Regarding the region segmentation, Europe accounted for the highest virtual power plant market share owing to the presence of a large number of industry players and new government initiatives across different European countries on 100% green energy. Asia-Pacific possesses the highest growth in the global virtual power plant market. This can be attributed to the rising energy demand in countries, such as China and India with rapid industrialization. For instance, by country of activity, China accounts for 36 percent of the steel industry's annual contribution to global GDP. The U.S. is expected to lead the market in North America and witness high demand for virtual power plants, owing to the increase in demand for renewable energy.

- By Technology: Distribution Generation, Demand Response, Mixed Asset
- By End User: Commercial Industrial Residential

Competition analysis: A lot of businesses have adopted product development, expansion, and merger strategies to sustain the intense market competition. The virtual power plant market analysis covers in depth information of major industry participants. Some of the major players in the market are: ABB, Schneider Electric, General Electric, Autogrid Systems, Flexitricity, Blue Pillar, IBM, Tesla, Toshiba, Osisoft, Next Kraftwerke and Siemens.

4.2. SWOT and PESTEL analysis:

❖ SWOT analysis:

VPP4ISLANDS aims to address the participation of citizens in the energy activities highlighted earlier by promoting the value proposition of the cost-benefit and readily available state-of-the-art related to the proposed advanced products and services. The analysis of the overall strategic position of the VPP4ISLANDS ecosystem/business and its environment is provided in a SWOT analysis. SWOT analysis (or SWOT matrix) is a strategic planning and strategic management technique used to help a person or organization identify Strengths, Weaknesses, Opportunities, and Threats related to business competition. The SWOT analysis aims to identify the appropriate strategies of exploitation and marketing, and best align its resources and capabilities to the requirements of the environment.

Table 1: The general SWOT analysis

Strengths	Weaknesses
VPP4ISLANDS has an Innovative and technological potential allowing to revolutionize the green energy market supply chain (e.g., smart metering and grid, AI, network design, distributed generation, machine learning, digital twin); VPP4ISLANDS has strong commercialization and go-to-market capabilities and a unique digital platform with strong user value propositions;	High front-up costs of investment to develop and implement innovative technologies to exploit natural energy resources; VPP4ISLANDS services are not known in the market yet. This issue will be addressed by the development and promotion of the VPP4ISLANDS brand via marketing and other communication channels; Possible overlap in economic and operation activities (e.g. ECs vs DSOs); VPP4ISLANDS will facilitate the

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Key stakeholders have indicated interest to adopt expected results of VPP4ISLANDS.	transparency and fair negotiation through agreements and smart contracts and ensure compromising and protecting the interest and the benefits of both actors.[9] **Insufficiency of policy and legal capabilities[10]:** VPP4ISLANDS participates in BRIDGE working groups (e.g., regulations), increase legal capabilities through cross-fertilisation and facilitate the dialogues with policy makers to suggest new recommendations[11].
Opportunities VPP4ISLANDS will benefit from the early entrant advantage; Increase of energy demand, with lack of fossil energy sources which come from mainland energy markets, compromising ECs' independence and energy security; Emerging standards for semantic interoperability across domains; Untapped energy generation potential due to the lack of technologies to explore those energy sources; National and international green policies (e.g. EU Green Deal) to support investments in sustainable energy sources, namely investments in research and development to support decarbonisation; Consumers are more interested in cooperatives and aware of climate change; Covid-19 and Ukrainian war crises can be a strong opportunity and motivation to replace fossil sources (e.g. gas) by RES and create new markets New qualified job opportunities for local communities.	**Threats** Lack of necessary infrastructures in the existing ECs, which means higher levels of investment VPP4ISLANDS will provide a sustainable financing scheme and help ECs to identify incentives, promote the collective actions and investments, and mutualize resources. Also, the project will foster the extension and the replication of the existing facilities (to not start from scratch)[12] Lack of local manpower with the necessary technical skills to implement and manage the IT platforms; VPP4Islands will provide full access to online digital training sessions Lack of storage capacity and flexible loads for ECs to use all the energy that will be provided through energy sources; That will be mitigated by incentives and collective actions. Lack of participation due to resistance to change and to adopt disruptive methods.it will be resolved by highlighting benefits and monetized values for end users. High dependency on green energy sources which can be affected due to natural disasters and climate change; firstly we have to avoid areas with high disaster risk and offer an early warning system. Lack of interest from commercial energy providers from fossil-based energy, which have energy market monopolies. We will try to involve them in the value chain as real actors. Different views and interests between citizens and local policymakers. We will contribute to establishing dialogue between them and give access to citizens feedback. Networks are not able to support the overdemand on RES integration which

[9] https://biblioteca.cejamericas.org/bitstream/handle/2015/3308/Renewable_Energy_Policies_and_Barriers.pdf?sequence=1&isAllowed=y

[10] https://www.sciencedirect.com/science/article/pii/S2214629618302251

[11] https://biblioteca.cejamericas.org/bitstream/handle/2015/3308/Renewable_Energy_Policies_and_Barriers.pdf?sequence=1&isAllowed=y

[12] https://www.sciencedirect.com/science/article/pii/S0957178717301285

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4.3. PESTEL analysis:

A PESTEL analysis is a strategic framework commonly used to evaluate the business environment in which a firm operates. Is **study the key external factors (Political, Economic, Sociological, Technological, Legal and Environmental) that influence an organization**, this component will help **VPP4ISLANDS** to analyze the environment around and can guide to find a strategy for the decision-making. All the aspects of this technique are crucial for any industry especially for a VPP4I Factory, is More than just understanding the market, this framework represents one of the vertebrae of the backbone of strategic management that not only defines what a VPP4I Factory should do but also accounts for an organization's goals and the strategies stringed to them.
It may be so, that the importance of each of the factors may be different to different kinds of industries, but it is imperative to the strategy of VPP4I Factory wants to develop the conduct of the **PESTLE** analysis as it forms a much more comprehensive version of the **SWOT** analysis. It is very critical for one to understand the complete depth of each of the letters of the **PESTLE**.

Political factors in PESTLE Analysis:

Political factors determine the extent to which a government may influence the economy or a certain industry. For example, a government may impose a new tax or duty due to which entire revenue generating structures of organizations might change. Political factors include tax policies, Fiscal policy, trade tariffs, etc. that a government may levy around the fiscal year and it may affect the business environment (economic environment) to a great extent, this is why VPP4I Factory has to be ready for all this component.

Economic factors in PESTLE Analysis:

Economic factors are determinants of an economy's performance that directly impacts a company and have resonating long term effects. For example, a rise in the inflation rate of any economy would affect the way companies price their products and services. Adding to that, it would affect the purchasing power of a consumer and change demand/supply models for that economy. Economic factors include inflation rate, interest rates, foreign exchange rates, economic growth patterns, etc.

Social factors in PESTLE Analysis:

Social factors scrutinize the social environment of the market, and gauge determinants like cultural trends, demographics, population analytics, etc. An example of this can be buying trends for Western countries like the US where there is high demand during the Holiday season.

Technological factors in PESTLE Analysis

Technologic factors pertain to innovations in technology that may affect the operations of the industry and the market favorably or unfavorably. This refers to automation, research and development, and the amount of technological awareness that a market possesses.

Legal factors in PESTLE Analysis:

Legal factors have both external and internal sides. There are certain laws that affect the business environment in a certain country while there are certain policies that companies maintain for themselves. Legal analysis takes into account both of these angles and then charts out the strategies in light of these legislations. For example, consumer laws, safety standards, labor laws, etc.

Environmental factors in PESTLE Analysis

Environment factors include all those that influence or are determined by the surrounding environment. This aspect of the PESTLE is crucial for certain industries particularly for example tourism, farming, agriculture, etc. Factors of a business environmental analysis include but are not limited to climate, weather, geographical location, global changes in climate, environmental offsets, etc.

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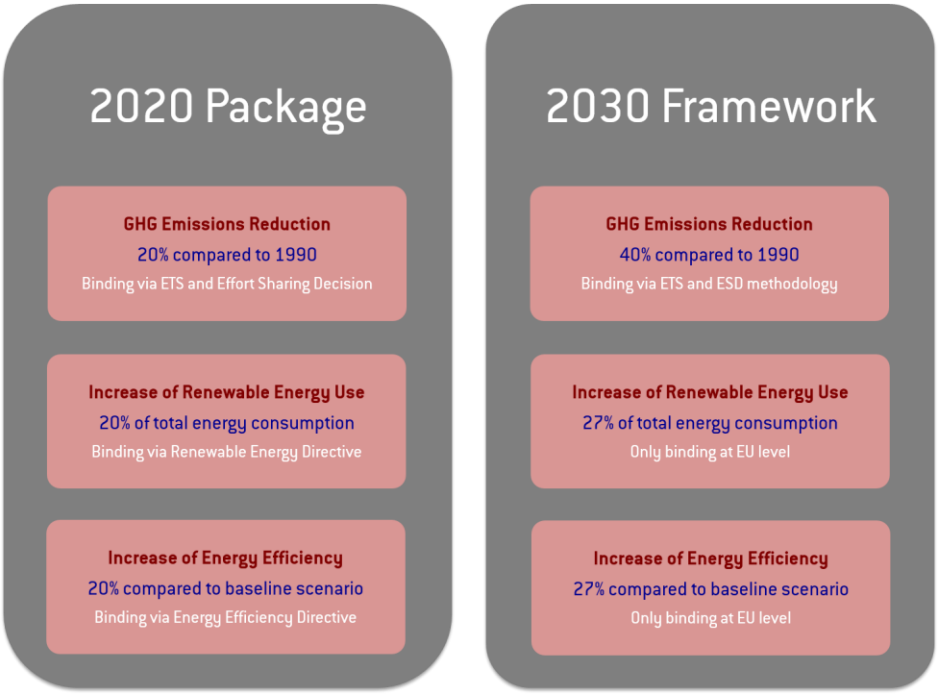

Figure 2: 2020 vs 2030 EU targets (source Bruegel)

Based on the leading Islands demonstrations, D8.5 will study mainly two countries **Turkey (European associated country)** and **Spain (EU country)** by using **PESTLE Analysis**[13] to better understand their barriers, enablers and impacts on VPP4ISLANDS.

Table 2 : ***PESTLE[14] Analysis & benchmarking in Spain***

Factors	**Spain**
Political factors	**Barriers**: Energy policy and regulation are not designed for disruptive concepts VPPs and Energy Communities; Lack of political support from local representatives and municipalities Concerning long-term energy plans, the Spanish Government has publicly defined an ongoing Energy Strategy Plan[15] for the next years but not sufficient for VPP integration, which complicates the implication of the energy sector and stakeholders in energy activities. Only, the Catalan Government has published a Clear National Pact for Energy Transition (ICAEN, 2017) Local regulations don't allow the trading of new services (e.g., flexibility services and the automated participation of ECs in the ancillary services) **Enablers:** European Standardization Organizations (CEN), CENELEC and ETSI, are responsible for fulfilling and achieve the mandates of the European Commission to establish norms, laws, directives (Revised 2009/28/EC), EU Strategies (e.g., REPowerEU; EU Green Deal), EU Initiatives (e.g., Renovation Wave) or standards

[13] https://pestleanalysis.com/what-is-pestle-analysis

[14] D2.1 "PESTLE Analysis & benchmarking of CEC implementations with stakeholder mapping" H2020 funded project LIGHTNESS

[15] https://www.boe.es/diario_boe/txt.php?lang=en&id=BOE-A-2021-5106

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	that facilitate the unification and homogenization regulation at European level (including Spain). - Local energy communities (LEC) will be an essential cornerstone for the success of the Energy Transition and The European Union (EU) acknowledges in the "Clean Energy for all Europeans" package the need for regulatory frameworks that empower renewable-based self-consumers (commonly referred to as prosumers) to generate, consume, store, and sell electricity back to the grid. - The Spanish government advocates for legislative support to local energy communities, to include the promotion of dynamic energy allocation and discriminatory electricity tariffs such as the recent Spanish framework[16]. - In response to the Ukrainian war, "Royal Decree-Law 6/2022" was published[17] to promote RES, autonomous communities and self-consumption facilities (reserve 10% of the transmission capacity). No longer a regulatory cap and floor in the Specific Remuneration Regime (SRR) from 1 January 2023. **Political Impact:** These new rules and new policies will ease all democratisation of VPP and the creation of LECs in many locations in Spain .
Economic factors	**Barriers**: The Spanish GDP represents about 1.435 trillion€ (nominal, 2022) with a growth of 5.5% compared to 2021. That fosters the creation of jobs in the sector. The renewable energy sector contributed 10,521[18] million euros to GDP in 2021 and represented 0.87% of the national economy which is still insufficient to respond to all energy needs. -The long-term business development for VPP is uncertain because of low financing aids or funding opportunities in Spain that are not clear. The Eurostat report[19] shows that Spain is one of the European countries with higher electricity prices and taxes for household consumers. The market cost is mainly the SPOT market, despite that the OTC markets or the PPA markets have very similar costs. In the Spanish market, 8-10 % (capacity mechanisms, for example) of this market cost is related to governmental decisions In Spain, there are 3 taxes: 1) A municipal tax (not always applied by all municipalities) represents the 1.5 % of the gross revenue earned by the utility. 2) A Tax on Electricity of 5 % of the combined regulated and market costs. This money goes to the local regions directly. 3) A VAT for the Peninsula of 21 % is applied to all elements included in the electricity bill. The gross profit for the energy utility represents about 5 % of the bill.

[16] Article Local Energy Communities in Spain Economic Implications of the New Tariff and Variable Coefficient.
[17] https://www.wfw.com/articles/important-regulatory-developments-in-the-energy-sector-approved-in-spain-decree-law-6-2022/
[18] https://www.evwind.es/2019/10/02/renewables-contributed-10521-million-to-gdp-in-spain/71163
[19] Eurostat. (2017a). Electricity price statistics, second half 2017.

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	The energy sector in Spain suffers from the lack of effective control and regulation by the public authorities of a liberalized electrical market dominated by the electrical Spanish oligopoly. Attracting private investments is still challenging due to high RES costs **Enablers:** EU grants, programmes and fundings for R&D activities in Energy sector Some public grants and national support are being raised to promote the implementation of VPPs and creation of ECs. Increasing adoption of new funding mechanism crowdfunding and other micro-financing solutions. Prices of novel ICTs, energy systems (e.g., BIPVs) and storage are dropping The energy market evolution has been characterized by the appearance of new players (ESCO, Aggregators, Brokers, etc.) encouraging customers to change their behaviour and to require new services (energy diagnosis, monitoring, load shifting, multi tariff, etc.). Moreover, new business models in the retail market have been developed thanks to new ICTs and the sector liberalization. **Impacts of economic factors:** Many advances are being defined with the expectation to get some public funding for the set-up of the community-based VPPs. Without these fundings, investments are high and risky for ECs, energy utilities and consumers.
Social factors	**Barriers**: Based on the current market structure, customer engagement and acceptance have been difficult. The dominant position of the former monopolies in the market and the growing concern of the Spanish citizens towards these companies means that direct cooperation between customers and companies is not usually welcome. The difficulty to trust in other individuals in one cooperation. Also, focus on community may increase isolation and disparities. **Enablers**: Social networks promote cross-fertilization and exchanging of experiences and knowledge Adoption of transparent technologies for fair share and management of members in one community (e.g., blockchain) Promotion of training and upskilling and easier access to digitise information. The existing Spanish cooperatives are joining the RESCOOP.EU model and trying to spread a new energy model based on renewable electricity consumption and production which will accelerate the adoption of these new models. **Social factors impact**:

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	Many initiatives regarding energy communities are fostered by the market liberisation and energy companies willing, in which final users become active and conscious customers, more involved and engaged in the electricity market in different ways, to promote the installation of PV systems and co-creation of ECs. Better social empowerment and cost reduction of RES technologies, leed to an increasing number of citizens installed RES production units in their homes.
Technological factors	**Barriers:** The electricity demand in Spain has increased in the last few years and the maximum demand is in winter[20]. The RESs have a more significant share and penetration in the grid and energy systems The need for new standards for the integration between SW and HW modules and lack of skills and specific training sessions for integrators. Complexity of IT services and difficulty in data integration, analysis and interpretation. **Enablers:** The cost of HW and cloud computing is decreasing and increased presence of smart meters and building digitalisation. Already since 2008, there has been a low demand of the wind farms that have been disconnected on several occasions at night-time. The Spanish TSO has also communicated the need to maximise the existing pumped storage as a new way to accommodate wind electricity production. A strategy to renovate control centers by integrating new technologies for better control and monitoring of energy assets. **Technological factors impact:** Spain has a strong potential to co-build VPPs and ECs because of the smart meters covering almost the whole country that will allow to design and improve the flexibility of the grid and be able to cluster the users profiles. Multiple measures are fostered to give access openly and freely to meaningful information for communities and SMEs.
Legal factors	**Barriers**: Lack of clear legal framework for energy storage systems. The presence of only one consolidated TSO (Red Eléctrica Española) and 3 DSOs that have the monopoly of the field. Aggregation is not legal in the Spanish electricity system and the demand-side resources are not allowed (they cannot provide upward/down regulation by deviating from their committed consumption schedule) to participate in the electricity market.

[20] D6.1: Detailed PESTEL and PORTER analysis of the CHEST system 99" CHESTER project

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	The rest of the balancing and ancillary services can only be accessed by generation, affecting the flexibility of the current Spanish electricity market. **Enablers**: The consideration of the EU legislation about ECs creation and definition in 2016 (Directive of the European Parliament COM (2016) 864). This price can be chosen by consumers with less than 10 kW of contracted power, and it is a way to protect the consumers from the freemarket companies that take advantage of technical unawareness of consumers. **Legal impact:** The existence of some legislation will help the introduction of VPP and the creation of ECs easier and more available in the whole Spain.
Environmental factors	**Barriers:** The main GHGs emission activities are transport (26 %) and electricity generation (21 %). Use of heavy non-green sources in energy generation (e.g. coal) which emit for example an intensity of carbon 235g despite the renewable share is about 40%[21]. **Enablers:** High average hourly irradiation sources potential compared to other European countries In Spain most of the projects are developed from a local initiative, with an important role of citizens committed to preserving the environment and the local social movement. EU strategies for the environment and educational campaigns to increase awareness about environment-energy consumption connection **Impact of the environment:** The sensibility of the public and government about the environment issues will help the society to accept VPPs and ECs concepts to be adopted in Spain and reduce carbon footprint.

*Table 3 : **PESTLE Analysis & benchmarking in Turkey***

Factors	**Description (Turkey)**
Political	**Barriers**: Fossil fuel lobbying Policy of town council and government (e.g. only price of the chosen fuel considered)

[21] https://app.electricitymaps.com/map

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	Administrative fences for market access and bureaucracy Lack of political support from governmental and local representatives. Lack of policy support for small-scale energy production Energy policy and regulation can not provide enough answers to the disruptive concepts VPPs and Energy Communities; **Enablers:** Turkish government fosters the adoption of EU directives and standards and participate in EU initiative (e.g. Green Deal) According to Directive 2009/28/ EC, Turkey aims to establish strategies to promote the development of renewable energy that will help easily facilitate the implementation of VPPs with the Turkish government. Voluntary agreements were implemented to motivate companies to reduce energy intensity **Political impact:** The Turkish policies will affect VPP in a positive way and will make it easy for the implementation of VPP4I Factory
Economic	**Barriers:** The Spanish GDP represents about €3,2 trillion (nominal, 2022) ranked 11th in the world with an increase compared to 2021. That leads to decreased unemployment. The renewable energy sector contributed to GDP however it is still insufficient to respond to all energy needs. The selling price of the electricity in Turkey is still not profitable for small communities (low tariff). Problems in accessing to national grants and investment Inflation and fluctuation of Turkish livre, which makes the economy slows down **Enablers:** The objectives of the Turkish government's policy of increasing the domestic share of energy production are to increase its security of supply, as well as to boost the economy. Attracting investments by providing a foreseeable energy and natural resources market and therefore, enhancing energy and natural resources sectors. Turkey has introduced a number of taxation measures aimed at supporting its energy objectives, for example: For power, the 1% electricity consumption tax applies to industry and transport users, According to the Eurostat report, the Turkish energy prices and taxes are low compared to other European countries which reduce the risk for ECs.

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	Redetermination of feed-in-tariff amount according to type and capacity of renewable energy source, Turkey has already made significant progress on liberalizing energy markets in the last decade, to mobilize investments needed by this sector. Improved predictability and transparency in pricing in energy markets **Impacts of economic factors:** Many initiatives taken by the Turkish government to improve the competitiveness of small entities will de-risk the installation of VPPs. Incentives are necessary to motivate consumers and prosumers to participate in energy activities.
Sociological	**Barriers:** Lack of political support from local representatives Energy transition difficult to accept for the traditional energy companies Absence of knowledge about the local energy resources and various support forms Insufficiency of framework for community engagement, leads to acceptance issues No experience/tradition of cooperatives with RES power **Enablers:** One of the biggest enablers of Turkey is its demographic profile. More than half of the population is under 30 years. Adoption of cybersecurity techniques for trustful share and management of information Promotion of e-learning and online training courses for an easier access to digitalise information. Involvement of organization (e.g. TROYA) and cooperatives in the RESCOOP.eu Existing of Energy communities and cooperative models in Turkey **Social impact:** Many initiatives have been taken by the Turkish government to improve the RES acceptance and empowerment of citizens, which will accelerate the wide co-creation of ECs.
Technological	**Barriers** Technology changing at a fast rate Lack of confidence in technology vendors (longevity) Currently, there are 42.5 million meters in Turkey which still low compared to other European countries Due to lacking grid capacities, growing renewable power generation and lacking flexibility of conventional power plants, the volume of redispatch is still too high. **Enablers**: According to the roadmap presentation[22], the distribution sector expects 50 million

[22] Turkey sets roadmap to smart grids, plan worth over EUR 4 billion (balkangreenenergynews.com)
(11)https://transparencia.gob.es/transparencia/dam/jcr:eaa4dcf1-c1e6-48be-a43e-965d16a19983/4thPlan_OpenGov_Spain_EN.pdf

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	subscribers by 2035, or 80 percent of which will be able to access smart technology infrastructure. Turkey is in the process of restructuring its transmission network infrastructure to make it ready for large scale renewable energy production. The renewable energy integration project will help to meet Turkey's growing demand for electricity by strengthening the transmission system to facilitate large-scale renewable energy production. In the buildings sector, the government focused on expanding the use of renewable energy and promoting central and district heating/cooling systems. Turkey increases the participation in international initiatives related to energy technologies as a means to accelerate results and maximize the impact of domestic efforts. At the European level, Turkey is an associate country in Horizon programmes and participates as well in the Strategy Energy Technology Plan, the technology pillar of the EU's energy. **Technological impacts on VPP4ISLANDS in Turkey** At this stage, the co-creation of VPPs and ECs could be applied in areas and sectors that are equipped with smart meters as VPPs provide flexibility services that require consumption data. As the number of subscribers increases over the time, the needs of VPPs services will be higher and is expected to become a new investment trend. VPP will facilitate the extension of Grid networks.

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Legal factors	**Barriers:** Too much bureaucracy, and complicated laws Current legislation and forms of support are too diverse and complex Consumers are not included enough to the markets, and the legislation are not dynamic Lack of supportive local authorities and/or local energy agencies. Lack of legislations for flexibility and ancillary services **Enablers**: In 2019, the Turkish government also approved a new framework for self-consumption and remuneration of excess generation at retail rates for residential, commercial and industrial applications (net metering) under the Principles and Procedures for Rooftop Solar Power Projects. Main turkish legislation and priorities intends to: 1) Providing accessible energy to consumers by improving cost, service time and provided energy amount. 2) Induction of public and private sector resources by strengthening the free market. Existing of laws for the development of a national hydro-strategy for the Turkish energy market Unlicensed (<1 MW) energy productions need a forecasting service (weather, price and production) **Legal impact:** These enablers open doors for VPP to be comfortable with the law and government and to get first support to implement VPP4Ifacrtory in the Turkish market.

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Environnement	**Barriers**: Low environmental consciousness of people Lack of awareness of CO_2 influence of burning wood The energy sector is the main source of greenhouse gas emissions by Turkey and contributes to climate change in Turkey, which is in turn affecting the economy by increasing droughts. Despite the growth in renewable energy penetration, the Turkish government focuses its efforts to ensure energy dependency and to expand domestic oil and gas exploration and production which increases the CO2 footprint. The electricity map shows about **356g of carbon intensity** even with these numbers Turkey trying to move further to build a green environment[23] Most institutions in Turkey encourage all fields of activity including resource efficiency, cleaner production, climate change, air quality monitoring, waste management and wastewater treatment applications. **Enablers**: High solar irradiation and wind source potential which increase the profitability of RES investment Turkey has set a goal that goes beyond the required reduction as a developing country, announcing to the world its goal of being carbon neutral by 2053. The country has great potential at this point. It has achieved a threefold growth in its renewable energy installed power alone in the last 20 years while more than half of its total installed power, 53% proportionally, consists of renewable resources. Largest installed capacity in the world. It ranks second in Europe and ninth globally in hydroelectric power plants (HPPs)[24] The Turkish GOV takes measures to reduce carbon emissions and ensure energy efficiency and the expansion of forests. **Impact of the environment factors:** At this stage, the co-creation of VPPs and ECs will be encouraged in Turkey especially at the big cities like (İstanbul, İzmir, Çanakkale, Didim, and other islands.) because the level of awareness is high in the society. ECs will contribute to the reduction of CO2 footprint.

[23] https://app.electricitymaps.com/zone/TR

[24] https://www.dailysabah.com/opinion/op-ed/turkey-takes-fight-against-climate-change-one-step-further

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4.4. Business model Canvas:

❖ Introduction of model Canvas:

The Business Model Canvas[25] is a visual representation to detail the different elements of how a business works. It illustrates the products and services provided, for and with whom, the resources it needs to reach the goals and the revenue streams and the costs of the business. It can be used for VPP4Ifactory to design new models or to analyze current models. The canvas is made up of nine different elements[26] described below. This canvas describes what each of them introduces the business of VPP4I Factory, and how that will increase its sustainability in the market. In this direction, some questions can be used such as 'what would happen to costs or revenue income if we introduce new partners or offers?' This allows you to weigh up effects and risks. It can also stimulate new opportunities and ideas. 'What if...?' can be asked when defining the business models.

Key partners: "What are your key partners to get a competitive advantage"? Needed partners to develop the solutions and go-to-market in a competitive way.
Key activities: "What are the most important strategic things you must do to make the business model work"? Here, the activities to be carried out to provide the products/services.
Key resources: "What resources are needed to make your idea work? If you don't already have these resources, what steps can be taken to obtain them"? This question can be utilized to better understand the key resources.
Value Proposition: "What is your unique value proposition? What do you bring to your customer's lives that weren't present before? How do you make their life/job easier"? It defines features and values that give customers a reason to use the product/service over another.
Customer relationships: "How will you manage interactions with your current and potential customers? How will you get your value proposition across to them"? The means that will build and maintain customer relationships for a successful business plan.
Channels: "How are you going to reach your customers? What channels of communication will you utilize"? The various ways will be utilized to reach your customers.
Customer segments: "Who is your business targeting? Define the ideal customer personas your value proposition is intended to benefit, who are your customers"? It intends to highlight the specific clients and end-users targeted by each business.
Cost structure: "What are you planning to spend on marketing and product development? Are you planning to charge for your product/service"? The fixed and variable costs needed to operate the financials of the business plan.
Revenue streams: Where does the money come from? What strategy will you use to capture the most value from your customers? The revenue streams, and profits where money comes from.

❖ Business model canvas for VPP4Islands:

Based on the large networks of industrial companies, energy utilities and operators, an inventory of stakeholders was defined, in which we specify their needs, expectations, pains, trends and regulatory contexts to recommend actions for the business implementation. RDIUP will assess the replication and prepare a sustainable strategy to scale up. VPP4ISLANDS has a start-up idea detailed in the next section. VPP4ISLANDS will define and implement a tailored strategy to maximize exploitation of

[25] https://www.culturehive.co.uk/wp-content/uploads/2016/01/Introducing-the-Business-Model-Canvas.pdf
[26] https://frescopad.com/business-model-canvas-definition/#:~:text=A%20business%20model%20canvas%20is%20an%20organizational%20tool%20that%20helps,take%20a%20business%20to%20market

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scientific and technological outcomes. Using a business model canvas (see canvas below) is one of the best ways to create a comprehensive business plan.

<table>
<tr><td rowspan="2">Key partners</td><td>Key activities</td><td rowspan="2">Value propositions</td><td>Customer relationship</td><td rowspan="2">Customer segments</td></tr>
<tr><td>Key resources</td><td>Channels</td></tr>
<tr><td colspan="2">Cost structure</td><td colspan="3">Revenue Streams</td></tr>
</table>

A first survey for business canvas was defined by RDIUP for better understanding their vision of work and highlighting all key strategic factors and the implication of key partners in the business. This is why we did a survey for more details.

Here the business model survey link (see Fig. 3):
https://docs.google.com/forms/d/e/1FAIpQLSdiZCJLrP8EPmXi8IFKWnws8Ju8pK2jYcGvQ9WEwI1vKdv67Q/viewform.

- ✓ What partners do you need to achieve your objectives and provide your products/services?
- ✓ Which central activities must our project provide, so that the business works?
- ✓ What resources are essential for your product, service, business' success?
- ✓ What value, product or service will you offer for every kind of customer or user ?
- ✓ What are your target segments of customers ?
- ✓ What steps or tools do you need or use to achieve long-lasting customer loyalty?
- ✓ How can your product/service/tool generate revenues ?
- ✓ What are the main required costs for your product/services ?

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Through which Channels do your Customer Segments want to be reached?

Figure 3: The questions of the survey

The tables and subsection below present the different answers that allowed VPP4ISLANDS to define the first business model canvases.

1- What partners do you need to achieve your objectives and provide your products/services?

AMU	**ALWA**	**SCHN**	**BC 2050**
DSOs	Partners who develops innovative optimized management processes for assets included in VPP	Universities	Blockchain technologies require the access to existing networks providing such service's for a fee (named "gass" in the blockchain terminology).
REGE	**CU**	**CIVI**	**INAVITAS**
Research centers	Demo islands, academia, Balancing Service Provider (BSP) and technological providers	As an ESCo, CIVI mainly needs the financial support of financial institutions and/or funds for implementing energy efficiency operations	IOT Platform provider
IDEA	**RDIUP**	**FTK**	**CSIC**
Public administrations, energy transport and management companies	For SPT, university and investors are needed	Technological providers and industry users	In particular, partners providing data or forecast
TROYA	**Brunel**	**Islands: UEDAS, FORM, BOEF, BOZI and GRADO**	
TROYA is a non-profit association, do not provide products or services.	Technological providers	Technological providers, integrators	

2-Which central activities must our project provide, so that the business works?

AMU	**ALWA**	**SCHN**	**BC 2050**

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Forecasting/ optimal scheduling and optimal planning/ flexibility	Visualization of metrics, data exchange between modules	Possibility to test and integrate with real installations and other components of the overall solution.	Secured gathering of energy production related information and proper management of smart contracts, following the GDBR guidelines
REGE	**CU**	**CIVI**	**INAVITAS**
Mainly development of price forecasting, energy and CO2 savings	Integrating the works across different WPs is crucial to the successful delivery of the VPP4Island solutions.	Support for the business model. Collection of data, implementation of high qualified energy performances audit, monitoring and control tools for verifying and certifying the energy savings goals,	Energy consumption forecasting
IDEA	**RDIUP**	**FTK**	**CISC**
Simulate the electrical grid of an island. Modeling regarding a power generator or consumers.	Doing marketing activities, improving the SPT APP, enhancing quality of our services, Collecting feedback	Provide personnel resources and enough flexibility to allow for the development of a pre-sales prototype	Within the project, we rely on all activities related to having data on power grid structure and on consumption readily available
TROYA	**Brunel**	**Demos**	
N/A	Energy assets modelling	Training and testing Assessment and improvement Data collection Validation	

Moreover, VPP4ISLANDS will ensure a proper development and correct operation of the Virtual Power Plant. In order to carry it out, the integration of all energy services in a coordinated manner is mainly required. In addition, external factors will have to be taken into account: legislative, political, social (acceptance)... Concerning the business model, it will be necessary to be economically viable and incentivised by the public bodies, and for there to be a social conscience that seeks the global decarbonisation of the electricity market.

3-What resources are essential for your product, service, and business success?

AMU	**ALWA**	**SCHN**	**BC 2050**

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Historical data, and streaming data from the renewable energy production sites	Cloud resources	It is essential to have good coordination between the different partners in order to achieve an effective integration between the different components.	A proper setup of communication channels between devices and involved actors in a Command & Control Center equipped with a complete set of operations and security workflows
REGE	**CU**	**CIVI**	**INAVITAS**
A data-base as complete as possible and a correct integration of all forecasting engines.	We mainly rely on researchers' time as well as computers to carry out this work.	Experts in business models, experts in energy management	Cloud service
IDEA	**RDIUP**	**FTK**	**CISC**
The project requires (besides grid data entered by users) electricity prices, weather forecasts and data of such nature. Public, free and easy to access APIs exist for all of them.	Databases, financing, humans resources, equipment (clouds, servers, PCs, transportation), offices, pool of expert	For the SAPL tools to succeed, at least one industry partner should move the usage of the tools to production after the project finishes in order to provide a reference customer for the technology.	For the models developed, it is essential to have data on the power grid structure and on consumption.
TROYA	**Brunel**	**Demos**	
N/A	Databases and fundings	Increased electricity production must be balanced by coupling the electricity system with the district heating system for BOEF (P2X can be part of this)	

4-What value, product or service will you offer for every kind of customer or user ?

AMU	**ALWA**	**SCHN**	**BC 2050**

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For prosumers and energy communities, a forecasting tool for their production, for aggregators, an optimization tool to manage their assets.	Balancing Service Provider (BSP)	A Remote Terminal Unit with enhanced capabilities, for the monitoring and control of electric grid infrastructure.	Blockchain technologies to assure GDPR compliance, data security and transparency with limited operational costs.
REGE	**CU**	**CIVI**	**INAVITAS**
The engine forecasting tool is a useful tool for all types of users (industry, residential, a geographic area...).	VESS engine to mitigate the forecasting error of renewable generation in the REC, support the energy community management and the maximization of its self-consumption. Additionally, VESS to provides frequency response services to power system operators	Financial support and monitoring of the energy performance during the contracting life	Consumption forecasting
IDEA	**RDIUP**	**FTK**	**CISC**
Services to offer could be special ad-hoc models for power generator and consumer nodes as well as special configuration of the electrical grid.	Increase the use of RES accelerate the decarbonisation of existing grids, improved energy-linked practices, optimize energy systems sizes, improve decision making process and generate clean transition planning	Tools, services, and consultation for developing and running custom software products using dynamic authorization following the Attribute Stream-Based Access Control (ASBAC) pattern	Within this project, we are developing the program for the digital twin of the power grid in islands. Beyond the project, CSIC is a research institution.
TROYA	**Brunel**	**DEMOS**	
N/A	Through the DSS, save energy and money, increase the awareness of climate changes, monitor energy transition actions,	Essentially flexibility in the energy system	

5-What are your target segments of customers ?

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AMU	ALWA	SCHN	BC 2050
Aggregators\DSO\ Energy communities	Balancing Service Provider (BSP), aggregator, also Energy Community	Electric utilities, system integrators	All
REGE	**CU**	**CIVI**	**INAVITAS**
Public and private customers	Energy communities, flexibility aggregators.	Public Authorities, Asset Managers, Industries, Enterprises	Utilities, energy communities
IDEA	**RDIUP**	**FTK**	**CISC**
Public administrations, energy operators, energy transport companies, etc.	Grid, municipalities, DSO ECs, Islands	IT Service Providers, System Developers, individual developers, SMEs and large enterprises with in-house development.	Companies, institutions, administrations that need modeling and data analysis to make informed decisions.
TROYA	**Brunel**	**Demos**	
N/A	DSOs / ECs	DSO's, TSO's, owners of PV-parks and Wind Turbines	

6-What steps or tools do you need or use to achieve long-lasting customer loyalty?

AMU	ALWA	SCHN	BC 2050
Granting an evaluation period free of charge.	Considering the application domain, continuous compliance with technical and legislative constraints, ease of use, integrability/scalability	Good quality of service and support.	Community build, including customers. Step by step engagement of key roles/stakeholders building relations on common trust. KYC techniques, as already required by EU 843/18 directives
REGE	**CU**	**CIVI**	**INAVITAS**

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Offer a direct, real-time service that is economically viable and of high quality.	Several Key Performance Indicators (KPIs) will be used to evaluate the quality of services provided by the VESS to ensure a lifelong customer Loyalty.	Public private Partnerships, Energy Performance Contracting	Awareness about the benefits of consumption forecasting
IDEA	**RDIUP**	**FTK**	**CISC**
Simulated results must be accurate enough to justify the investment.	updating, technology support, customer mailings, maintaining the relationship...	The basic SAPL engine is the background IP of FTK and its stakeholders.	**N/A**
TROYA	**Brunel**	**Demos**	
N/A	**W**ebsites and platforms	Tools that can generate low heat-prices (enabling use of peak electricity production for district heating)	

7-Through which Channels do your Customer Segments want to be reached?

AMU	**ALWA**	**SCHN**	**BC 2050**
RDIUP\SATT	Usually B2B channels	Through local sales offices in their countries.	Mainly social media and local energy coops
REGE	**CU**	**CIVI**	**INAVITAS**
Through companies in the energy sector, mainly the actors involved in the electricity market: generators, TSOs, DSOs, aggregators, ESCOs, etc. Public bodies can also play an important role in	Social media and other communication channels, such as public workshops and exhibitions will be set and used to spread information regarding the energy community and the role of the VESS within it to	Through our banking/funds network	Through direct communication

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making the project visible.	household and distributed renewable energy resources providers. Ancillary service market platforms will be used to procure flexibility services provided by the VESS.		
IDEA	**RDIUP**	**FTK**	**CISC**
Direct approach would be the best case in our opinion, based on a strong marketing campaign via specialized media and SN	phone, platform, social media, representatives, through our networks	Engagement with developer communities through conference attendance, talks, and social media.	**N/A**
TROYA	**Brunel**	**Demos**	
N/A	Public training and webinars	District heating customers can be reached by local radio, local television and local press	

8-How can your product/service/tool generate revenues ?

AMU	**ALWA**	**SCHN**	**BC 2050**
commission of the savings made	SaaS model	By providing accurate information about the grid elements so the grid could be properly operated.	The tools BC2050 are the base for future expansion of the system to "tokenize" the produced energy by its technology (green electricity, green hydrogen etc). Then such tokenization can be "monetized" in order to create revenues both to the producers, the service provider and the consumers/customers
REGE	**CU**	**CIVI**	**INAVITAS**

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Savings in electricity consumption, incentives for production and consumption of energy from renewable sources. Benefits can also be achieved through the operation of energy services, e.g. through EPC (Energy performance contracting).	The flexibility provided by the VESS will reduce the curtailment of renewable generation within the energy community. Additionally, if the VESS participated in ancillary services markets, revenues will be generated due to higher penetration of renewable generation.	Mainly Energy Performance Contracting which includes our revenues Subscription based fee	Subscription based fee
IDEA	**RDIUP**	**FTK**	**CISC**
Being able to simulate different scenarios will save unnecessary changes in design and erection. Not only that but it can achieve a better demand prediction maximizing green renewable energy sources use.	**S**ell the licenses, doing subcontract for audit, paid as you save (commission), training sessions	Consultation services, product licenses, SAAS offerings.	**N/A**
TROYA	**Brunel**	**Demos**	
N/A	Licensing	District heating in DK is non-profit, and revenue is lower prices and managing the island energy system optimally	

9-What are the main required costs for your product/services ?

AMU	**ALWA**	**SCHN**	**BC 2050**
cost of deployment on server	Infrastructure (cloud deployment), maintenance/upgrade/ update (e.g. legislative constraints)	Development costs for the remote terminal units design. Later on, manufacturing costs need to be taken into account.	Being able to simulate different scenarios will save unnecessary changes in design and erection. Not only that but it can achieve a better demand prediction maximizing green renewable energy sources use.
REGE	**CU**	**CIVI**	**INAVITAS**

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The costs for the development of the forecasting tool are essentially personnel costs.	The capital costs related to VESS components and the required communications systems are the main costs associated with the VESS.	Personnel cost, software purchase	Data costs, communication costs, server costs
IDEA	**RDIUP**	**FTK**	**CISC**
Cloud infrastructure, licensing and maintenance fees	Fixed costs(electricity, office, assurances...),variable costs(employees, clouds, transportation, travels)	Personnel costs for development.	Qualified personnel
TROYA	**Brunel**	**Islands demos**	
N/A	Personnel costs and cloud resources costs	Costs for digitalisation, forecasting and advanced control systems	

At this preliminary study, D8.5 will be updated by CIVI at M36, we defined three main business model as follows:

- **Canvas Aggregation of the Grid flexibility (see Fig. 4):**

The renewable energy transition is still a challenging goal in European countries. However, in the rapidly changing society, it creates a new vision and a new opportunity that could respond to so many crisis needs (climate change, Covid-19, war in Ukraine….). This is at the heart of VPP4ISLANDS concepts and business by promoting better ways of consuming and distributing clean energies. A VPP, as a service connecting various and multiple energy assets to act together, has to be adaptable to very market conditions and scalable to respond to the demand growth.

To react more efficiently to fluctuations and thus to orchestrate between them before they cause instability in the system, a VPP4INode not only networks renewables to improve forecasting but also to provide ancillary and flexibility services to the grid operator. After receiving a signal to ramp up or down power generation from the grid operator, the VPP4INode (optimization engine) splits up that signal to varies of individual signals for the individual dispatchable renewable power plants, taking into account their restrictions on response time, capability and network constraints. It then automatically sends the ramping signal to the involved VPP4IBoxes units and ramps them up or down to support the grid frequency through the VESS and to absorb the fluctuations caused mostly by PV and wind. Since short-term reserves (STR), to balance between supply and demand, are extremely important to run the electricity system and to provide the security of supply, they have a significant revenue stream. Tapping into that potential by providing short-term reserves to the grid operator is an excellent business case for aggregators, especially because they don't need to invest in the physical buildup of flexible power generation (e.g. gas-fired power plants or pumped hydro storage) but merely in the networking of existing smaller-scale fast-on demand generators or flexible units. Traditionally, the VPP operator splits

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the revenues from successful capacity tenders and actual deliveries of ancillary services with the operators of the dispatchable RES units that are involved in the VPP4INode.

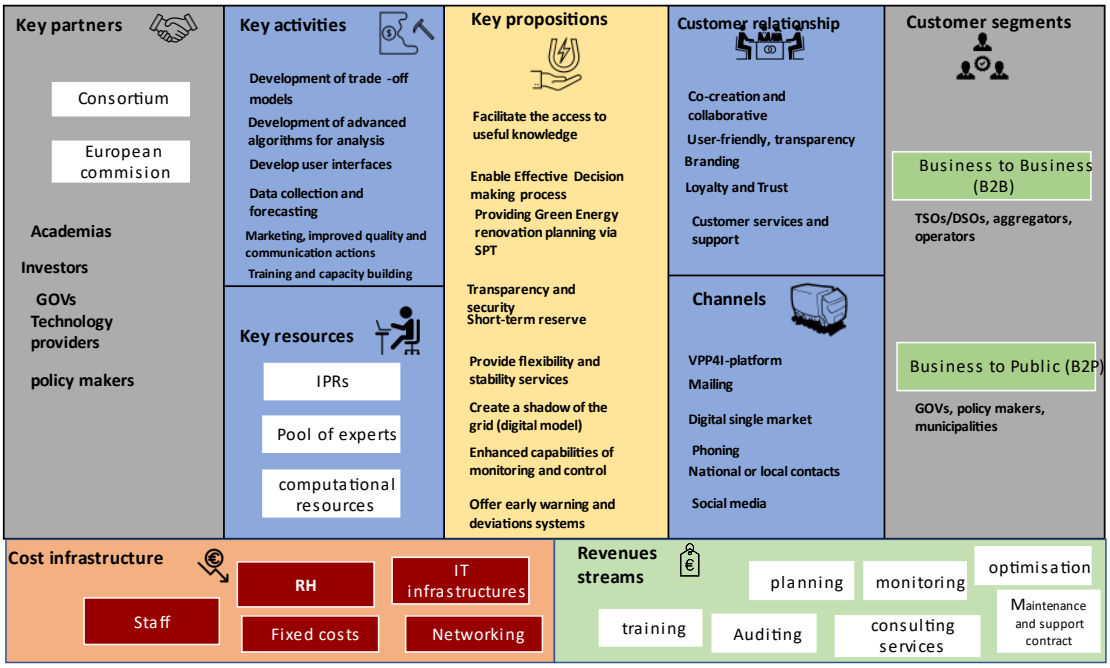

Figure 4: Canvas Aggregation of the Grid flexibility

Table 4: The linked stakeholders

Key stakeholders	Roles	Expectations
DSOs/TSOs, Aggregators	Run or operate the VPP4INode by himself to harvest the flexibility from distributed energy resources.	Flexibility from dispatchable renewables
DERs' operators	Flexibility and balancing provision	Generate more benefits from the VPP

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Retailers	Trade energy and services	Accurate forecasting tools
Policy makers	Recommend new guidelines and policies	Access to meaningful information and validation process

Business Canvas for energy self-sufficient community (Uberisation of energy assets see Fig. 5):

As previously mentioned, the grid stabilization can be a major issue, even at large scale. Instabilities are even more likely to appear at a smaller scale, such islands, and have greater impacts on the energy communities. Also, many islands are not connected to the mainland grid and they need standalone solutions for residential buildings. Therefore, the uberisation of DERs can be an appropriate solution for energy communities to deliver local, stable and independent energy sources and ensure self-sufficiency. However, they need digital solutions to operate their communities in a transparent way and better manage the use of clean energy sources. In this direction, VPP4Islands will provide VPP4IBoxes and VPP4INode to reach these goals and ensure the satisfaction of the electricity and will give these communities control of their own energy assets. The business canvas defines this business case provides the main values and the segmentation of customers.

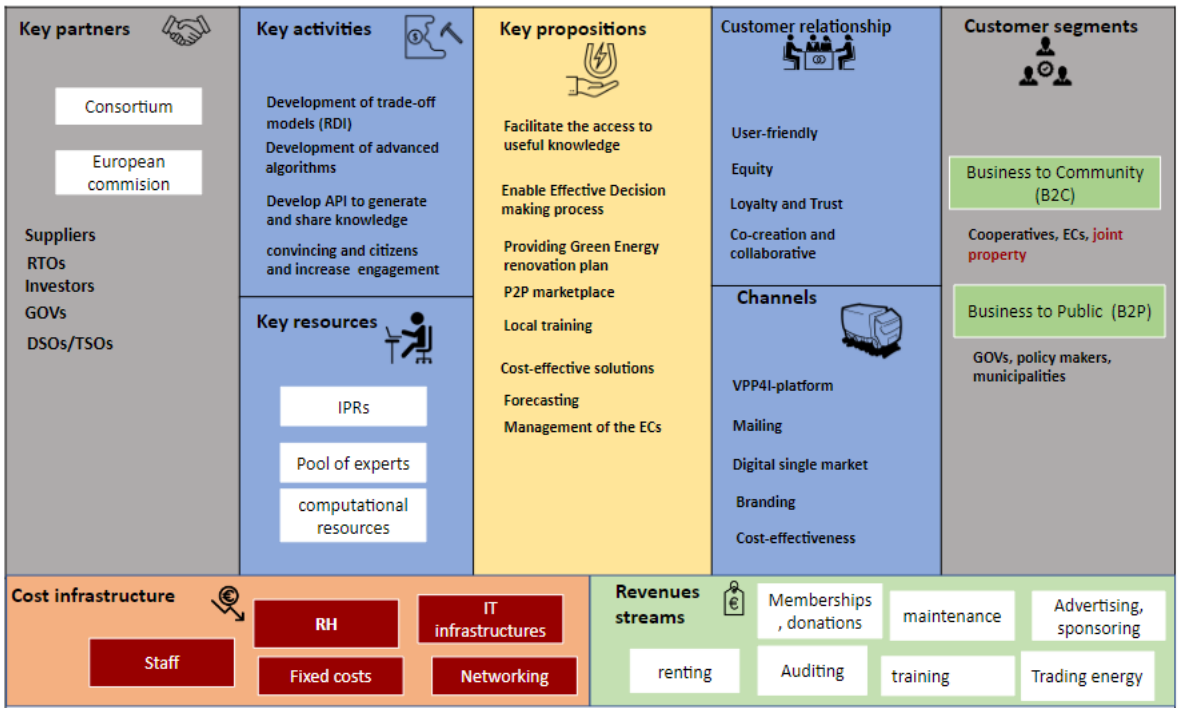

Figure 5 : Canvas energy self-sufficient community

Table 5: The linked stakeholders

Stakeholders	Role	Expectations
ECs	Produce and store energy, local energy trading	Self-consumption and independence
Independant aggragator	Aggregate RESs and assets	Accurate forecasting and balancing tools
Prosumers	Produce energy and flexibility	Generate benefits and clean energy

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❖ **Canvas Smart Planning Tool (see Fig. 6):**

The smart planning tool (SPT) is a tailored sustainable plan generator that includes the different actions and size of energy system components before implementing the VPP or improve exiting energy portfolios. Also, the SPT can be integrated and used to plan decarbonization actions and accelerate the clean energy transition in Islands or other municipalities. The SPT has various high-level functionalities and module such as the Decision Support System to provide size optimizations and cost/CO2 reduction. This tool can be used to offer a unique business case to prepare and initiate the co-creation of VPPs in efficient and cost-effective way (as illustrated in the business canvas below).

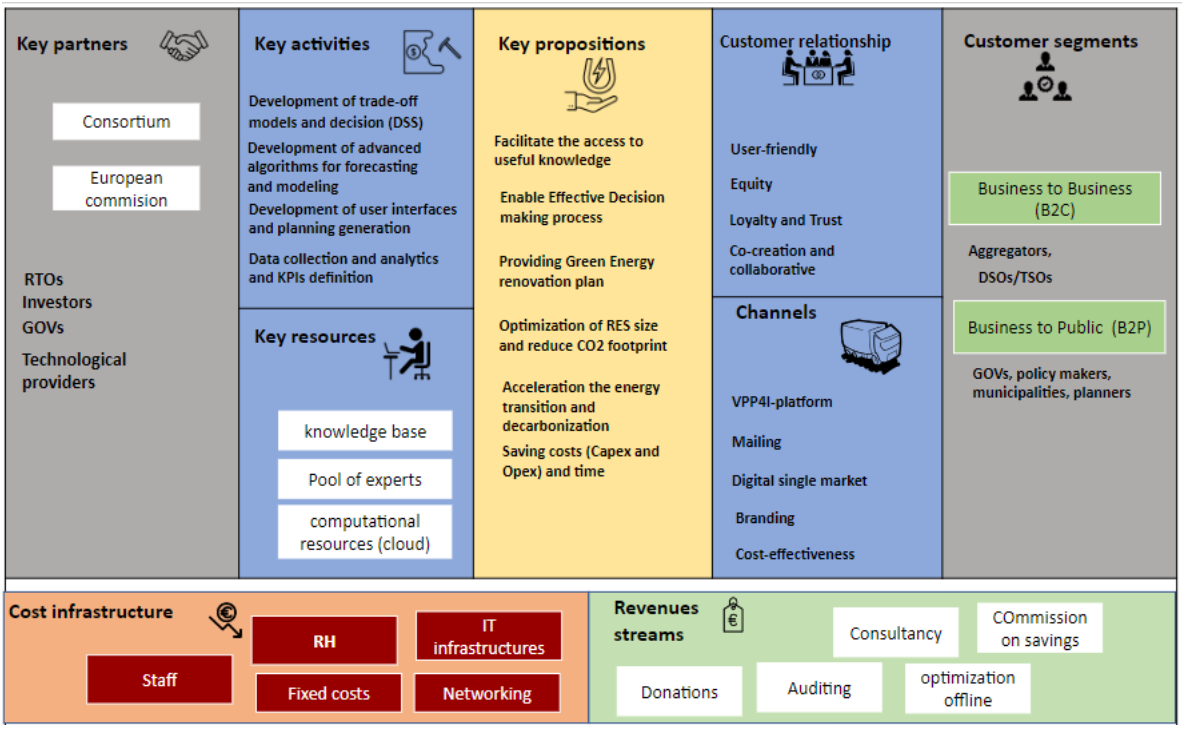

Figure 6: Canvas Smart Planning tool

Table 6: The key stakeholders

Stakeholders	Role	Expectations
Planners	Planning energy transition	Ease of use and explanation
Policy makers	Recommend new policies	Meaningful information and affordability
Grids	Reduce CO2 and increase RES share	Trade-offs and user-friendly tool

4.5. Value propositions:

The Value Proposition Canvas promotes transparency and affordability, enabling the understanding of added values of each business case while considering mainly the clients or users' needs. Also, it helps VPP4ISLANDS and involved teams systematically create solutions that fit the real requirements of its customers.

The Value Proposition Canvas focuses on customers' pains and expectations and providing the position statement of delivered products or services that address their needs. To represent these aspects and understand why customers will buy our solutions, we used six key blocks to explain the value proposition **(Jobs, Pains, Gains, Products and service, Pain relievers, Gain creators).**

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VPP4ISLANDS will consider all these parts to define business plans for the energy communities, grid flexibility and SPT. These canvases will permit to structure information about the satisfaction of end-users and how to improve the services provided.

- **Value proposition of energy self-sufficient Community:**

RDIUP studied the expectations and the needs of energy communities through interviews mainly with TROYA in order to build a linked value proposition canvas. As illustrated in the Figure 7, it allows to explain the benefits of the services provided to the energy community. The main pains are the trust, lack transparency and costly solutions and the major expectations of prosumers/consumers are fair share of benefits and access to needed information.

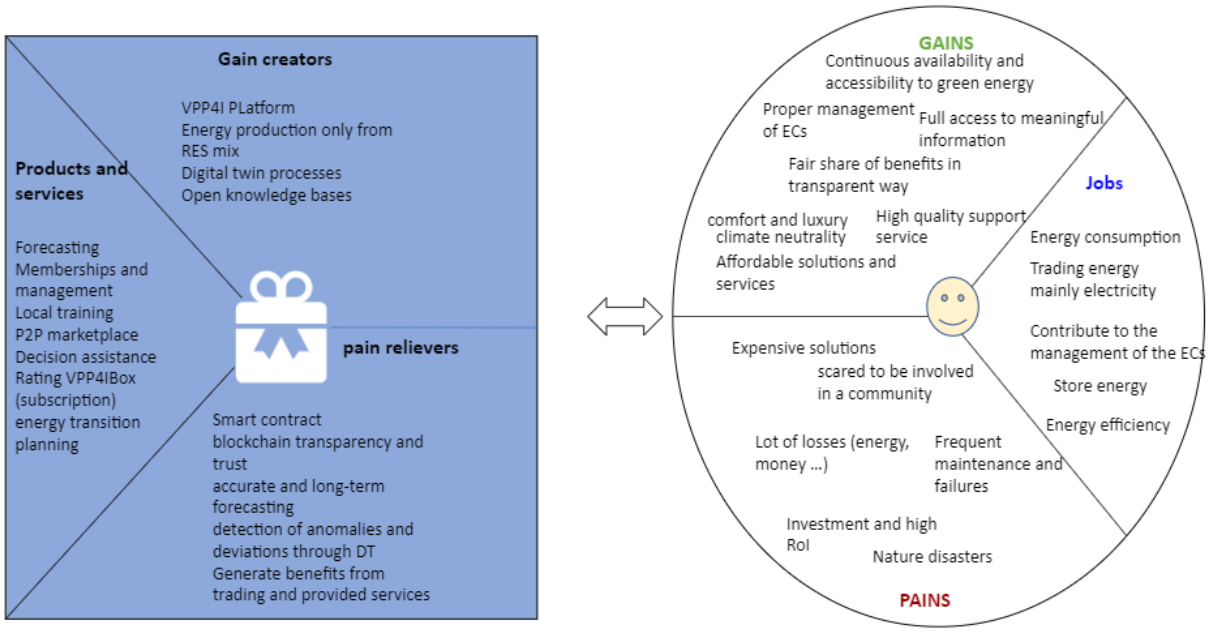

Figure 7: Value proposition of the self-sufficient Energy community

- **Value proposition aggregation of the grid flexibility:**

Regarding the grid flexibility, the Value Proposition Canvas (see Figure 8) helps VPP4Islands to define the business strategy for the grid flexibility case by providing the appropriate services for a maximum satisfaction, especially for the energy assets aggregators. Therefore, the figure below will showcase the identified values based on a review and analysis of the benefits, costs, and services that VPP4ISLANDS can deliver to the grids to enhance the flexibility provision.

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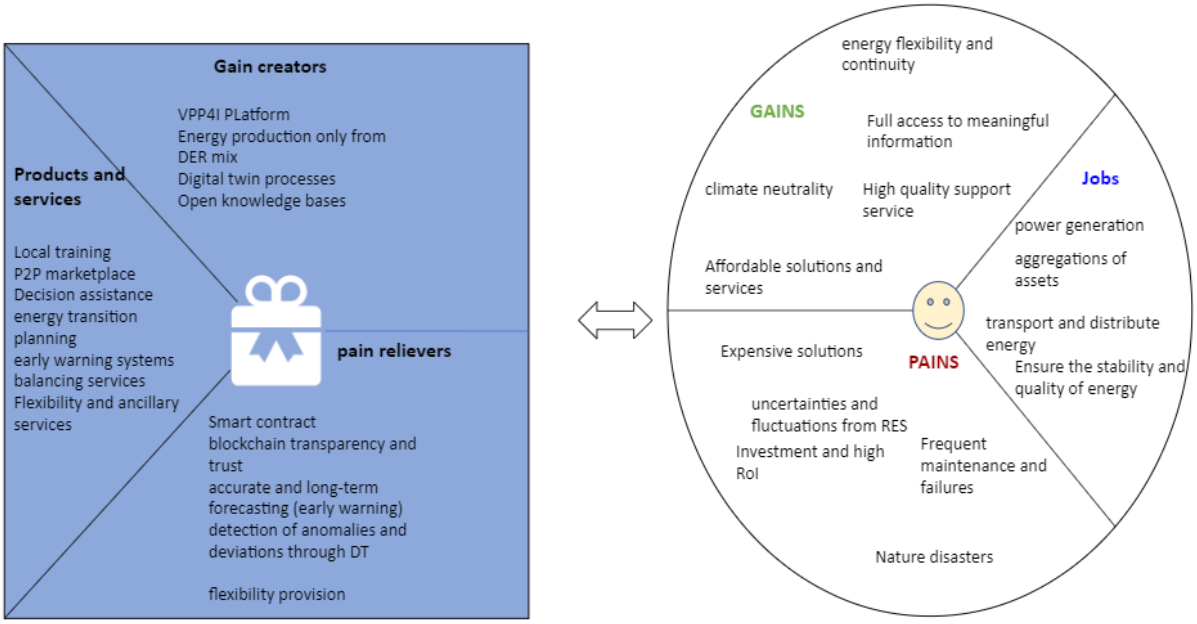

Figure 8: The value proposition of the grid flexibility

❖ Value proposition of the smart planning tool:

Value proposition Canvas (see Fig. 9) will propose a better way of commercialization of the smart planning tool, identify the main related problems and what the proper mitigators to solve these pains. In order to craft a strong value proposition, VPP4ISLANDS conducted market study and PESTEL analysis to determine which services and functionalities will be offered to assist planners in an efficient energy transition in the Islands.

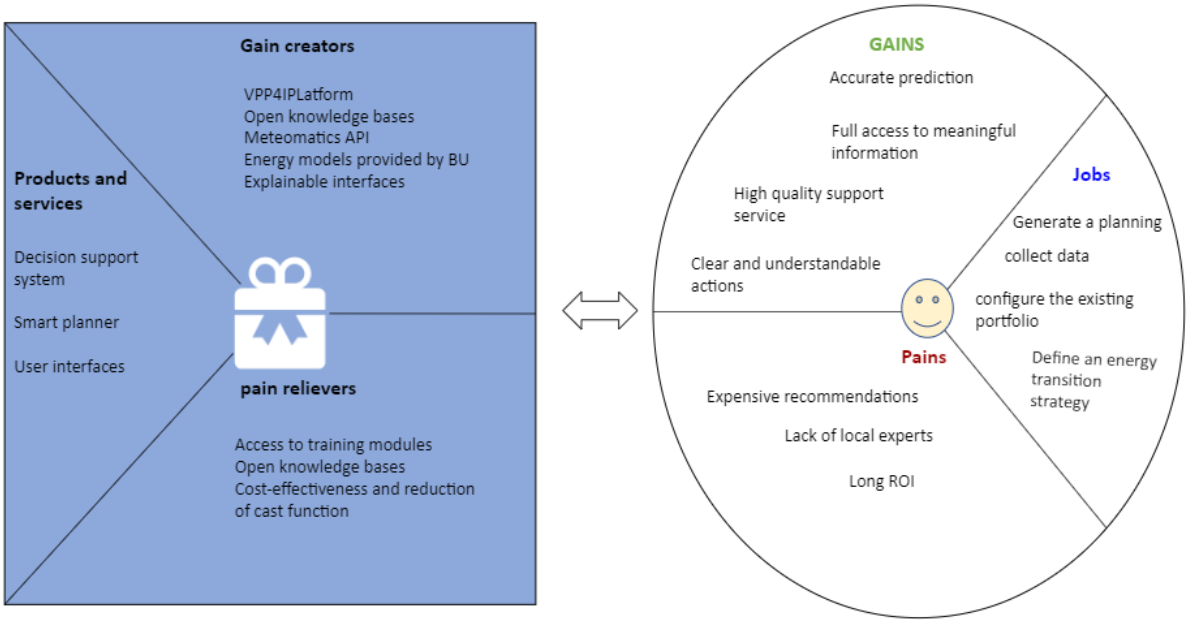

Figure 9: The value proposition of the SPT

5. business plan of the VPP4I Factory (spin-off)

This subsection presents a first estimation of the revenues that can be generated by the different business cases defined in the previous sections. These estimations will be enhanced over the progress of project

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development. The expected VPP4I Factory startup will lead the commercialization and the marketing of these solutions. In this business plan, RDIUP provided preliminary assumptions and 5 years estimations of revenue streams and costs to obtain a first evaluation of VPP4I Factory potential and how can VPP4ISLANDS improve and optimize the cash flow by the end of this project. Two examples of business plan are defined for :

- The first business plan was defined for the Energy communities, in this case we consider that the VPP4Ibox will be rented for residential buildings, householders and small prosumers/consumers
- Second estimation for the Grid flexibility, here we consider that VPP4Ibox will be sold for aggregator or DSOs/TSOs

5.1. Assumptions and cash flow

❖ Assumption : (Energy community)

This table 7 presents the assumptions considered for the business case of the self-sufficient EC (almost per Quarter). The main goal in this case is to provide affordable solutions, thus, we suggest to rent the VPP4Ibox through subscription 20€ per month and focus our business strategy on pay on savings, funding and donation to reduce costs. The estimation of assumptions, defined based on the first interviews with implicated partners and pilots (mainly UEDAS and TROYA), will be improved and tested in WP7. As the final solutions are not yet finalized and integrated, these preliminary values are not validated and it will be updated in the final business plan.

Table 7: Assumption of the self-sufficient Ecs

Assumptions	Unit	First estimation
Rent box (monthly subscription)	€	20
Training	€	1000
Traveling cost	€	4000
Personnel costs	€	25000
Full Networking & marketing cost	€	5000
Cost of buying the VPP4Ibox (supply)	€	2000
Equipement (cloud, servers, …)	€	10000
Fixed costs (office, électricité, assurance…)	€	8000
Commission from trading Energy	%	5
SPT planning service	€	10000
Flexibility service	€	10000
Total number of target Islands	Number	293

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Ads, sponsoring	€	10000
Maintenance services	€	1000
Minimum EC members	Number	100
Forecasting commission	%	1.5
Optimization impacts	%	20
Funding and donation	€	10000
Commission from Optimization service	%	5
Total energy per EC per Q KWh	kWh	46250
Average European electricity price of kWh	€	0,24
Amount of energy traded per Q per EC kWh	kWh	100000

- **Cash-flow : (Energy Community)**

As illustrated in the table 8, a first 5 years estimation of cost and revenues that can be generated by the startup VPP4I Factory according to the assumptions predefined in the table above.

Table 8 : Five years estimation

Revenues	**year 1**	**years 2**	**years 3**	**years 4**	**years 5**
Training	4310	5239	6368	7740	9408
Renting VPP4I Boxes (memberships)	777	1665	2553	3441	4329
Maintenance services	42000	90000	138000	186000	234000
Commission from trading energy (transparent) 5%	4000	4000	4000	4000	4000
Ads, sponsoring	16800	36000	55200	74400	93600
Forecasting 1.5%	10000	20000	30000	40000	50000
Commission from the Optimization 5%	1166	2498	3830	5162	6494
Costs	**year 1**	**years 2**	**years 3**	**years 4**	**years 5**

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Fixed costs (office, counting, electronics, assurance ….)	32000	32000	32000	32000	32000
Personnel costs	100000	100000	100000	105000	134009
Equipement	40000	40000	40000	40000	40000
Networking & marketing	20000	20000	20000	20000	20000

Based on the assumptions, net results and cash flow, the estimations of profits are low and little risky (see Fig. 10). In the first year the result will be negative (-51947€) because of renting Box and low number of starting ECs (only 3) and as we provide low-costs services to convince citizens to participate in energy activities. The number of ECs will increase over the years. In the second year, the cash flow stats to be positive and gain profits for the startup. From the third year, VPP4I Factory will be profitable and generate more revenues than costs. In the five year, VPP4I Factory will be generate about 300k€. To ensure the sustainability and stability of the startup they need at least a working capital of 70000€

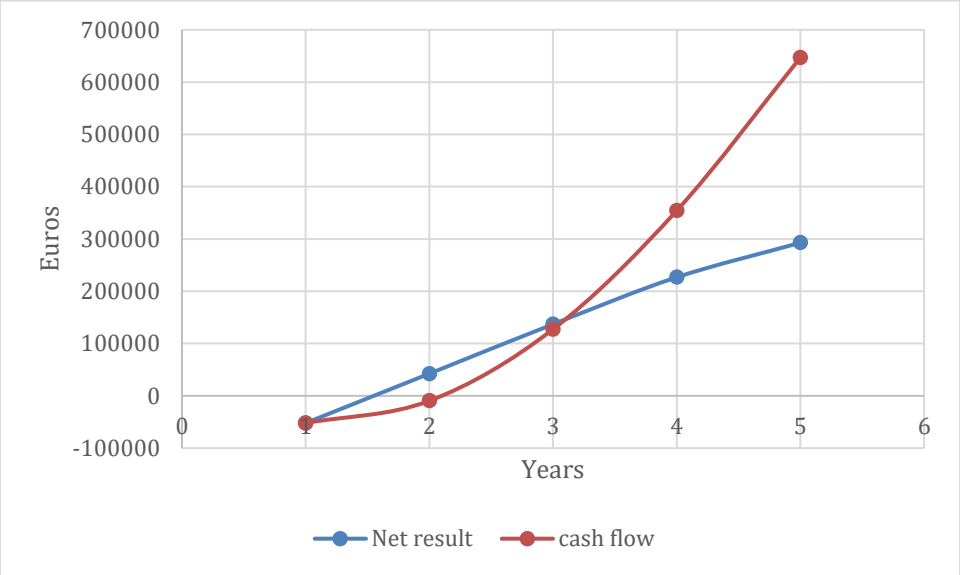

Figure 10: The first estimation of monetised outcomes

❖ Assumption: (Grid flexibility)

The table 9 presents the assumptions considered for the business case of the grid flexibility (almost per Quarter). The main goal in this case is to provide affordable and profitable solutions at the same time, thus, we suggest to sell (not rent) the VPP4IBox about 3500€ and based our business strategy on pay on savings and flexibility services. The estimation of assumptions, defined based on the first interviews with implicated partners and pilots (mainly UEDAS, TROYA, CU and AMU), will be improved and tested in WP7. As the same case for the first business case, these preliminary values are not validated and it will be updated in the final business plan.

Table 9: Assumptions for the grid flexibility case

Revenue	Unit	values
Selling the box	€	3500

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Skilled Training	€	10000
selling the software solution	€	25000
Flexibility services	€	10000
planning(SPT)	€	10000
Personnel cost	€	50000
Optimisation impacts	%	20
Commission from Optimisation	%	5%
Auditing service	€	5000
Flexibility services	€	10000
SPT	€	10000
Monitoring with 25% increase per year	€	7000
Number min box to sell per grid	number	50
Commission of forecasting service	%	1.5
Total energy per Grid per Q kWh	kWh	462500
The energy of the Grid vs EC	multiplication	10
Average price of kWh	€	0,24
amount of energy traded per Q per EC kWh	kWh	100000
Traveling cost	€	4000
Personnel costs and hiring new employees	€	50000
Full Networking & marketing cost	€	25000
Cost of buying the VPP4Ibox (supply)	€	2000
Equipement (cloud, servers, …)	€	10000
Fixed costs (office, électricité, assurance…)	€	20000

- **Cash-flow: (Grid flexibility)**

Table 10: Monetised estimation for 5 years

Revenues	year 1	years 2	years 3	years 4	years 5
Training	43101	52390	63680	77404	94085

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Commission from optimization energy 5%	7770	16650	25530	34410	43290
Selling software license	25000	100000	100000	100000	100000
Commission from trading energy 5%	84000	180000	276000	372000	468000
Auditing	7500	11250	16875	25313	37969
Forecasting service1.5%	9157,5	24975	38295	51615	64935
Monitoring (KPIs and tags)	7000	8000	10938	13708	17090
Planning (SPT)	10000	10000	10000	10000	10000
Selling VPP4IBoxes	350000	350000	350000	350000	350000
Maintenance services	6000	12000	18000	24000	30000
Flexibility services	49934	87334	152748	267158	467261
Costs	**year 1**	**years 2**	**years 3**	**years 4**	**years 5**
Fixed costs	80000	80000	80000	80000	80000
Employees(4) augmentation de 10% each year	200000	300000	320000	336000	408408
Equipement	40000	40000	40000	40000	40000
Networking & marketing	100000	100000	100000	100000	100000
VPP4Ibox costs	200000	200000	200000	200000	200000

Based on the assumptions, net results and cash flow, the estimations of profits are promising and profitable (see Fig. 11). In the first year the result will be negative (-20500€) because of renting Box and low number of starting Grids (only 2) and as we provide competitive services to convince DSOs/TSOs to use our solutions and build VPP4INodes. The number of VPP4INodes will increase over the years (at least 2 more nodes per year). In the second year, the cash flow starts to be positive and gain profits for the startup. From the same year2, VPP4I Factory will be profitable and generate more revenues than costs. In the five year, VPP4I Factory will be generate about 854k€ and a total cash flow of about 1858k€. To ensure the sustainability and stability of the startup they need at least a working capital of 40000€

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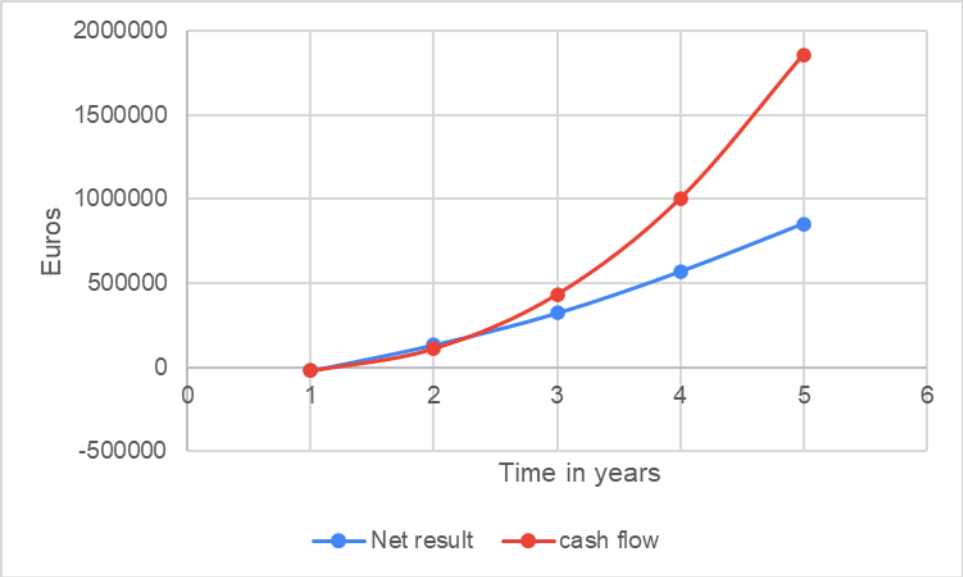

Figure 11: Second business monetised results

5.2. Investment and financing schema:

The investment is a mean of mechanisms to generate benefits and raise quickly values over a period of time. That's requires to invest in time, money, or effort. In finance, the purpose of investing is to generate a return from the invested asset. The return may consist of a gain (profit) or a loss realized from the sale of a property or an investment, unrealized capital appreciation (or depreciation), or investment income such as dividends, interest, rental income, or a combination of capital gain and income. The return may also include currency gains or losses due to changes in the foreign currency exchange rates. Also, they are different types of investments that can be addressed by the VPP4I Factory start up to increase the TLR and facilitate the go to market strategy, as follows:

- Equity
- Shares
- Capital corporate
- Crowdfunding
- Grant(subvention)
- bank (loans)
- Venture capital

Equity: Besides determining the value of a company, equity is important to businesses because it can be used to finance expansion. Funding business expansion by selling shares of stock to investors is "equity financing." This type of investment is important for VPP4I Factory to continue their growth and to be open to the rest of the world.

Shares: Shares represent ownership of a company. Individuals or entities can buy shares in VPP4I Factory company, they become one of its owners. The whole shareholders choose who runs the startup and are involved in making key decisions, such as whether a business should be sold[27].

Capital corporate: In general, capital refers to the durable goods or assets (property, energy systems, equipment, money) that are used as productive inputs for further production of goods and services. For VPP4I Factory, capital can be raised by issuing either debt (as a loan or via bonds) or equity (stock).

[27] https://www.investopedia.com/terms/s/shares.asp

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Crowdfunding: Crowdfunding is a way of raising money to finance specific developments and businesses. It can enable VPP4I Factory to collect money from a large number of people via online platforms such as Kickstarter, GoFundMe and social networks. Crowdfunding is most often used by startup companies or growing businesses as a way of accessing alternative funds. It can be a fast way to raise finance with no upfront fees. pitching a project or business through the online platform can be a valuable form of marketing and result in media attention. sharing your idea, you can often get feedback and expert guidance on how to improve it.

Grants: (Subvention): Grants are a support financing that are offered by governmental and charity organizations with a specific impact goal. There are a very wide range of grants and donations that can be mobilized while building a community-led project. It is important to explore those sources as well. The main advantage of grants is that the project will be judged on its impacts on the energy communities and the society at large.

Bank (loan): It is a financing in debt which requires guarantees and the payment of interests. In order to have access to a traditional bank loan, it is needed, VPP4I Factory has to prove that the products/services are bankable, profitable and viable as well as the guarantees.

Capital venture: Startup companies with a potential to grow need a certain amount of investment. Wealthy investors like to invest their capital in such businesses with a long-term growth perspective. This capital is known as venture capital and the investors are called venture capitalists. Such investments are risky as they are illiquid, but are capable of giving impressive returns if invested in the right venture. The returns to the venture capitalists depend upon the growth of the company. Venture capitalists have the power to influence major decisions of the companies they are investing in as it is their money at stake.

- **Financial scheme:**

Based on the study carried out by RESCOOP[28], RDIUP has defined a methodology to facilitate the financing of VPP-based solutions and increase the implementation across Europe (see Fig. 12). To increase the financial potential of VPP solutions, VPP4ISLANDS will provide attractive, competitive and profitable products/services to the energy markets.

Figure 12: Instruction how to create a successful VPP

The Figure 12 illustrates our vision to raise fundings and financial support for end-users and from key stakeholders:

- VPP4ISLANDS and/or End-users will charge to search and find new sponsors, loans or capital ventures respectively for the VPP4I Factory or the ECs
- Customers can earn money by participating in energy activities, providing flexibility services and reducing the electric bills.
- Through policy recommendations, Governments have to offer incentives, Taxes reduction, financial Aids for VPP co-creations or the buying energy assets (e/g. PV or storage systems).
- Municipalities can contribute to this schema through local promotion, coupons and Bonus.

[28] D4.1.2_Financing_Guide.pdf (rescoop.eu).

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- Energy communities can create new opportunities for industries and manufacturing of PVs smart appliances. Therefore, that can ensure a mass flow of their products and lead to supporting ECs and reducing prices of technologies.

6. Exploitation's strategy:

Our main strategy is to create a VPP4Islands Factory which is an entity that creates new VPP4INodes or optimizes existing portfolios to be transformed into VPP4INode. Also, VPP4Islands factory will continuously accompany the different clients (e.g. Grids or Energy Communities) to propose remunerated digital-based and flexibility services. Also, we will generate revenues from VPP4IBox selling and monitoring of different installations. The key to any marketplace is user trust. In this direction, we will evaluate the possibility to better understand the results of partners and how that can be exploited. Concretely, the main objective is to have a preliminary review and inventory of expected results and how can we share fairly profits with all stakeholders and ensure the loyalty of our solutions.

During the project 2020-2024, the VPP4Islands technologies will try to reach an average TRL8. In addition to each partner's individual exploitation strategy, the consortium will develop and implement a joint strategy for transitioning the VPP4Islands solutions to market-readiness (TRL9) and for commercializing the technologies (2024- 2025) to ensure the long-term sustainability VPP4Islands. Therefore, our main strategy is to create a start-up (VPP4I Factory) to exploit the KERs and commercialize the proven products and services. RDIUP as start-up maker will be responsible for these activities with the support of industrial partners. In this section, we will define a roadmap of the exploitation strategy and study the individual and joint exploitations through surveys and interviews.

6.1. Overview:

As illustrated in the Fig. 13, a roadmap of exploitation strategy was defined. This methodology contains 5 elements: interviews and mapping tools, Key exploitable results, Values and target groups, Business and partners vision, and Post-Project and opportunity. To reach our goals, the proposed exploitation strategy roadmap will be built on the outputs of the interviews and surveys carried out during the two first years. That will help to describe a preliminary approach for the exploitable results, and different possible impacts:
Potential Commercial, Technological, Educational, Political and Societal impacts are presented as a background for the five particular opportunities for the upcoming exploitation.

Figure 13: Exploitation strategy roadmap

Commercial Exploitation: VPP4ISLANDS will use a co-creation approach to deliver close-to-market (TRL8) solutions to address more customers, create new market opportunities and to get more feedback from the Energy communities all that will be beneficial for the project. Also, the business plan will help to build strong strategies and channels to ameliorate our performances to accelerate the market uptake.
Technological Exploitation: It is urgently needed to develop digital solutions and advanced algorithms and utilize the latest communication technologies for interconnection and control of VPP4INodes components through rapid transmission and aggregation of data. Thanks to these technologies, it can

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efficiently manage energy production, storage and consumption, resulting in significant money savings this the goal of VPP4Islands.

Educational Exploitation: VPP4ISLANDS and partners was trying to co-creation sessions with the public to raise awareness of energy transition and island decarbonization. The results can be used as a new way to discover new approaches and technologies by researchers, universities, research institutes, research-driven networks and the scientific community. Also it can be the beginning of new collaboration to start new project and new foundations for Energy community.

Political Exploitation: VPP4ISLANDS is defining energy strategies and guidelines to increase and foster the digital and green transitions. Through dialogues with policymakers at national and European level, these outcomes will be used to support the environment and climate change adaptations by the islands' decarbonization. These policies will be adopted by Islands and be replicated in other municipalities to maximize impacts across Europe.

Social Exploitation: The main goal of VPP4ISLANDS to reduce traditional use of electricity (fossil and coal ...) and to find other ways of production of the electric energy. This vision have a critical societal impact not only at a European level but at a global one. For that, we create an experience in Living Lab operations that constituted a significant challenge for the project and for our partners. And that brought valuable knowledge and feedback from the Energy communities to evaluate our project and include each opinion and views of the society.

6.2. Surveys:

A general survey (see Fig. 14) was defined and circulated with our partners to better understand their key exploitable results (KERs). Also, during the project, some of our partners develop new KERs and upgrade their solutions. This is why we want to bring to light these efforts. The questions of the survey will renew all data we already have for our partners and will give a new vision of VPP4ISLANDS. All questions refer to GDPR and regulations compliance based on their involvement in the data management. Here is the survey at the link below:

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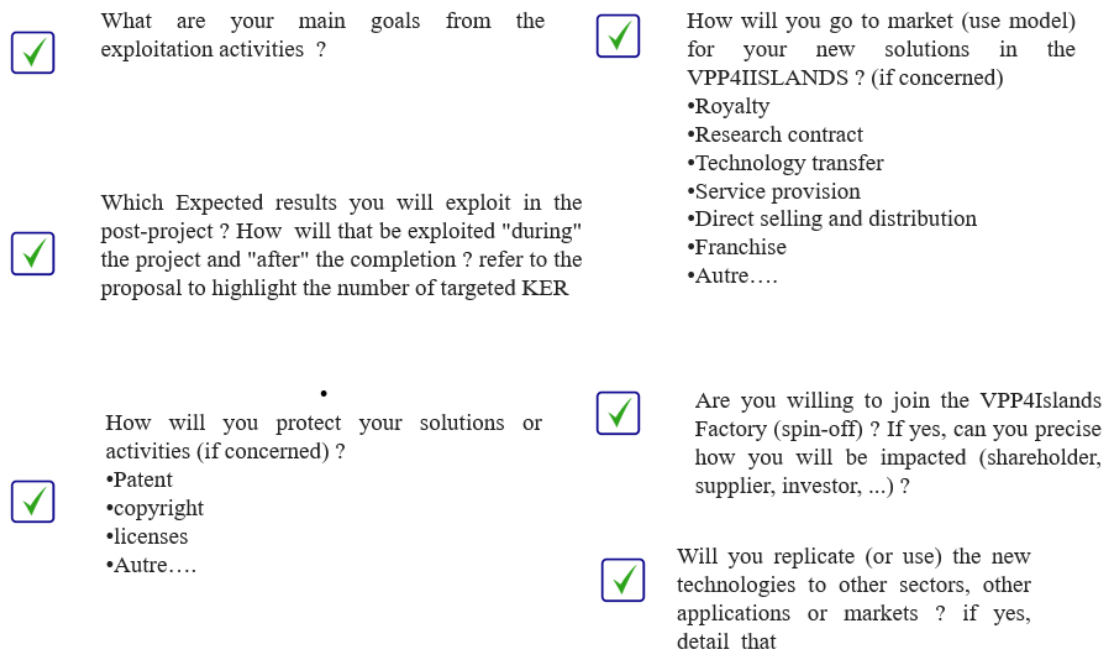

Figure 14: The general exploitation questions

For depth analysis of individual and joint exploitations (see the table 11), RDIUP has defined tailored surveys for AMU, ALGOWATT, Schneider Electric, UEDAS and CU and arranged meetings with key partners involved in the VPP4IBox (Schneider Electric, CU and BC2050), VPP4INode (AMU, RDIUP, REGE, and ALWA) and VPP4IPlatform (BU, CISC and IDEA).

Table 11: Surveys for exploitation strategies

Exploitation Activities **(AMU)**	https://docs.google.com/forms/d/e/1FAIpQLSdkM-CDzvjWIUm3MeUEEN8pih-ntFWLMFwvrw-r1lhxxTb7nw/viewform
Exploitation Activities **(ALWA)**	https://docs.google.com/forms/d/e/1FAIpQLSdQyjJDpUvzpyNByltq2w1VppqjZ4J8wpV1TZoSMUrEU1x6Nw/viewform
Exploitation activities **(Schneider Electric)**	https://docs.google.com/forms/d/e/1FAIpQLScWggZn0OjZyUYTVocEEK2nFI-J06xVEFIb5orAqa833VL_EA/viewform
Exploitation Activities **(UEDAS)**	https://docs.google.com/forms/d/e/1FAIpQLSfqc2m2PZCH90FAJauZwU2ALhG7Ea1fez6JkvLtlKLGkYjScg/viewform
Exploitation Activities **(CU)**	https://docs.google.com/forms/d/e/1FAIpQLScIORDjw9yus20Oa_j49xRLtCdOi8rVsI1kEr5oItKsoiQdUw/viewform
Exploitation Activities **for**	https://docs.google.com/forms/d/e/1FAIpQLSfE8TKX1c6SrHNgyB3mxXq64BWnqWM2MpFlYosu2r9j4b3ErQ/viewform

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other (partners)	

6.3. Answers and analysis:

In the tables below, we represent the different questionnaire's answers and our recommendations to enhance the GDPR and regulation compliance for each partner. In this section, IDEA, CISC, FORM, BOZI and GRADO were not concerned.

1-What are your main goals from the exploitation activities ? (if concerned)

AMU	**ALWA**	**SCHN**	**BC 2050**
Commercialisation of the developed API	Increase of the budget associated with digital energy solutions, increase of collaboration in follow-up R&I initiatives.	New functionalities of Remote Terminal Units (RTU), being the RTU part of the VPP4IBox concept.	- Advance research - Improve products - Increase company's visibility - Establish new research and commercial partnerships
REGE	**CU**	**CIVI**	**INAVITAS**
Identify exploitation aims and priorities to help focus the efforts of the consortium as a whole. -Outline the general IP management and knowledge protection policies of the Project. -Present a commercial exploitation framework to support the Consortium's exploitation efforts and identification of commercial - exploitation pathways Present exploitation key performance indicators.	The main objectives are (1) to produce scientific publications to describe the methodology developed for smart management of virtual energy storage systems (VESS), (2) to implement the VESS engine that we developed in real case studies in the Spanish and Turkish power systems.	Boosting the activity of CIVIESCO as Energy Service Company exploiting the financial tools and instruments produced in VPP4ISLANDS	Finding stakeholders in the field, discussing project results and lessons learned with other (stakeholders) and enhancing the results to be useful for all the related factors.
IDEA	**RDIUP**	**FTK**	**CISC**

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Commercialize the digital twin (DT)	Commercialize a product (software) in energy sector and commercialize SPT as solution	Grow a consultation and product business surrounding SAPL.	New research activities and transfer

TROYA	**Brunel**	**Demos**
Raise awareness renewable energy and our project in the community Inform community and stakeholders about the outcomes of the project Share knowledge and information gained by the project Establish links and create synergy with national/international associations	Developing of python packages for our energy assets models	UEDAS task in the project is to conduct field tests of the VPP platform. In this way, we will be able to demonstrate the operability of the platform to people. Explore the future energy system on Bornholm by coupling the electricity system with district heating, and further develop the carbon neutral energy system.

2-Which Expected results will you exploit in the post-project ? How will that be exploited "during" the project and "after" the completion ? refer to the proposal to highlight the number of targeted KER (if concerned)

AMU	**ALWA**	**SCHN**	**BC 2050**
AMU team will propose their expertise in VPP and commercialize their developed technology (KER1, KER3, KER5, KER7)	One of the key services offered by BSP solutions is that of sending flexibility offers to the balancing market organized by the transmission system operator (TSO). Since no partner (external or internal to the consortium) with a license to access the balancing market could be found during WP2, the platform for BSP could not be validated.	The added value of Remote Terminal Units will increase. The developed functionalities will be adapted for commercial use in the RTU.(KER 4)	Knowledge gained as well as the outcomes of the project will be exploited by approaching relevant energy entities, communities, groups of end users, etc. to inform them about the technological innovations of the project and the capabilities it arises, with the scope to establish collaborations. All KERs fall within the sphere of or interest for being exploited,

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			with KER2 and KER7 being on top of the list.
REGE	**CU**	**CIVI**	**INAVITAS**
REGENERA intends to exploit the energy price forecasting and CO2 emissions calculation tool jointly with the VPP4Islands consortium and also at the individual level through transfer and replication to other sectors.	CU will consider the lesson learnt of the project to assess and validate the economic benefits of the VESS and how it can be improved with the novel technologies and to exploit the innovative business models related to P2P trading. CU will utilize the following Key Exploitable results (KERs); Smart APIs (KER 3) and VPP4IBox (KER 4). Additionally, access to real data produced from case studies will enable CU to gain a better understanding of real-world opportunities and challenges of implementing VPP.	Financial tools and instruments tested in the demos islands, and economical feasibility studies produced for follower islands	Consumption forecast
IDEA	**RDIUP**	**FTK**	**CISC**
During : ensure the access to our DT After: the access will be restricted	Regarding the SPT, full access during the project and in the post project restricted access for partners and paid access for customers	SAPL. During: Reach out and guerilla marketing. After: Added premium enterprise services, following a freemium business model.	Research and scientific actions during and after the project
TROYA	**Brunel**	**Demos**	
DURING: -KER2 - Create open discussions with the stakeholders and share knowledge of expected outcomes of the project and prepare a road map about how to use the new technology.	Research projects	The project will strengthen the strategy and decisions facing new technologies and developing the energy system on Bornholm towards carbon neutrality -The project idea is very original and will be beneficial for UEDAS. If there are regulations related to the VPP system, it will be beneficial for the electricity distribution system. For example, in terms of ancillary services.	

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-KER6 – Gathering necessary information from the community for smart contact by conducting living labs. AFTER: -KER2 - Troya will assist the building of a new economical model for communities and cooperatives and provide information about energy transition regulations and policies.		

3-How will you protect your solutions or activities (if concerned) ?

AMU	**ALWA**	**SCHN**	**BC 2050**
Licenses	Licenses	Copyright	Copyright
REGE	**CU**	**CIVI**	**INAVITAS**
Licenses	Copyright	Specific agreements with demos and follower islands	Copyright
IDEA	**RDIUP**	**FTK**	**CISC**
Licenses	Copyright and trademark	Copyright	Open source Licenses and copyright for research
TROYA	**Brunel**	**UEDAS, FORM, BOEF, BOZI and Grado**	
We are the social partner of the project, not involved in the technical aspects, therefore we do not have any concerns.)	Copyright for research	The results will be fully open	

4-How will you go to market (use model) for your new solutions in the VPP4ISLANDS ? (if concerned)

AMU	**ALWA**	**SCHN**	**BC 2050**

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Royalty	Franchise, royalty	Technology transfer	Depends on the situation
REGE	**CU**	**CIVI**	**INAVITAS**
Service provision	Technology transfer	Service provision	Service provision
IDEA	**RDIUP**	**FTK**	**CISC**
Licence agreement	Licence agreement	Consultation and services	Research collaboration, IPR transfer
TROYA	**Brunel**	**Demos**	
We will promote the model in the community by introducing it with several activities,	Technology transfer	Technology transfer	

5-Are you willing to join the VPP4I Factory (spin-off) ? If yes, can you precise how you will be impacted (shareholder, supplier, investor, ...) ?

AMU	**ALWA**	**SCHN**	**BC 2050**
Yes	In consideration of the new company structure, of the new management, of the newly presented industrial plan 2022-2024, algoWatt will take into consideration the possibility to join the VPP4IFactory (spin-off) and to invest in its creation/activities once the integration and validation campaigns will be completed and evidences for economical considerations will be available.	Not certain at this moment. Schneider Electric has specific committees to identify possible spin-offs to be joined.	Willing to join the VPP4slands Factory spin-off as shareholders
REGE	**CU**	**CIVI**	**INAVITAS**

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Yes (Shareholder)	Yes, CU would be keen to join the VPP4I Factory spin-off. We are open to contribute in any ways that support the objectives of the spin-off.	Yes, attracting more investments and boosting ESCO activity	Yes, (supplier)
IDEA	**RDIUP**	**FTK**	**CSIC**
Yes, based on the business plan	RDIUP could lead the VPP4I Factory so shareholder	Yes, (Supplier)	Yes, (Supplier)
TROYA	**BUL**	**Demos**	
-Troya can be involved in the promotion / marketing of the product to create energy communities and encourage the use of the product.	Yes, (Supplier)	Not decided yet (depend of the headquarters)	

6- Will you replicate (or use) the new technologies to other sectors, other applications or markets ? if yes, detail that ? (if concerned)

AMU	**ALWA**	**SCHN**	**BC 2050**
No (that can't be answered from AMU because is more academic and research institution)	The technologies developed by AlgoWatt within the VPP4Islands project are quite focused on specific market segments (Balancing Service Provision, Energy Communities) - extension of portfolio solutions to specific applications (e.g. Commercial Virtual Power Plant and Technical Virtual Power Plant) will be taken into consideration.	Developed technology for RTU might be used in other markets, like oil & gas applications, or any other markets needing reliable real-time communication between embedded devices and SCADA systems.	As long as there's fertile ground and relevant opportunities, BC 2050 is willing to proceed to replication or use of the new technologies in other sectors, applications or markets. No specific plans, as these fall under our dynamic corporate strategy that adapts to opportunities, both existing and emerging.
REGE	**CU**	**CIVI**	**INAVITAS**

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The forecasting tools for predicting energy market prices and calculating carbon footprints have enormous replication and transfer potential to practically all productive sectors, as well as being aligned with the objectives of the European Green Deal.	In addition to flexible demand and energy storage units, the VESS portfolio can include multi-vector energy resources, e.g. combined heat and power (CHP) systems. Similar to the VESS engine, a tool can be developed to quantify the available flexibility of the VESS and report it to the concerned parties within gas and heat networks.	Maybe, it depends on the oncoming opportunities	Consumption forecasts will be carried out for different applications
IDEA	**RDIUP**	**FTK**	**CSIC**
Yes, in other sector such building (BIM)	Maybe for nexus sector (water energy food). SPT can be used to improve the management of water in countries threatened by drought	Yes. SAPL is domain agnostic. Obvious fields are manufacturing, life science and business applications	
TROYA	**BRUNEL**	**Demos**	
-No, Troya are the social partners of the project. Our technical knowledge is limited, so we will only be involved in creating energy communities by informing the public about new technology, its benefits, and how to use it.	Not concerned	Not concerned	

As shown in the Table 12, expecting CIVI, Form, GRADO and BOZI, all partners will be involved in the initial key exploitable results at this stage. In the further months, VPP4ISLANDS will define a specific strategy for CIVI, FORM, GRADO and BOZI to adopt the major findings and proven solutions in these organizations to maximize the impacts of our project.

Table 12: The mapping of the KERs

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	KER1 **VPP4IPlatform including Digital twin**	KER2 **Shared knowledge base**	KER3 **Smart APIs**	KER4 **VPP4IBox**	KER5 **VPP4I-Node**	KER6 **Smart contract**	KER7 **Smart planning Tool**
AMU	X		X		X		
ALWA		X	X		X		
SCHN				X			
BC2050						X	
BUL	X						X
REGE	X				X		
CU				X		X	
CIVI	Not implicated in the development of the KERs						
INAVITAS	X						
IDEA	X						
RDIUP					X		X
FTK				X		X	
CSIC	X						
TROYA							
UEDAS	X			X			
FORM	Not implicated in the development of KERs						
BEOF		X				X	
BOZI	Not implicated in the development of KERs						
GRADO	Not implicated in the development of KERs						

6.5. Specific exploitation analysis:

Specific interviews were carried out with AMU, ALWA, SCHN, FTK, CU, BUL, REGE, CISC, and BOEF in order to collect more information about the exploitation strategies we are able to do a one-to-one interview with each partner to exchange important data and to ask important questions we didn't propose in the survey to clarify all the updates of the KERs (some partners decided not participate to

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the one by one interview). All questions (see Fig. 15) refer to GDPR and regulations compliance based on their involvement in the data management.

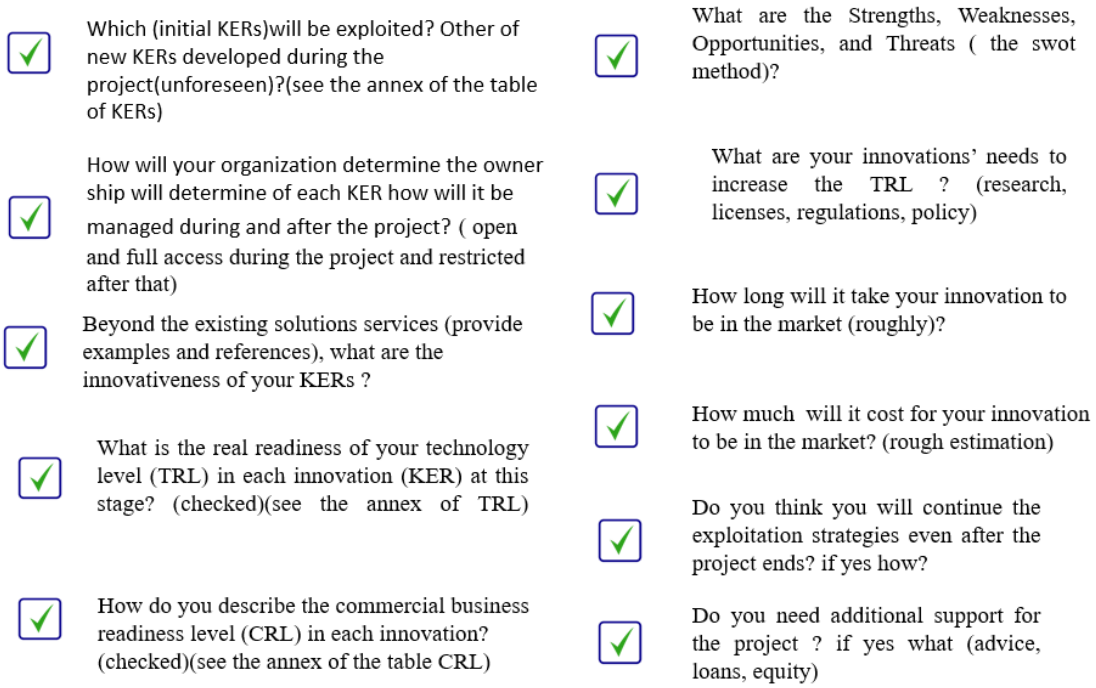

Figure 15: The specific questions

6.4. SWOT Analysis of KERs:

The table 13 presents the positive and the negative aspects related to the solutions provided by the interviewed partners.

Table 13: The SWOT of specific KERs

	Strength	**Opportunity**	**Weakness**	**Threat**
AMU	Strong R&D team, using of open frameworks	The needs of short term and accurate forecasting	Lack of funding and small software team	The cost of the solution will be high
ALWA	Robustness and developed early entrance	Market uptake of RES and EC, social political situation, EU commitments and national fundings and Ecosystems	Limited application and testing of the KERs	Legislation framework (Italian market (it can be an opportunities) ok but not the same thing for other countries and hard to be adopted)
SCHN	Schneider is a big company and	Schneider has the technology and the experience to	Lack of feedback for VPP4box	A lot of competition around

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	has a lot of resources and a good reputation.	develop VPP4box in the best way possible.		
FTK	Open source for public	FTK support soft solution and will provide to reach the opportunities that will increasing the requirement for information sharing across the organization, whic h data streaming application and will support SMEs to own a software development.	Open source also weakness could the competitive stilling the idea	Lack of private funding, investment, commission funding,
CU	Expertise in aggregating assets	Raising of flexibility market size and needs	Low background linked to commercialization	High competitiveness
BUL	Similar to the SPT and easily interoperable with it	The raising of needs of mix models for the grid	Lot of data and loads are required from end-users	Leak of information, high competitiveness, difficulty to validate DSS & SPT
REGE	The capacity to quickly commercialis e and integrate the solution in the electricity market	Everything automatically first kind in the market	Could not be used in electric market for other country	The price of electricity so high
CISC	Simplicity to model (coded with python, and interoperable, low memory and fast computing - possibility to test different scenarios. -flexible to include any	Raising the need to increase the stability of the grid through scenarios. interest in producing data predictions.	Difficulty to reproduce all complex grid models. Not be able to describe accurate behaviors of grid. They don't consider losses in power lignes also voltage dynamics are not included (only frequency dynamics)	Difficulty to collect real data

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	energy assets (battery)			
BOEF	Industrialized technology	More resilient and local less depend	Data leak	Economic crisis, regulatory

6.5. The innovativeness of VPP4ISLANDS solutions:

Based on the different interviews, we identified the following novelties of our solutions:

The provided solution will be mainly open source to be used widely by technical and scientific communities and policy makers to provide improved recommendations and training activities. Also, the novelty of the platform is to provide optimization and functionalities including accurate forecasting (at long-and-short terms) and improvement of energy portfolio through digital twins.
The deployment of smart contract, low-cost VPP4IBox (e.g. raspberry, sky camera operation) will promote the wide integration of VPP4INodes and decarbonization of islands. Combination of algorithms and hybridization of methods (mix energy systems models and domains). Also, the KERs delivered by VPP4ISLANDS will follow the evolution of the market, boost the co-creation of ECs (turn key solutions) and contribute to the support of users while considering the whole value chain. Concretely, they aim to provide better and more practical products and services.

Regarding the security and digital policies aspect, the SAPL engine will provide a unique administration of the policies and deep integration with platforms to easy offering of policy while complying with the protection requirements and standards.

6.6. The needs to improve the exploitation

The main needs of VPP4ISLANDS are the real data and results of the use cases. Also, partners need knowledge and advices especially from operators who are interested in of using the grid models (to provide their needs and requirements). Moreover, large scale pilots, optimization of existing solutions, better communications infrastructure, miniaturization and complying with regulations will maximize exploitation impacts.

Other needs are specifically concerning price requirements for specifying the premium license, not free components for the engine to clearly formulate the premium model. More collaboration and partnerships with research centers, GOVs and industries. needs large scale pilots, optimization of existing solutions, better communications infrastructure, miniaturization for regulations.
To increase TRL and ensure the continuity of the project and solutions, they need national and European projects and funding. The investment for qualification of solutions and prospects (investors interested in partnership are very important to bring the KERs to the market.
Almost of partners have confirmed and expressed their willing to contribute to the co-creation of VPP4I Factory as shareholders, however that will be confirmed based on the final and accurate business plan. Specific workshops and face-to-face meetings will be organized in the upcoming months to clarify and valorize the implication of each partners.
The average budget required (rough estimation) to finalize development and go-to-market can be between (100k and 150k euros), also, it is expected to spend 1 to 2 years to enter market.

6.7. Joint exploitation strategy:

The joint Exploitation Strategy is a plan containing more than one part's requirements to joint activities together in the Consortium. However is committed to carrying out, how the project's results will be exploited, and ultimately used by principal beneficiaries and end-users.

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We ask our main partners some questions about the joint exploitation of VPP4Ibox and digital twin to discuss their vision in the post project and to specify action for each partner (see Fig. 16)

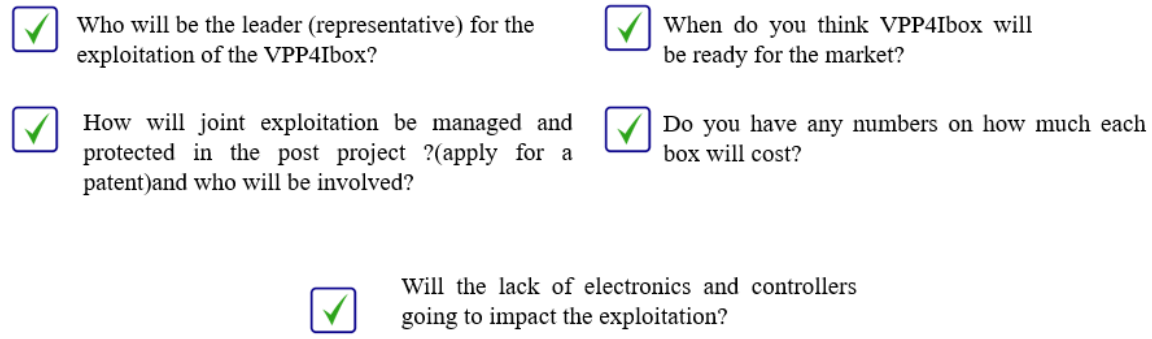

Figure 16: Example for questions for the VPP4IBox

- **VPP4IBox**: the key partners involved in the development of this layer are Schneider electric (RTU), Cardiff university (VESS) and BC2050 (Smart contract). The leader of the joint exploitation will be Schneider electric with the agreement of CU and BC2050. At this stage, the final solution is not yet finalized and several data are missing. The VPP4IBox will be protected by patent application. Mainly Schneider will be responsible for the industrialization of this box and probably with be a supplier for the VPP4I Factory. The first estimation of the VPP4IBox will be between 3 to 4K€ and the cost will be from 1.5 to 2K€. The main threat will be the lack of chips and electronic cards.
- **VPP4INode:** the main partners implicated in this layer are AMU, RDIUP, ALWA, and FTK. The exploitation will be mainly led by RDIUP and agreement will be defined with owner of IPRs. VPP4INode will allow to orchestrate between VPP4IBoxes and ensure the optimization and short-term forecasting of services in a secure way (SAPL). The exchange of data and the visualization of results will be ensure by ALWA and RDIUP will guarantee the data analytics. For RDIUP, the server costs will depend on the portfolio of the VPP and will cost between 3 to 4k€ for cloud computing resources or 9K€ for a local edge computing for unique VPP(estimation).
- **VPP4IPlatform:** the main partners implicated in this layer are Brunel university, IDEA and CISC. The exploitation will be mainly led by IDEA and agreement will be defined with owner of IPRs. They will provide on demand and real time (15min periodic run) simulation and validation functionalities. IDEA will Prepare the simulation interface and model update endpoint, BUL and CSIC will provide a docker image or container (they will sign an NDA in the commercialization phase based on service). At this stage, they are waiting for the new progress and they cannot make decision because of lack of data. However, some modules will be provide openly and freely and premium services will be paid. For IDEA, the server costs will depend on the infrastructure (deployed server capacity) and will cost between 200-300Euro/per month for unique VPP(estimation).

The joint exploitation will be analyzed and improved over the progress of the project development and the integration phase.

7. Lessons learned and best practices:

The business and exploitation strategies may be strengthened and its output maximized with the adoption of a set of ten good practices.

- It will better if only one representative per layer leads the exploitation of the whole component

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- To go-to-market quickly, we have to showcase that our solutions are bankable and profitable to find investment and reach higher TRL and CRL (see annex).
- Meet local regulations and recommend policies for incentive taxes for VPP solutions will facilitate the exploitation of VPP4ISLANDS
- To enhance the business impacts, non-profit impacts have to be considered by VPP4Islands as focusing on innovation with societal impact and well-being of consumers.
- The service-based business models will be developed and take into consideration the participatory processes that support open innovation for VPP sector domine future of RES.
- The business plan of grid flexibility highlights that it provides more profits than the self-sufficient ECs.
- The acceptance and the satisfaction of end-users and consumers are crucial for a sustainable business strategy.
- The participation of researchers centers and businesses in the same joint KER facilitates the post-project commercialization of the solutions and reduce conflicts.

8. Conclusion:

The deliverable D8.5 provides a clear description of the workflow for the business model and the exploitation strategy which we explain each task developed by the beneficiary partners, as we defined some uses cases with SWOT and PESTEL analyses to better understand the situations in Turkey and Spain and identify the impact on our business strategy.
The D8.5 defines business cases mainly for the grid and Energy community by providing a business plan as estimation of clear numbers can be accurate to achieve the right vision for VPP4Islands.
The Business model canvas of the VPP uses **(**Grids, Energy communities, SPT) is designed to form the basis for the decision making for a business, a business model canvas is one of the best ways to create a comprehensive business plan, This will provide a valuable information for the development of an investment tool able to assess the total replication and prepare a sustainable strategy to scale up.
Also the survey and interviews are used to provide guidelines and ensure consistency during the further development of the business models and respond to all kind of questions we will need and use for the post project as part of the exploitation strategy. Also, the development of D8.5 gathers inputs from all WPs and their outcomes with a specific focus on the Exploitation strategy and exploitable results and actions.
Meanwhile to collect more information about the tasks of three layers (VPP4IPlatform, VPP4INode and VPP4IBox) we arranged interviews for joint exploitation to understand who is going to lead in a certain assignment in the project and that we will be the first steps to spinoff for VPP4Ifactory. The D8.5 will be updated by CIVI as co-leader of the task T8.4.

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9-Annex:

Table of the TRL

LEVEL9	actual technology system proven in operational environment	
LEVEL8	Current technology system completed and qualified through test and demonstration	
LEVEL7	technology prototype demonstration in operational environment	
LEVEL6	technology demonstration in a relevant environment	
LEVEL5	technology validation in a relevant environment	
LEVEL4	technology validation in laboration	
LEVEL3	analytical and experimental proof-of-concept of critical function	
LEVEL2	application formulated	
LEVEL1	basic principles observed	

Table of CRL

LEVEL9	Widespread product sell	
LEVEL8	First product sold	
LEVEL7	customers in extended product testing or first sell	
LEVEL6	benefits of the product and first customers testing	
LEVEL5	established interest for the product	
LEVEL4	confirmed problem	
LEVEL3	first market feedback	
LEVEL2	identified specifique need from the market	
LEVEL1	hypothesizing in possible needs from market	

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The readiness of the technology (TRL) table(during and after the project)

Partners	AMU	ALWA	SCHN	BUL	Rege	CU	FTK	CSIC	BEOF	RDIUP	BC2050
level 9											
level 8	end									end	end
level 7		end					end				
level 6			end	end		end					Start
level 5	start	start				start		end	end	start	
level 4			start	start	start		start	start			
level 3									start		
level 2											
level 1											

CRL Table

The commercial business readiness table (CRL)

Partners	AMU	ALWA	SCHN	BUL	Rege	CU	FTK	CSIC	BEOF	RDIUP	BC2050
level 9											
level 8		end					end		end		
level 7											end
level 6		start				end	start				
level 5			end								
level 4					start					end	start
level 3			start								
level 2				start		start		start	start	start	
level 1	start										

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