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Smart integRation Of local energy sources and innovative storage for flexiBle, secure and cost-efficIent eNergy Supply ON industrialized islands

D 7.9 – Position paper on policy influence, regulatory, data management and business modelling

Lead partner: ETN

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Contributing Author(s)	Dimitra Pli (Stratagem), Mario Luigi Ferrari (UNIGE)		
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Executive summary

This Deliverable is related to the task T7.3 “Stakeholders engagement to overcome obstacles to innovation” and consists in issuing a position paper on policy influence, regulatory, data management and business modelling as outcomes of the ROBINSON project.

The information contained in this document is based on the learnings acquired by ROBINSON partners during the project implementation. This deliverable highlights the existing gaps in the non-technical domains, and it provides policymakers with relevant recommendations to address the most urgent socio-economic challenges in the future islands’ decarbonisation projects. Effective business models to facilitate the deployment of technological solutions are also reported in this document.

During the preparation of the deliverable, the following questions were addressed:

- Which driving factors can ensure social acceptance of the local stakeholders?
- What solid business models can be applied in the local communities for future projects?
- What actions should be undertaken by policymakers to ensure the security of data?

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List of abbreviations

BMC	**Business Model Canvas**
EMS	**Energy Management System**
ESCO	**Energy Services Company**
PPP	**Public-Private Partnership**
VPP	**Virtual Power Plant**

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1. Introduction

Since the launching of ROBINSON, the Consortium has exploited communication and dissemination tools to advocate favourable regulatory and policy framework, with the aim of facilitating the project future replication. For this purpose, the project partners actively participated in EU-funded platforms, such as the BRIDGE and the Clean Energy for EU Islands Secretariat and ensured the smooth cooperation with the relevant islands' local stakeholders via the organisation of the ROBINSON Islands Energy Forum (ROBINSON Replication Advisory Board). Joint communication and dissemination activities – such as webinars and also hybrid events – were regularly organised also with other EU-funded sister projects (including GIFT H2020, INSULAE H2020, ISLANDER H2020, IANOS H2020, MAESHA H2020, NESOI, REACT H2020, Soclimpact H2020, and VPP4ISLANDS H2020).

With reference to the BRIDGE initiative, the ROBINSON Project Partners represented the Consortium at the following Working Groups, by exchanging information and best practices on the non-technical and technical domains related to the decarbonisation of islands:

- Working Group on Business Models (represented by Stratagem). Stratagem co-chaired the Working Group from April 2022 to March 2023.
- Working Group on Consumer and Citizen Engagement (represented by ETN).
- Working Group on Data Management (represented by UNIGE).
- Working Group on Regulation (represented by RES-T)

The specific technical and non-technical challenges in the decarbonisation of geographical islands were also summarised in "White Paper on Replication", issued in September 2023. This task – coordinated by ETN (on behalf of ROBINSON project) – was the result of a coordinated effort with the above-mentioned EU-funded sister projects. The aim of the White Paper was to:

- Report the hurdles to the replication of sustainable projects and the relevant lessons learned, and
- Provide long-term recommendations to the European Commission, its bodies, and the Member States, highlighting the required measures to enable the projects replication

The lessons learned and recommendations touched upon topics such as the integration of renewable energy technologies, the existence of divergent regulations at the national level, the functioning of energy markets, social acceptance, and the programmes of capacity building for the local communities.

Considering the advancements in our project after the publication of our White Paper, the current document will provide a more detailed insight into the learnings acquired by the ROBINSON partners particularly on business models development, data management and regulation, as well as social acceptance.

2. The learnings and recommendations on social acceptance

The participation of the local islands' stakeholders and the social acceptance have been highlighted as two of the key factors in ensuring the success of this demonstration project.

More in detail, project partners identified the following principles as those driving the process of energy transition:

1. The **ownership and deployment** of the local community, by exploiting local resources
2. **The initiative of addressing the environmental concerns** of the local communities, and
3. **The affordability of the energy** sources (i.e., economic savings)

As highlighted in the White Paper on Replication in 2023, the empowerment of local communities and organisations will enable them to take ownership of the replicated project, control the energy management, and overcome technical issues in a timely manner. The principle of ownership was at the heart of the ROBINSON project proposal, as local partners (in particular Dalane Energi) provided technical solutions and later benefitted of high level of trust among the local community.

Within the context of community ownership, our Consortium recommends the need for ambitious steps for future projects funded by the European Union and/or its Member States. To strengthen ownership and facilitate the process of replication of sustainable projects, public and/or regional institutions should boost the investment programmes dedicated to capacity-building, with the aim of enhancing the local stakeholders' skills and expertise. Such action schemes should deliver high-quality training on the core technical matters, such as energy management practices, consumption patterns, and innovative renewable energy technologies.

Technology transfer is also another mean to empower local communities and increase social acceptance. National and EU institutions can establish cooperation mechanisms among the full stakeholders' value chain, including the industrial organisations, the research institutes, and the local community. This coordinated programme will generate technical benefits, as it will accelerate the integration of flexible solutions in the geographical islands.

Fron the perspective of local project partners involved in the ROBINSON project, it was also of upmost importance to engage in awareness campaigns with the general audience, with the aim of communicating to the widest audience possible the benefits of the proposed technical solutions. Success stories, case studies, and best practices shared through different platforms – including the

EU-funded ones, such as BRIDGE and the Clean Energy for EU Islands – shall serve the ultimate purpose of advocating the replication of sustainable projects and the establishment of Renewable Energy Communities on islands.

Finally, as far as the cooperation with the local stakeholders is concerned, the participation of public authorities and the involvement of any international networks and organisations are essential since the early stage of the project proposal. This will avoid mismatches between the expected outcomes of the project and the basic needs of the islands' local communities.

In the following section, the ROBINSON learnings in the domain of energy business models are reported. A set of proposed business models for the ROBINSON demonstration and follower islands are also mentioned in detail.

3. The use of Energy Business Models to engage local stakeholders

Project partner Stratagem lead the research on the Energy Business Models, with the scope of identifying the most appropriate to deploy the ROBINSON technological solutions. The principle behind the Energy Business Models is that a major motivation towards clean energy transition is boosted by the triggering of financial investments, aimed at providing a positive impact in society, the environment, and the economy.

Considering the ROBINSON learnings, our Consortium also underlines the driving factor of the financial returns in the selection of the energy business models. In this regard, when designing and planning the project, its scale, potential risks, and barriers, expected revenues and social benefits should be the key aspects in the definition and adoption of effective business models.

Project partners encountered significant relevant challenges and gained useful lessons during the 48 months of project implementation. In first place, the energy business models shall enable citizens to deploy clean energy on their properties. By creating a favourable environment through supportive policies, involving communities via participatory business models, and making clean energy financially accessible, local communities can overcome barriers and accelerate their transition to clean energy.

Policies such as subsidies, tax incentives, and renewable energy mandates facilitate investments for clean energy projects. Wide public engagement measures, such as public consultation processes and community participation, may also generate additional benefits to the proposed business models, which result in more tailored actions that better satisfy the needs of the local communities.

Economic benefits to the communities generated via the proposed energy business models (e.g., lower energy costs and jobs creation) can increase public support, when communicated in a transparent and clear manner. Policies targeting business models should also address potential negative impacts to the islands' stakeholders (e.g., the noise level, visual impairments in the case of solar and wind power).

With reference to the financial instruments and their role in clean energy projects, these tools bring many advantages to clean energy deployment since they:

- Remove barriers to entry,
- Create a revenue stream and financing basis for business models,

- Have the design flexibility to be adjusted to support different technologies or actors, and
- Contribute to circumventing other obstacles, such as lack of long-term or project financing from the private sector or underdeveloped financial markets where it is difficult to obtain financing at reasonable costs.

Therefore, publicly funded financial instruments should target the elimination of barriers or risks that are hindering private investment, as well as facilitate the delivery of the largest amount possible of private funding using the smallest amount of public financial support.

More information on the financial mechanisms and instruments, can be found in the deliverable D6.3 "Business models for energy communities".

3.1 The ROBINSON study: Business Models for Eigeroy, Western Islands, and Crete

The section below summarises the energy business models researched and developed as part of the ROBINSON Project. The aim of this section is to highlight the existence of appropriate models that could be applied to future projects on islands' decarbonisation, and hence facilitate the work of policymakers at the national and the EU level.

In line with the principles detailed in the section above, and to identify and develop targeted business models that could be applied to ROBINSON business cases, a questionnaire was distributed to the Consortium during the implementation of the project. During this process, Stratagem collected information on the energy communities of the demonstration and follower islands

To select energy business models, investigation on the status, the constraints, the energy particularities and the challenges were studies with reference to Eigeroy, Western Isles, and Crete. As a results of this study, five (5) energy business models for communities that could be applied in RODINSON cases were identified, without excluding other options and based on the following criteria:

- Different profiles of demand and availability of energy
- Balancing energy demand and supply
- Optimising the energy management trough a devoted real-time software (EMS)
- Reducing the financial risk
- Benefiting from lower energy costs • Renewable energy resources, including wind, wave, and tidal energy

- Establishment of new industries
- Seasonality/security of supply
- Reducing carbon emissions
- Lack of integrated storage systems
- Legislation framework

a/a	Business Model	Demo case
1	Public-Private Partnership (PPP)	Eigeroy
2	Energy Services Company (ESCO)	Eigeroy
3	Community energy	Eigeroy
4	Virtual power plant (VPP)	Eigeroy, Western Isles
5	Energy Cooperatives	Eigeroy, Crete

Table 1: Business models for energy communities

Application of Business Model Canvas (BMC)

For the scope of this work, the Consortium has been using Business Model Canvas (BMC) to describe the selected energy business models. Through a visual chart, the BMC facilitates the representation of an organisation's business logic in terms of how it is organizing its operations for creating, delivering, and capturing value (Schütz et al. 2021).

BMCs were developed to indicate the different actors, customers, services, revenues and resources, involved in the business model. The model focuses on creating value through the integration of renewable energy sources, energy-efficient technologies, and smart grid infrastructure.

EIGEROY - Community Energy Business Models

The Community Energy Business Models developed for the demonstration island in Eigeroy focuses on the **community ownership, leadership and benefits,** meaning that the ownership and ventures are shared by the community.

The Communities own, or participate in, the production of clean energy. In such Business Models, most of the community energy project profit is given back to the community through revenue distribution or other benefits such as programmes targeting vulnerable and fuel poor households, providing energy advice to community members.

EIGEROY - Energy Services Company (ESCO) BM

The second Model elaborated for Eigeroy (ESCOs) put emphasis on energy savings. In this scenario, the focus is on reducing consumer demand which results in lower energy use and CO_2 emissions. The community can appoint an ESCO to carry out energy retrofitting on their building stock such as insulation, improving the indoor climate and integrating heat pumps and also renewable energy sources such as solar PVs.

EIGEROY - Public-Private Partnership (PPP) BM

The third model developed for the demo island, the Public-Private Partnership (PPP), involves a contract between a public-sector authority and a private party for a clean energy project. In PPPs, a public partner's role can participate by providing financial support and monitoring the performance of the private partner and enforcing its obligations. In conjunction to the public authority, a private partner contributes by co-providing additional financial budget, undertaking installation, and offering operational and maintenance support. Upon the completion of the project, the private partner would participate as a public services provider in the domain of electricity.

CRETE - Cooperative energy BM:

In this business model proposed for the follower island of Crete, the local stakeholders can influence the organisation of the cooperative, whilst benefiting from lower energy costs because of the cooperative's bulk purchasing power. This model enables community members that cannot (or do not) install clean energy at their properties to access clean energy and minimizes adverse social and environmental impacts.

The success of the model is highly dependent on regulation and support schemes, availability of financing and finance mechanisms, and local skills.

WESTERN ISLES - Virtual Power Plant (VPP) BM

The VPP business model studied for the follower island of Western Isles Is a software platform, which remotely controls a network of medium and small-scale generator units such as solar, micro combined heat and power plant, wind, and biogas.

Individual households and businesses can become part of VPP as flexible consumers and provide smart response to VPP. Prosumers, decentralised energy generators, and storage system can participate in VPP through providing variable power resource.

3.2 Conclusions on Business Models

To effectively support cities and communities in overcoming barriers and accelerating clean energy projects, an approach that combines supportive policies, adequate business models, and accessible financial instruments is essential. Such an integration can enhance social acceptance and ensure the successful implementation of clean energy initiatives.

The link between policy, social acceptance, business models, and financial instruments is crucial for the success of clean energy projects.

4. Recommendations on the Data Management

In the ROBINSON Project, an Energy Management System (EMS) for the demonstration site in Eigerøy was developed by the University of Genoa. With relevance to the data management, the experimental results of the laboratory tests in cyber-physical mode demonstrate the importance of the EMS robustness to avoid abnormal and risky situations in case of measurement errors for malfunctions, wrong data management or cyberattacks.

The EMS advanced concept was also proven successful when applied to the follower islands of Western Isles and Crete). Such tests confirmed the solid achievements of the EMS in terms of reliability, flexibility, and robustness.

4.1 Lessons learned on the Data Management

The ROBINSON Consortium acquired relevant learnings on data management, which can be useful to ensure the success of EU- and national-funded projects in the domain of energy transition.

Firstly, the data management shows the complex efforts required to ensure the stability of an energy system. To achieve this outcome, the software needs to be carefully tested and debugged in different operating conditions to avoid failures and negative impacts on the users. This dimension is an important aspect to guarantee energy security during the necessary time to do maintenance of damaged components.

Secondly, another learning from our Consortium comes with cybersecurity, which will play a pivotal role in the extensive utilization of the EMS technologies with data management. The ambitions of future EU and national projects to decarbonise islands should cover the prevention of external interference in the data network, whilst also ensuring stability in case of wrong modification of control parameters (including unproper manual operations). The dimension of cybersecurity is relevant to guarantee data protection related to the interactions between the users and the grid and any other personal data. Ruling by governments will be important for future applications, as the standardization of protocols, devices, cybersecurity constraints will be essential at the international level (inside the EU, but also in those countries providing the necessary technology).

Due to the large integration of such grids with local communities, it is important to ensure a link between policy and social acceptance, on one hand, and data management. Policymakers shall disseminate and raise awareness around the benefits of these systems that can generate substantial cost saving, environmental benefits, and safe continuous operations. The role of policy will be not only linked with incentives and prevention of criminal operations (e.g. market abuses), but also with the involvement of communication activities between technicians and scientists for promoting the technology. Moreover, the development of this technology may largely benefit by the simplification of activities in users' manuals and/or support to basic or refresher courses. The involvement of local and national policy bodies can ensure reaching such goals in a more successful manner.

National governments and EU bodies can play a significant role also to ensure the timely deployment of the EMS technologies. As these solutions are developed in different terms of scale or performance, dedicated market policies and regulations shall be put in place for each of them. Finally, policymakers shall also strengthen the institutional support in terms of financing, capacity-building, and cooperation among the relevant stakeholders[i].

4.2 Future perspectives and recommendations

Considering the lessons learned in the ROBINSON project, it is important to highlight the following needs for the development of complex systems dealing with data management:

- **Stability, reliability and continuity of platforms**. This is an essential factor to avoid operation stops due to software updates and platform reliability. Continuous updates of the operating systems or software applications can hence produce unexpected crashes with important time and money losses. Therefore, government decision-makers and policymakers shall introduce appropriate stability, reliability and continuity minimum requirements in the software markets.
- **Standardisation in communication protocols**. Due to the communication between the different components (prime movers, software platforms, etc.), advancements in such standardisation are required to simplify the component communication and the data management (e.g. in a database). The relevant policy institutions and the relevant stakeholders can play a role in facilitating this standardisation, by strengthening the cooperation framework mechanisms at the international level.

- **Cybersecurity and data traceability**. Cyber-attacks or wrong data management can produce problems ranging from the circulation of private data to serious damages to the components of the EMS. Such topics were already considered in the initial planning of the ROBINSON project, but where not included in the actual implementation. Therefore, future national and EU-funded projects in the domain of energy transition should also include the development of an increased system robustness as a main objective of the calls.
- **Social acceptance**. Communication and dissemination activities of national and EU-funded projects should address the development and deployment of unmanned systems, as these could pose risks to the privacy of ordinary citizens.
- **Fundings for installations**. The installation of technologies related hydrogen and other low-carbon solutions (also in small-size systems) requires a substantial financial support, with the aim of reaching a high degree of market penetration.
- **Incentives and initiatives for market penetration**. Although the energy transition projects addressing the development of poly-generation grid (including the platform for data management) aim at reaching TRL7, their demonstration sites often remain at prototype level. In the case of ROBINSON, the participation of SIT Technologies (third party of UNIGE) provides a relevant opportunity for market penetration. Further fundings would be key to ensure a faster proliferation and deployment of such technological solutions. This result can be achieved with the coordinated efforts of the industrial stakeholders, the research community, and the policymakers.

Conclusions

The current deliverable summarised our outcomes and recommendations on matters such as social acceptance, business cases, and data management applied to national and EU funded projects on decarbonisation.

Considering the demonstration nature of the ROBINSON project, a set of learnings for the future initiatives were collected, with the aim of providing recommendations to facilitate the implementation of future TRL8-9 industrial projects.

The attractiveness of the business models, along with the ownership of the local community, constitute most of the under-estimated challenges in the demonstration projects. The entry into the market of the technologies and the support of the local community are key factors driving the ultimate success of a demonstration project.

The EU-funded initiatives mentioned in the introduction of this document serve the purpose of exchanging information on successful or promising business models, as well as best practices to ensure the support of the local community and strengthening the data management of the technological solutions. Nevertheless, efforts from the EU institutions and the national authorities should prioritise:

1. The large financial support to those projects aiming at the decarbonisation of geographical islands,
2. The Consistency of the regulatory framework among the EU Member States at the larger extend possible, in particular when for the installation of new, low-carbon technologies, and
3. The cooperation with the relevant local stakeholders. By using a bottom-up approach, project partners can take into account the tailored needs at the planning phase of the project.

[i] M. Yaqoot, P. Diwan, and T. C. Kandpal, "Review of barriers to the dissemination of decentralized renewable energy systems," Renewable and Sustainable Energy Reviews, vol. 58. Elsevier Ltd, pp. 477–490, May 01, 2016. doi: 10.1016/j.rser.2015.12.224.