Project handbook

31/01/2021 (M3)

D1.5: Project handbook
WP1 "Coordination and project management", Task 1.1 "Procedural and quality management"

Authors: Marialaura Di Somma (ENEA); Amedeo Buonanno (ENEA); Martina Caliano (ENEA); Julia Merino (TECNALIA), Ata Khavari (DERlab); Christina Papadimitriou (FOSS), Loizos Loizou(FOSS), Gabriele Comodi (UNIVPM); Mark Thompson (ICONS); Andrei Morch (SINTEF)

Technical References

Project Acronym	eNeuron
Project Title	greEN Energy hUbs for local integRated energy cOmmunities optimizatioN
Project Coordinator	Marialaura Di Somma Department of Energy Technologies and Renewable Sources - Smart Grid and Energy Networks Lab, ENEA marialaura.disomma@enea.it
Technical Coordinator	Christina Papadimitriou FOSS Research Centre for Sustainable Energy, University of Cyprus papadimitriou.n.christina@ucy.ac.cy
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[1] PU = Public
PP = Restricted to other programme participants (including the Commission Services)
RE = Restricted to a group specified by the consortium (including the Commission Services)
CO = Confidential, only for members of the consortium (including the Commission Services)

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2	18.01.21	ENEA		Marialaura Di Somma, Martina Caliano, Amedeo Buonanno
3	24.01.21	FOSS		Christina Papadimitriou
3	25.01.21	DERlab		Ata Khavari

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Summary

The purpose of this document is to provide a detailed description of the work to be done in eNeuron project with the aim to promote an effective trans-disciplinary work in the consortium and ensure an adequate communication among partners. The document describes the project's goal, by presenting the specific and measurable objectives, which will be attained within the project duration. The concept underpinning eNeuron, the innovative methodology proposed, as well as the expected impacts together with the measures to maximize the impact of the project's results are presented.

The work plan is structured to allow a logical progression of the needed activities, and closely follows the objectives and methodology proposed. In detail, eNeuron project consists of nine work packages which are strongly interdependent. This strong correlation reflects both the GANTT and PERT charts. A detailed description of Work Packages, including definition of partners' roles, tasks, deliverables, and milestones is presented.

Moreover, the deliverable defines the key aspects of external communication and internal communication among partners, through the description of the channels to be used by the consortium, such as eNeuron project repository, web-meetings and physical meetings, project logo and templates and the social media.

Finally, the essential issue of dissemination and communication with external stakeholders is addressed. In this respect it is the objective of the consortium to work closely with the industry, operators, and policy entities and standardisation bodies for responding effectively to their needs and, at the same time, creating the right bi-directional communication and response for validating the identified solutions and developments.

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1 Introduction

1.1 Purpose and scope of the document

The main goal of the eNeuron project is to develop innovative tools for the optimal design and operation of local energy communities (LECs) integrating distributed energy resources (DER) and multiple energy carriers at different scales. This goal will be achieved, by having in mind all the potential benefits achievable for the different actors involved and by promoting the Energy Hub concept, as a conceptual model for controlling and managing multi-carrier and integrated energy systems in order to optimize their architecture and operation. In order to ensure both the short-term and the long-term sustainability of this new energy paradigm and thus support an effective implementation and deployment, economic and environmental aspects will be taken into account in the optimization tools through a multi-objective approach.

eNeuron's proposed tools enable tangible sustainability and energy security benefits for all the stakeholders in the LEC. Local prosumers (households, commercial and industrial actors) stand to benefit through the reduction of energy costs while leveraging local, low carbon energy. Developers and solution providers will find new opportunities for technologies as part of an integrated, replicable operational business model. Distribution system operators (DSOs) benefit from avoiding grid congestion and deferring network investments. Policy makers benefit from increasingly sustainable and secure energy supply systems.

eNeuron is a high TRL project in line with the Work Programme, by developing innovative approaches and methodologies to optimally plan and operate integrated LECs through the optimal selection and use of multiple energy carriers and by considering both short- and long-run priorities characterized by the economic and environmental sustainability. Through optimally coordinating all energy carriers and vectors, cost-effective and low-carbon solutions will be provided for fostering the deployment and implementation of this new energy paradigm at European level.

This deliverable D1.5 falls within the scope of WP1 "**Coordination and Project Management**" and has the main goal to provide a detailed description of the work to be done in eNeuron project with the aim to promote an effective trans-disciplinary work in the consortium and ensure an adequate communication among partners.

The project consists of 9 work packages, each of them with specific and measurable objectives. The entire work plan is structured to allow a logical progression of the needed activities, and follows the objectives and methodology proposed. This strong correlation among activities in the various WPs reflects both the GANTT and PERT charts.

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Regarding dissemination and communication issues, it is the objective of the consortium to work closely with the industry, operators, policy entities and standardisation bodies for responding effectively to their needs and at the same time creating the right bi-directional communication and response for validating the identified solutions and developments.

1.2 Structure of the document

The eNeuron project summary with the main project objectives and expected impacts is discussed in Section 2. The work plan including the detailed description of the Work Packages is described in Section 3. The project as a whole including the PERT and GANTT Charts is discussed in Section 4. The channels for internal communication among partners and external communication are described in Section 5. The key aspects of communication with external stakeholders and dissemination of the project results are discussed in Section 6.

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2 Project summary

The general information of eNeuron project are summarized below:

- **Project title**: greEN Energy hUbs for local integRated energy cOmmunities optimizatioN (eNeuron)
- **Grant Agreement number**: 957779
- **Starting date:** 01/11/2020
- **Duration in months:** 48
- **Call identifier:** H2020-LC-SC3-2018-2019-2020
- **Topic:** LC-SC3-ES-3-2018-2020
- **Type of Action:** Innovation Action (IA)
- **Total budget from EU:** € 5,731,117.50

The list of the beneficiaries is presented in the table below, whereas their locations is shown in Figure 1.

Table 1- eNeuron beneficiaries

Participant No. *	Participant organisation name	Short name
1	Agenzia Nazionale per le Nuove Tecnologie, l´Energia e lo Sviluppo Economico Sostenibile	ENEA
2	UNIVERSITY OF CYPRUS	UCY/FOSS
3	INSTYTUT ENERGETYKI	IEn
4	Fundacio Institut de Recerca de l'Energia de Catalunya	IREC
5	SINTEF Energi AS	SINTEF
6	Fundación TECNALIA Research and Innovation	TEC
7	European Distributed Energy Resources Laboratories e.V.	DERlab
8	EPRI Europe DAC	EPRI
9	Università Politecnica delle Marche	UNIVPM
10	Universidad Politécnica de Madrid	UPM
11	ENEA OPERATOR SP ZOO	ENEA OPERATOR
12	Skagerak Nett AS	Skagerak
13	LABELEC - ESTUDOS, DESENVOLVIMENTO E ACTIVIDADES LABORATORIALS SA	EDP LABELEC
14	Fondazione ICONS	ICONS
15	Eneida Wireless & Sensors, S.A	ENEIDA
16	Minitério da defesa Nacional - Marinha Portuguesa	Marinha
17	City of Bydgoszcz	CoB

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Figure 1 - eNeuron partners' location

Figure 1 also shows the locations of the four pilots that will be used for validating the eNeuron tools and the related technical solutions. The four eNeuron pilots are located in Poland, Norway, Portugal and Italy and will be described later in detail.

2.1 Challenges and eNeuron solution

The European Union (EU) set ambitious environmental and energy goals to design a low-carbon energy system by the middle of the 21st century. The EU climate and energy framework establishes targets by 2030 to a 40% reduction in greenhouse gas emissions (from 1990 levels), 32% share for renewable electricity and 32.5% improvement in energy efficiency. These ambitious targets can be achieved by developing energy systems to support the implementation of three primary goals: protecting the environment, creating affordable and market-oriented energy services, and ensuring security, reliability and resilience of energy supply. These targets also require a low-carbon electricity, heating, cooling and transport transition.

The ongoing energy transition brings new opportunities for DER integration and deployment, and for the evolution in the role of final users from passive consumers to active prosumers who both produce and consume energy. Local energy systems can potentially contribute to the EU energy and

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climate objectives, by helping reverse energy consumption and emission trends, as also highlighted in the Clean Energy Package for all Europeans [1] where LECs are recognised as an efficient and sustainable way of managing energy at a local community level – with or without a connection to distribution systems.

The LEC concept refers to a set of energy users deciding to make common choices in terms of satisfying their energy needs, in order to maximize the benefits deriving from this collegial approach, thanks to the implementation of a variety of electricity and heat technologies and energy storages and the optimized management of energy flows. Indeed, LECs are well-placed to meet local energy needs, reduce the need for transmission infrastructure, and bring people together to achieve common goals for well-being. DER within a LEC can also be employed to support the grid by providing ancillary services and flexibility through different products such as demand response (DR), congestion relief, local energy markets, etc. Local energy projects can also lead to job creation and economic growth, especially in rural areas, while fostering consumers' engagement.

Concerns for resilience and public acceptance of RES have motivated a growing interest in decentralised approaches in recent years. As compared to traditional centralised energy systems, decentralised local energy systems promote an enhanced focus on local security of energy supply. By representing locally and collectively organised energy systems, LECs are able to effectively integrate energy systems through a variety of local generation of electricity and heat, flexible demand, energy storages and electric mobility. As a result, LECs are able to fulfil the multi-energy demand of the communities' users through the optimised operation of local DER, by exploiting synergies among the various energy carriers. LECs can also serve as the centre of energy system decision making for the community while capturing the benefits locally. In addition, LECs aim not only to efficiently self-provide for the communities' users - under the concept of energy islands - but also to provide system services to neighbouring systems such as balancing and ancillary services. In addition, exploiting the interplay among different energy sources at local levels reduces RES curtailment, thereby supporting decarbonisation.

However, in order to achieve all these benefits, optimisation of the design and operation of a LEC is crucial. The wider range of potential actions by developers, asset owners, operators, and final users make optimisation of such systems a complex task, given the degrees of freedom in the design and operation phases. LEC formation must start from the basis of providing secure, reliable, cost-effective and self-sufficient energy as consumers and society have come to expect. From the design point of view, the planning of a LEC inherently involves multiple and conflicting objectives. For instance, the interest of developers in achieving a system configuration with lowest costs might conflict with the interest of EU energy legislation in public welfare in terms of sustainability of the energy supply. Overall economic operation of the system might conflict with the customer preference at the domestic level. Operation and scheduling tasks pose a challenge when considering the interaction between energy carriers (e.g., electricity, heat, cooling, etc.), which face different

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demand, technical, economic, and safety drivers. Novel approaches to identify equitable solutions are required to promote stakeholders' participation in the decision-making process and facilitate collective decisions.

In order to address these challenges, the main goal of eNeuron project is to develop innovative tools for the **optimal design and operation of LEC** for use by such communities. These tools focus in particular on integrating multiple energy carriers at different scales to identify the potential benefits achievable for the community and its stakeholders by adopting the Energy Hub (EH) concept. An EH is considered an abstract unit where multiple energy carriers can be converted, conditioned, stored and consumed. The EH concept is not limited to a certain size of the system: the concept enables the integration of an arbitrary number of energy carriers and products providing significant flexibility in system modelling architecture and operation. Due to this high flexibility, various real facilities can be modelled as EHs. The EH definition is thus seen as a conceptual model for controlling and managing multi-carrier and integrated energy systems across multiple scales, in order to optimize their architecture and operation.

Inherent flexibility of energy hubs allows introducing the concept of micro-energy hub (mEH) representing the prosumer (industrial, commercial or residential) within the community. Under this assumption, each micro-energy hub will represent an integrated energy system consisting of multi-energy generation, conversion and storage technologies to satisfy its own energy needs. In the eNeuron LEC, micro-energy hubs cooperate by sharing all energy carriers, with the aim to satisfy the energy needs of the entire local community represented by the Energy Hub. Community generation, and community storage systems are also involved through dedicated community energy management systems. The Energy Hub promotes local balancing as well as strategic exchanges with electrical external grids through coordination of exchange. In this way, the energy hub will always have interactions with larger systems, sustaining access to the largest pool of external resources possible, while leaving open the possibility of local resource optimization and provision of services to other hubs or the bulk system. The system as a whole will allow synergies between different sectors such as electricity, heat, cooling and transport (electric and hydrogen) as well as between different technologies. The interactions among micro-energy hubs within the LEC and with the larger system under eNeuron concept are shown in Figure 2. Micro-energy hubs can exchange energy locally. The connection to the larger system will allow covering the residual demand and selling excess or procuring shortfalls of energy as well as providing system services to the grid operators.

eNeuron's proposed tools enable tangible sustainability and energy security benefits for all the stakeholders in the LEC. In detail, local prosumers (households, commercial and industrial actors) stand to benefit through the reduction of energy costs while leveraging local, low carbon energy. Developers and solution providers will find new opportunities for technologies as part of an integrated, replicable operational business model. DSOs benefit from avoiding grid congestion and

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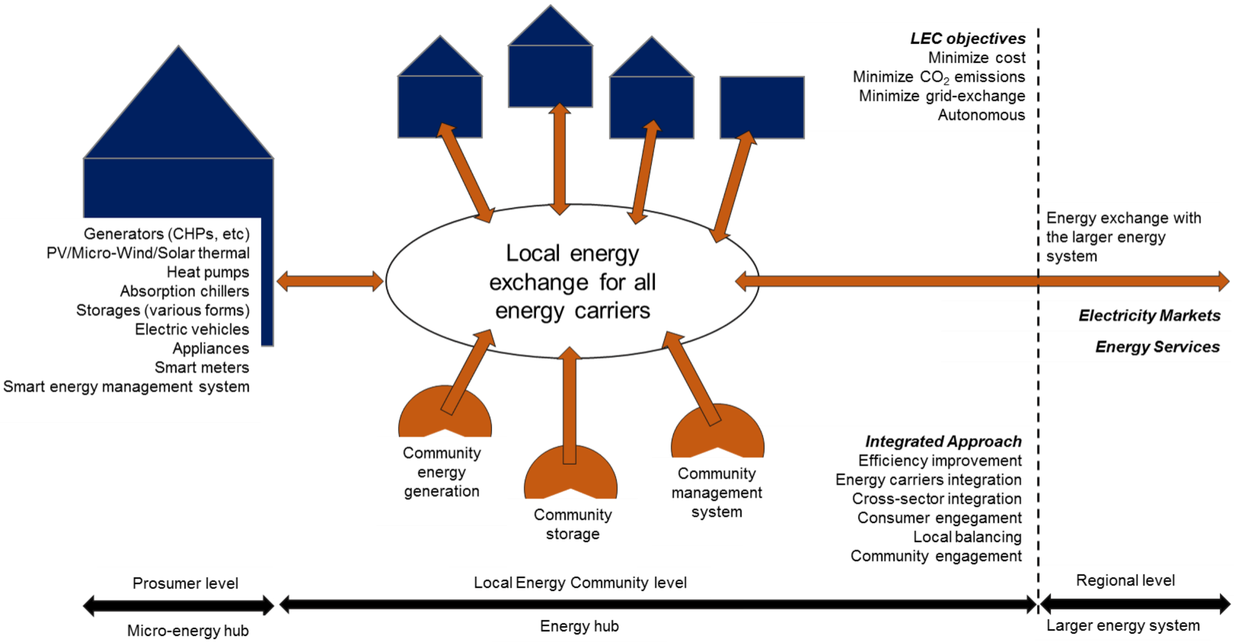

Figure 2 - Interactions among micro-energy hubs within the LEC and with the larger system under eNeuron concept

2.2 Project objectives

The main goal of eNeuron project is to develop a cloud-based solution with a web-based user interface tool for:

- the **long-term design optimisation of multi-carrier local integrated energy systems**, aiming at identifying the optimal architecture of such systems, in terms of optimised configuration alternatives through a multi-objective approach to account for both technical, economic and environmental priorities / objectives;
- the **optimal daily operation of the integrated systems** through a stochastic approach;
- the **simulation of peer-to-peer energy trading** to investigate the feasibility and convenience of the optimised scheduling strategies from the prosumers point of view in a local real time market employing blockchain technology.

The eNeuron tools will be designed to offer a set of functionalities for LEC (e.g. minimizing CAPEX through optimal investments on RES and other assets), operators (e.g. local congestion management) and prosumers (e.g. activate demand response and energy sharing).

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The specific, measurable objectives (O) of eNeuron which will be achieved within the project duration are described below. These objectives correspond to the main objectives of the WPs which will be measured through the deliverables to be released, the milestones to be achieved and relevant key performance indicators (KPIs), as discussed later.

- **Research objectives**
  - O1. Critical assessment of the current deployment of integrated local multi-vector energy systems (power, storage, heating & cooling (HVAC), transport) and corresponding supporting mechanisms, tools and technologies in Europe (WP2): eNeuron will identify current barriers and shortcomings to the optimal use of local energy resources within a multi carrier energy system and will work on the solutions and the recommendations for overcoming them.
  - O2. Identification of the "Integrated Local Energy Community" subject (WP3): eNeuron will critically assess existing and emerging EU regulatory developments, map the main enabling technologies for LECs and identify the key actors with potential interests for the implementation of this new energy paradigm .
  - O3. Development of the use cases and new business models for the eNeuron tool (WP3): In order to meet the needs of the key actors of energy communities, the consortium will identify and develop value propositions and use cases for LECs along with new business models that can be tested through the pilots.
  - O4. Development of multi-objective optimisation framework for an energy hub (WP4): The design optimisation framework for an energy hub will be developed through a general formulation problem taking into account all different carriers and technologies having multi objective criteria. This will be the basis of the eNeuron tool.
- **Innovation objectives**
  - O5. Development of the eNeuron tool (WP4): The eNeuron tool will be developed through a general and operational architectural model for multi-carrier energy systems that will allow optimal integration of the different energy carriers and vectors in the context of LECs.
  - O6. Development of software and hardware innovative devices (WP4): These devices will allow optimisation based on a hybrid approach of central optimization and a peer-to-peer (P2P) energy trading approach under a local integrated spot market following the developed business models.
  - O7. Development of the integrated local spot market (WP4): eNeuron foresees an integrated local real time market where all carriers are intertwined and that is the means of interfacing P2P (decentralised) and central dispatch operation within the LEC.
- **Demonstration objectives**

- O8. Validation of the eNeuron technical solutions for the multi-energy hubs in the lab environment (WP5): Through different laboratories made available in the consortium and by using the common testing methodology developed in the framework of the H2020 project ERIGrid, the projects' innovative technical solutions will be evaluated before going in pilots.
- O9. Pre-demonstration testing of the eNeuron tool: eNeuron tool and devices will be tested and optimised before being delivered in the pilots.

- **Pilot roll out objectives**
  - O10. Test the eNeuron approach in the pilots across Europe (WP6): eNeuron technical solutions will be implemented and tested into the four pilots that will be described later to provide the functionalities required in each context.
- **Dissemination, replication and exploitation objectives**
  - O11. Replication (WP7): Development of a replication and scalability plan for the eNeuron approach leveraging insights from pilots to ensure wide replicability and scalability across the EU.
  - O12. Stakeholders' engagement (WP8): Organisation of stakeholder workshops and other consultation activities to discover ways through which eNeuron can provide added value to the various actors in the context of energy communities, and means through which the functionalities of the tool can be embedded in the actors' business models, by also increasing the socio-economic impact of the project.
  - O13. Research communication and outreach to the broader community (WP8): Set up of effective communication channels and tools addressing wider target groups, including citizens and broader communities of stakeholders to increase awareness on the goals, achievements, benefits and impacts of the project.
  - O14. Dissemination of eNeuron outcomes to R&I community (WP8): Development of exploitation-oriented dissemination formats, publications in scientific journals and participation to relevant conferences, the BRIDGE initiative and public webinars, as well as active use of academic and research organisations such as EERA as multipliers to spread the eNeuron outcomes and encourage their uptake towards academia and the stakeholders' community.
  - O15. Enabling exploitation and sustainability (WP7, WP8): Design of an effective roadmap to market for each exploitable result and assessment of a sustainability framework supporting both exploitation and replication strategies.

2.3 Concept and methodology

2.3.1 eNeuron Concept and Functionalities

In the figure below, the main attributes of the building blocks of the eNeuron concept are shown.

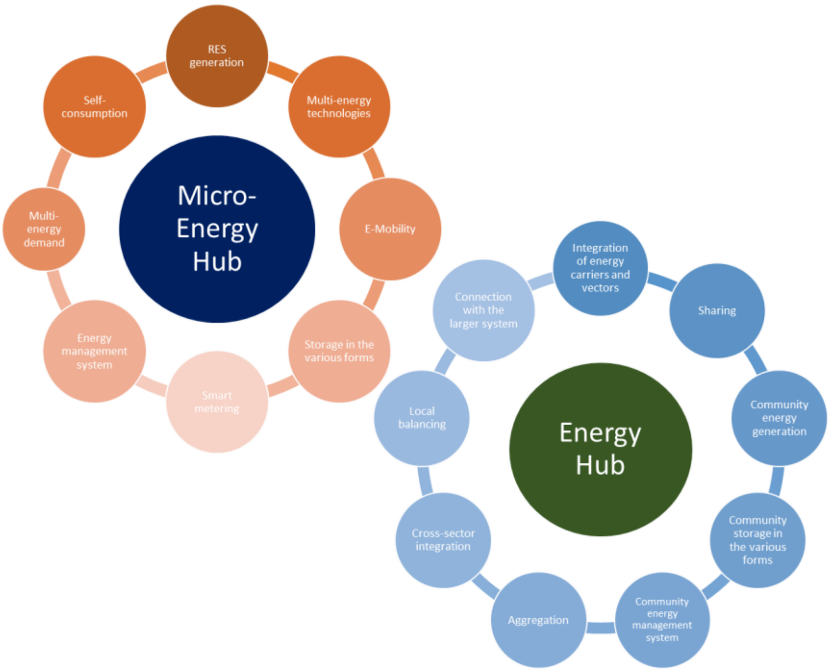

Figure 3 - Defining characteristics of the micro-energy hub and the energy hub in eNeuron project

The conceptual architecture of the eNeuron tool that will allow the fulfilling of the objectives above, is shown in the Figure 4 below, and both the reasoning and architecture are analysed below. The tool will offer benefits to the operators for each pilot and the LEC in all hierarchy levels meaning central level-LEC and lower level-actors of LEC supporting the concept of micro-energy and energy hubs.

eNeuron functionalities

The eNeuron tool will consist of two operational layers. The upper operational layer will deliver the design and daily operation optimisation of multi-carrier local integrated energy systems, through two composing stages. The upper layer based on a centralised optimisation interacts with the lower layer where decentralised operational optimisation will take place forming a hybrid and necessary approach for LECs and future business models in power grids. More specifically:

Upper Operational Level

The upper operational layer consists of two stages. **The first stage, based on the existing eTransport tool, will deal with the long-term design optimisation of multi-carrier local integrated energy systems**, aiming at identifying the optimal architecture of such systems, in terms of optimised configuration alternatives, related to selection of technologies, their quantities and sizes through a multi-objective approach to account for both technical, economic and environmental priorities / objectives. The output of this first stage will be the optimized configurations of the LEC as a whole

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(types, number and sizes of all technologies) considering the technical, economic and environmental objectives.

The second stage, **using as input the optimal architecture alternatives of the system, will deal with the stochastic daily operation of the integrated system**. Beyond this input, the main other inputs for this second optimization stage are:

- Day-ahead electricity prices
- Prices relevant for other energy carriers e.g. natural gas, biomass
- Residual RES and load forecasts springing from the P2P trading at micro-hub level (lower level)

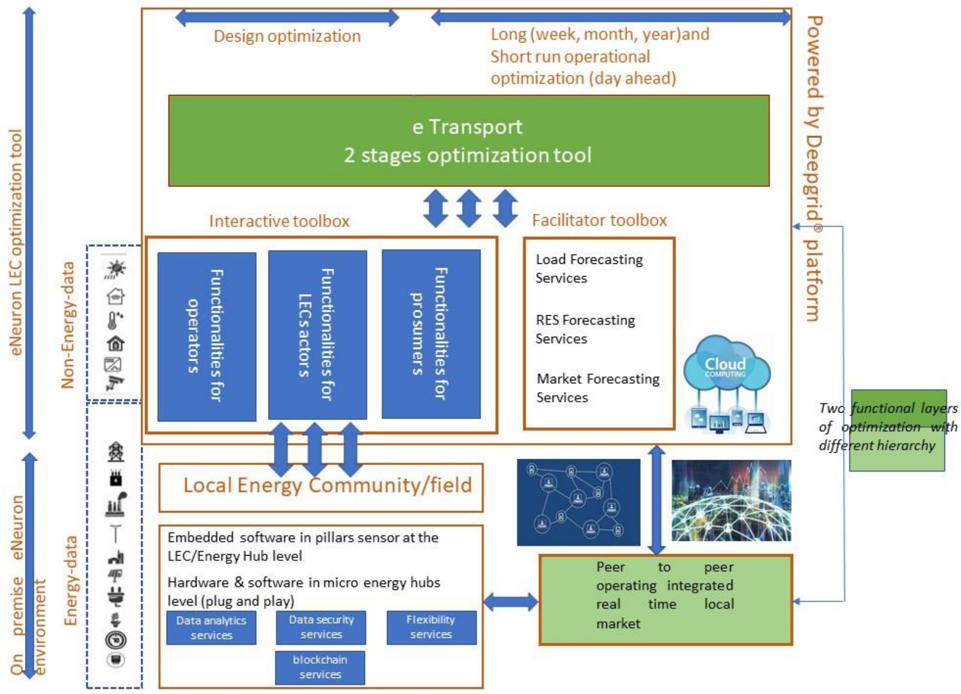

Figure 4 - Conceptual architecture of eNeuron

This **second stage** will deliver the **optimized daily operation schedules for the energy technologies in the LEC.** In order to deal with the stochastic behaviour of RES and loads, dependable forecasting tools will be used to predict these variables on a day-ahead frequency aiming to achieve an accurate scheduling of resources. The schedule will be optimized with the aim to maximize RES share within the local generation mix, by utilizing the properties of the multi-carrier energy system, battery energy storage systems (BESS) and demand response (DR).

Lower Operational Level

The lower operational level will interact with the upper operational level in the following way. The second stage of the tool will share the day-ahead optimal dispatching while **peer-to-peer energy trading will be simulated in order to investigate the feasibility and convenience of the optimised**

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scheduling strategies from the prosumers (micro-energy hub) point of view in a local real time market employing blockchain technology. The output of this simulation process at the closure of the market will be one of the inputs of the upper level as already mentioned above forming a loop that will offer the following to the LEC:

- Hybrid optimisation serving different horizons (day ahead and real time)
- Optimisation for both LEC (EH) and actors of the LEC (mEH)
- LEC can trade surplus or deficit of energy according to the feedback of the peers at a lower level.

eNeuron tool

The eNeuron tool will be cloud-based with a web-based user interface (based on DeepGrid platform), allowing LECs to design an optimal system (based on eTransport), utilizing a scenario-based operational optimisation (based on eTransport) and perform stochastic daily operational optimisation (new second stage tool) for a multi-energy carrier confined energy system. The second optimisation stage will be developed following a modular approach, where modules will correspond to energy carriers e.g. electric part, district heating and cooling, gas etc. This stage will be able to interact with the P2P market and forming the loop of the hybrid operational optimisation for both LEC and its actors. The eNeuron tool will be based on eTransport as already mentioned. eTransport is an optimisation tool focused on the long-term horizon used for design and operation of confined multi-carrier systems through a user-friendly graphical interface. The tool is module-based and builds an overall optimisation model based on the graphical construction of a system from several modules. eTransport combines economical and engineering aspects of the system in order to provide an holistic approach for the optimisation. The main inventory of this tool is presented below.

Table 2 – Main aspects of eTransport tool

Inventory	Inputs	Outputs
• Modules for technology characteristics. • Representation of several energy carriers. • Cost-minimizing optimisation.	• Technology costs. • Carbon emission costs. • Fuel costs. • Existing infrastructure. • Load profiles. • Investment options.	• Energy system design considering economic aspects. • System operation of representative days. • Costs and emissions.

Interactive Toolbox: Enables the functionalities that will be delivered and employed from the LECs i.e., from the pilots in this case. The main functionalities (analysed in pilots' section) are categorised per target as follows employing central or distributed optimisation techniques where needed.

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- ***Functionalities for operators***
- ***Functionalities for LEC***
- ***Functionalities for prosumers.***

Facilitator toolbox: Service algorithms, such as RES or demand forecasting feed back to both layers.
Load Forecasting: Will take input from the field and embedded software integrated into the substation. The time horizon of providing the load forecasting will be dependent on the historic dataset length and granularity. For certain features, high frequency but consequently short forecasts will be needed, while for others, low sampling which allows for longer time periods is ideal.
RES Forecasting: Will make use of the load historical data retrieved from the field unit, together with historical and forecasted solar irradiance data to determine the amount of PV area present and expected energy output. This forecast can be done as long as we have forecasted time series of load and solar irradiance, and be limited in length only in the same way load forecasting is. The forecasting will include only PV as they are impacting severely the distribution grid and represent the most popular RES expected to be included in integrated energy systems due to maturity of technology and its low cost.
Market Forecasting: After having an accurate forecast of the load and the amount of energy generated by PV, we can estimate the actual power that needs to be supplied. For example, the energy demand and supply in high PV density neighbourhoods can be accurately calculated in uncharacteristic periods of low injection.

On premise Environment- OPE-Lower operational layer
The on-premise environment consists of both software and hardware that employ the functionalities already presented and facilitate the lower operational layer objective. These assets are going to be developed within WP4 and supported as concept and theory by WP3 and WP5. The ultimate validation of the devices and embedded software will be done in field through the piloting within WP6. The main objectives of this layer are four fold:

- Provide all needed data to the upper layer to enable the functionalities
- Secure the two-way information between OPE and eNeuron tool
- Enable the P2P energy trading, through the decentralised optimisation approach at the micro energy hub level
- Secure the micro energy hub participation in the spot market.

Embedded software at the substation level: The software within the substation sensor provided by ENEIDA has the listed monitoring functionalities:
- Voltage and currents measurements;
- Power and power factor calculus;
- Total and individual harmonic distortion calculus for voltage and currents;

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- Energy accumulation;
- Network power quality function according IEC 61000-4-30 Class S;
- HV dead section and current fault alarms.

The advances for the eNeuron proposal will be presented later on.

Software and Hardware device at the micro energy hub level: The hardware device will be installed at the level of the micro energy hub as an extension of the smart meter. It will be developed from scratch and the embedded software will support:

- Data analytics;
- Flexibility services and interaction;
- Peer-to-peer energy trading through blockchain;
- Participation in the real time market.

Both eNeuron tool and OPE along with the spot market will be hosted by the already existing platform of ENEIDA (DeepGrid)**.** The main features of this platform are:

- Anticipation and prevention of current faults;
- Detection of faults on MV single phase;
- Measuring the quality of the network against regulatory baseline requirements;
- Identification of feeders and phases with higher technical losses;
- Mapping smart meters in substations, feeders and phases;
- Identification of areas with non-technical losses;
- Anticipation of power and current constraints by substation, feeder and lines;
- Identification of the best phase to connect a PV panel;
- Identification of the best feeder to connect an electric vehicle (EV) charger;
- Identification of the substations that can benefit the most by having distributed generation and batteries;
- Data Analytics and Global States: ranking substations or feeders or feeder-lines per key energy parameter (Voltage, Power Occupation; Current Imbalance; Neutral Magnitude);
- Load Forecasting for specific networks (from which a large historic is available).

2.3.2 eNeuron Methodological Approach

eNeuron project will adopt a User-Driven Innovation Approach towards addressing end-user and local needs (mEHs and EHs), which is critical for the successful project implementation and the realisation of its anticipated impacts. The User-Driven Innovation Approach aims to involve beneficiaries and energy value chain stakeholders throughout all stages of the project life-cycle, as key enablers of the eNeuron innovation process, towards encouraging active and collaborative contributions in the development of an optimal operating local integrated multi energy carrier system. Continuous Validation and Verification processes will be incorporated in the overall User-

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Driven Innovation Approach to manage cross-functional teams and ensure the establishment of an effective framework that will facilitate energy system optimisation through the EH concept and employing functionalities facilitated by big data analytics, data sharing and innovative energy services and applications. The User-Driven Innovation Methodology and Approach and Agile Development of eNeuron will be also supported by the establishment of the eNeuron cluster of Living Labs. Its creation is motivated by the understanding that a Living Lab can provide an excellent network for experience sharing and exchange towards user and business-driven open innovation as will be explained in WP5 description.

The Living Lab methodology will involve not only the partners labs but also end-users and beneficiaries from the very beginning of the project, creating the motivation to share and discuss requirements. This collaborative environment (that will be embraced by DERlab), where all partners and stakeholders co-create solutions, will lead to a natural acceptance by users who will be empowered not only to test, evaluate and report their own experience with the eNeuron solutions, but mainly to live with them, smoothly accept and incorporate eNeuron in their everyday lives and operations through the mEHs and EHs under the LECs concept.

The eNeuron implementation methodology involves the following steps to deliver the envisaged innovation:

- **Use cases Definition and Concept Screening:** This will be analysed within WP3. Detailed audits will be performed at the project demo participants, to landscape data sources and availability, understand operational processes and needs and motivate local demo partners to actively participate and share their experiences throughout the whole project duration.
- **eNeuron Tools prototyping:** The purpose of this step is to integrate solutions provided by the technology partners into the eNeuron tools, to enable the delivery of a fully-fledged, functional, integrated prototype which will be demonstrated to elicit user feedback and realize significant impact achievements. This step also comprises activities for the optimisation and fine-tuning of the eNeuron framework throughout the demonstration activities of the project (WP4 and WP5).
- **Demonstration / Piloting and Marketability Tests:** These tests represent the most important step for user engagement. Validation tests will involve a vast number of stakeholders and end-users involved in the eNeuron demonstrators. A second equally important testing goal will be to validate the impact claims regarding the optimisation of energy systems (as further analysed in next section). This step includes demonstration, performance verification, testing and validation towards replication. As part of this step, Pre-Validation Testing activities will be applied to ensure fulfilment of functional and non-functional requirements and specifications, prior to proceeding in the roll-out of the integrated framework in the pilot sites (WP6, WP7).
- **Business innovation planning:** Parallel to implementation activities, a business innovation plan will be developed to facilitate and prepare the commercialisation phase following the project end. This plan will detail sales strategy, continuous market and competition analysis

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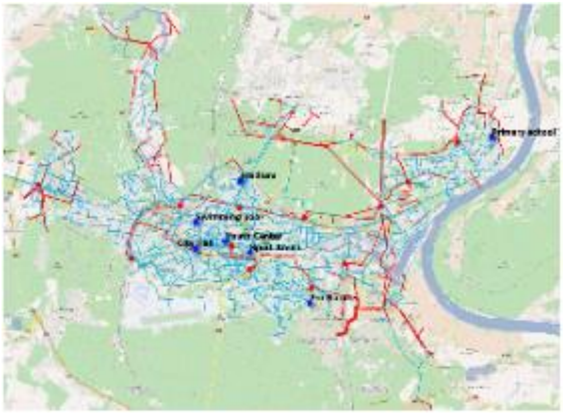
(including market intelligence and SWOT analysis), final marketing mix (e.g. pricing policy, promotion strategy, sales channel creation), operational plan, business unit exit strategy and financial projections.

2.3.4 The eNeuron pilots

The eNeuron project will count on four pilots distributed across Europe (Poland, Norway, Portugal and Italy), which will be used for validating the tool and the related technical solutions. The four eNeuron pilots are described below.

- ***The Polish Pilot: City of Bydgoszcz (ENEA Operator)***



The pilot covers the area of city of Bydgoszcz and its major energy nodes, connected to both LV (light blue) and MV grid (red). Most of them are newly constructed buildings with some degree of energy self-sufficiency; they are also equipped with smart meters registering 15-minute energy consumption profiles and 10-minute phase voltage profiles.
Nearly all MV/LV in the project area stations are at present equipped with balancing meters, connected to central AMI system by means of cellular network. 10-minute voltage and 15-minute energy import/export profiles are available with minimum delay (minutes), and also on-demand measurements are possible (P, Q, V, I, etc). Detailed network topology is available and modelled in PowerFactory. All actual P, Q, V, I measurements are available directly from primary substation, or indirectly from SCADA system, so that near real-time energy flow tracking management is achievable, and can be superimposed over detailed GIS map. This will deliver full insights into MV operation in visual way and lay foundation for the Polish Pilot demonstration.
The high-level management architecture proposed for the local energy system is based on central, master application concept, controlling micro energy hubs installed at each energy node (asset). The central application will coordinate the micro energy hubs so that they can act together and provide a number of functions, such as:

- Local energy management - in terms of loads and generation;
- Grid flexibility management;
- Maximisation of local generation – reduction of energy in-flow from Transmission System Operator (TSO) and the HV grid;
- Local energy system optimisation for basic ancillary services provision to the MV grid – local active grid congestion avoidance and voltage stability support.

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Table 3 - The Polish pilot

Energy carriers/ vectors	**Electricity, CHP turbine at the thermal waste processing plant**	
Multi-energy technologies	HVAC systems, PV systems; local battery storage (large scale UPSes), CHP generators	
Multi-energy asset	Power-to-heat (e.g., HVAC heat pumps); Combined heat and power (thermal waste processing plant - 200 MWh/day, 2GJ/day)	
Emerging technologies and technical characteristics	Demand Response from diverse flexible loads installed at participating energy nodes (micro energy hubs), temporary increase of energy generation from thermal waste processing plant.	Approx 500 kW of installed PV at city buildings. Approx 200 MWh daily (60 GWh yearly - 65% of total municipality needs) generation from thermal waste processing plant utilising CHP turbines. Planned in 2023: biogas power plant, 26 GWh yearly, 30% of municipality needs.
Existing assets with related description and technical characteristics	3 Primary substations; Approx 15 Secondary substations; Smart meters with AMI software system.	
Loads types	Varied demand portfolio that is well characterised and monitored: Bydgoszcz city hall, sports arena, football stadium, swimming pool, large primary school, cultural centre.	
Innovation in eNeuron	eNeuron will stimulate the development of local energy market and ancillary services provided to the grid. Operations of the thermal waste processing plant will be optimised, maximising the generation during peak hours and effectively lowering the in-feed from the HV grid within local energy hub.	

- ***The Norwegian Pilot: Skagerak Energy Lab (Skagerak)***

The Norwegian demo will be deployed at industrial size installation at operational football stadium, so-called "Skagerak Energy Lab", combining a big-scale (800 kW) PV generation plant, with BESS (1 MWh) and power electronics allowing several operational modes for the unit, including fully islanded operation. The adjacent area includes several commercial and household end-users and several EV charging units.

The planned demonstration will be closely coordinated with Skagerak Nett, which operates the installation, and aligned with the planned test and development program. The demonstration intends to utilise two important high TRL assets – the physical installation at the stadium and eTransport optimisation tool in order to study:

- Using eTransport for operational optimisation of the installation in different modes, including (preliminary):
    - optimisation of PV production and consumption;
    - use of the installation as a flexibility resource;
    - islanded operation: supplier of the emergency power.

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- Using eTransport for development and comparative evaluation of alternative expansions of the installation through using additional energy vectors, which would allow to maximise the RES-based generation and maintain secure and reliable power supply.
- Input to further development of eTransport based on data and learnings from the demonstration.

The results and learnings from the pilot will provide input to the overall validation of the decarbonisation solution and its optimisation potential in the present and extended configuration, where extension scenarios can be evaluated.

Table 4 - The Norwegian pilot

Energy carriers / vectors	**Electricity, Transport/Electric Vehicles, Storage/Hydrogen**			
Multi-energy technologies	Extension to additional technologies powered by carrier other than electricity will be explored			
Emerging technologies and technical characteristics	PV: 800 kWp installed capacity; panels' area: 4300 m^2 Normal annual production: 660 MWh	Demand response: several commercial customers in the confined system	BESS: 1 MWh Power: 800 kW	EV chargers
Existing assets with related description and technical characteristics	PV panels and control system	Smart meters	Electrical storage and control system	Two charging outlets
Loads types	Commercial electric loads (grocery stores)	Office electric loads (office premises)	Households electric loads (apartment buildings)	
Innovation in eNeuron	The main innovation part lays in deployment and validation of multi-criteria optimisation of design and operation of confined energy system i.e. LEC with several energy vectors embedded.			

- ***The Portuguese Pilot: Lisbon's Naval Base Energy Hub (EDP LABELEC/Marinha)***

The envisioned demonstration comprises a local energy system – a urban district – within the Lisbon's Naval Base campus, property of the Portuguese Navy - Marinha Portuguesa. The proposed pilot site presents the opportunity to optimise the electricity system operation in eNeuron with other energy carriers/vectors, not just electricity but also heating/cooling, transport and/or industry in a sector-coupling approach,

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increasing the hosting capacity for RES at local level. The Hub's border will be a MV/MV substation, since the military facility has its own distribution grid. The substation powers two different networks, a 6kV / 50Hz network, comprising residential and industrial loads – naval station buildings and the department of propulsion and energy workshops, and a 6kV / 60Hz network, comprising the docks and the battleships.

From the different types of loads available we may consider, lighting circuits, HVAC systems, boilers, and industrial appliances, e.g., ovens. Distributed generation and other energy resources to consider are: ship's diesel generators and batteries, PV systems in parking and buildings' rooftops and an EV charging station.

The high-level management architecture proposed for the local energy system is based on a master-slave approach, where a system aggregator for the entire Hub will coordinate and manage micro Energy Hubs, i.e., small scale systems comprised by a secondary-substation and its LV circuits, or a small campus and its cluster of buildings. Slave micro Energy Hubs will be governed in an automated way, targeting a certain degree of self-optimisation and functional independence, taking into consideration the characteristics of the available assets and flexibility.

The main applications to explore will be:

- Local energy and flexibility forecasting;
- Peer-to-peer energy and flexibility trading;
- Local system's optimisation for basic ancillary services provision to the MV grid connection node – local active grid congestion avoidance and voltage support.

Table 5 - The Portuguese pilot

<table>
<tr><td>Energy carriers</td><td colspan="3">Electricity (including peer-to-peer energy and flexibility trading), heating and cooling, transportation (e-mobility)</td></tr>
<tr><td>Multi-energy technologies</td><td colspan="3">EV charging stations, HVAC systems, PV systems, appliances (e.g., boilers)</td></tr>
<tr><td>Multi-energy asset</td><td colspan="3">Power-to-heat (e.g., HVAC heat pumps); Power-to-mobility (e.g., EV chargers)</td></tr>
<tr><td>Emerging technologies and technical characteristics</td><td colspan="2">Demand response from diverse flexible loads within the three hubs, workshops of the department of propulsion and energy, buildings of the naval station, wharfs with docks and ships (B/HEMS and network's real-time monitoring and control system to be installed)</td><td>PV generation - 1MW (to be installed)</td></tr>
<tr><td>Existing assets with related description and technical characteristics</td><td colspan="2">1 substation (30/6kV);
3 secondary substations (6/0.4kV 50Hz 1MVA, 30/0.4 kV 50Hz 1.25MVA and 6/0.4 kV 60Hz 1MVA);
Dynamic converters (6/6kV 50/60 Hz 3.5 MVA).</td><td>EV charger AC 22 kVA (2 vehicles)</td></tr>
<tr><td>Loads types</td><td>Appliances within the workshops of the department of propulsion and energy, e.g., industrial machines and ovens (thermal and electrical)</td><td>Appliances within the buildings of the naval station, e.g., lighting, HVAC, and boilers (thermal and electrical)</td><td>Appliances within the wharfs (docks and ships), e.g., ships' systems, batteries and diesel</td></tr>
</table>

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			generators (thermal and electrical)
Innovation in eNeuron	Within a delimited system, the proposed Energy Hub comprising Lisbon's Naval Base, combine the aggregated potential of the following energy vectors – electricity, heating and cooling, transportation, to optimise the local system's operation by increasing RES share and promoting higher energy efficiency. The number of mEHs governed by the Aggregator Hub is not limited. Adding new mEHs will be straightforward thanks to 'wizard function' where required mEHs parameters and structure will be defined by the system administrator before setup; Moreover, a 'grid agent' approach may be applied, where mEH role will operate in an agent-like manner, being supplied with actual setpoints (i.e. operational vectors) to execute atomic functions (down to single load/generator level) autonomously, trying to achieve a global goal for the itself and for the clustered system. mEH software module will report its actual state and completeness of set goals to the Aggregator Hub governing software.		

- ***The Italian Pilot: Montedago site in Ancona (UNIVPM)***

Università Politecnica delle Marche (UNIVPM) is located in the Marche Region, in Central Italy. It has different campuses spread in the Region. UNIVPM can be considered as an Energy hub with four sub hubs in sites spread over the city of Ancona (Italy). UNIVPM accounts for a total of around 17,000 people among students and staff. These sites consist mostly of school and offices, and among these the site of Monte Dago is a multi-energy microgrid (micro-energy hub).

This demo focuses on the four main sites located in the town of Ancona, the main city of the Region.

- Montedago multi-energy microgrid (three faculties: Engineering, Life Sciences and Agriculture);
- Faculty of Economics;
- Faculty of Medical Sciences;
- UNIVPM Rectorate (headquarter).

Sites 2, 3 and 4 are almost passive users with no DER. Site 1 is a multi energy-microgrid. The Italian pilots aims at:

- demonstrating the role of both UNIVPM (acting as an "energy aggregator" of these four sites) and of the Montedago multi-energy microgrid (acting as a micro- energy hub);

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- demonstrating that the higher integration among energy vectors/networks (natural gas, electricity, district heating/cooling, hydrogen and transports) contributes to increase the flexibility of the energy system in presence of a high share of renewable energy.

Table 6 - The Italian pilot

<table>
<tr><td>Energy carriers</td><td colspan="4">Electricity, heating, cooling, natural gas</td></tr>
<tr><td>Multi-energy technologies</td><td colspan="4">CCHP system in the Montedago site</td></tr>
<tr><td>Multi-energy asset</td><td colspan="4">The CCHP system in the Montedago site (570 kWe and 661 kWth,) feeds a district heating network connecting multiple buildings; some of them are also equipped with absorption chillers to supply space cooling during the summer (district cooling)</td></tr>
<tr><td>Emerging technologies and technical characteristics</td><td>PV system: approximately 30 kWp in the Montedago site</td><td colspan="2">HCPV system: 7 kWp in the Montedago site</td><td>Lithium-ion battery storage: 15 kWh to be installed soon in the Montedago campus</td></tr>
<tr><td>Existing assets with related description and technical characteritics</td><td colspan="2">Apartment size nanogrid lab (PV, heat pump, smart appl., EMS etc.)</td><td colspan="2">Smart building with PV, storage and monitoring system</td></tr>
<tr><td>Loads types</td><td>Office Load 1 (Smart building, located in Monte Dago campus)</td><td>Office load 2 (Passive, located in Villarey campus)</td><td>Office Load 3 (Passive, located in Rettorato)</td><td>Office Load 4 (Passive, located in Medicina campus)</td></tr>
<tr><td>Innovation in eNeuron</td><td colspan="4">Optimal usage of renewable electricity by means of the optimal dispatch and coordination between a PV system and a set of additional storage and conversion technologies, also exploiting the synergies among different energy vectors. Specifically, the hardware deployed in the project allows to also demonstrate the role that hydrogen and electric vehicles can have in achieving so.
Optimal scheduling of DER (CHP), energy storage (electric storage, hydrogen, EVs) and loads (smart building and nanogrid lab) to provide flexibility to the microgrid by exploiting the synergies among different energy vectors. In particular, the role of hydrogen and EV will be investigated theoretically and experimentally in the pilot.
Optimal planning of future scenarios for the UNIVPM hub.
Use and test of “second life” batteries, that is batteries already used for e-mobility purposes and then re-used for stationary applications.</td></tr>
</table>

The coverage of eNeuron functionalities by the four pilots is shown in the figure below.

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Functionalities for operators	*Functionalities for LEC*	*Functionalities for prosumers*
"Soft islanding" functionalities- using DER and energy storage Skagerak Nett, Università Politecnica delle Marche	*Technical and economical optimization for vectors cooperation with high RES penetration. LEC minimizes its OPEX by optimally scheduling the consumption of its end users, the production of its RES and other.* Enea Operator, Skagerak Nett, edp, Università Politecnica delle Marche	*Activate Demand Response and energy sharing through different approaches, e.g., peer to peer, aggregation etc.* Enea Operator, edp, Università Politecnica delle Marche
Local congestion management Enea Operator, Skagerak Nett, edp	*Facilitate local DER development by intelligent management* Enea Operator, Skagerak Nett, edp, Università Politecnica delle Marche	*Optimise operation and architecture for the system of End-users (Optimisation of Micro Energy Hubs)* Enea Operator, Skagerak Nett, edp
Increase MV automation level – tie-points with remote control Enea Operator	*LEC minimizes CAPEX by making optimal investments (i.e. optimal localisation sizing) on RES and other assets of all carriers* Enea Operator, Skagerak Nett	
Ancillary services provided by LEC to enhance flexibility (frequency, voltage support etc.) Enea Operator, Skagerak Nett, edp	*Reduce energy intake by maximising local generation thus decarbonizing" the locally consumed energy* Enea Operator, Skagerak Nett, edp, Università Politecnica delle Marche	

Figure 5 - Coverage of eNeuron functionalities for operators, LEC and prosumers by the pilots

2.4 Impacts

In accordance with the outlined objectives of previous section, eNeuron's contribution to the expected impacts of the call is presented below.

Impact 1# Validate solutions for decarbonisation of the local energy system while ensuring a positive impact on the wider energy infrastructure, on the local economy and local social aspects, and local air quality.

eNeuron will offer decarbonisaton solutions through the eNeuron tool in the following ways:

- Develop a general methodology to recognise and optimise a local energy system's architecture, operation, participants and their market roles. This will enable the LECs to plan their infrastructure, operation and expansion in the optimal way in both the short and long term.
- The methodology above would also be beneficial in determining the LEC's long term strategy for ensuring economical and societal benefits for all actors, e.g. high peak loads caused by

EV chargers would encourage investment in residential battery storage with coordinated management and DR participation through eNeuron devices.

- Increase accommodation and minimise curtailment of RES in local distribution networks through optimal operation across different energy vectors.
- Promote both the energy adequacy of the LEC and energy efficiency of the local consumers through the hybrid approach of the operational layers.
- P2P collaboration among the mEH promotes local social cohesion.
- As eNeuron is based on the Web-of-Cells concept developed in ELECTRA project, actors within the LEC have the right not to participate if they prefer, without being socially excluded.
- Increase of RES integration and optimal combinations of multi carrier systems will greatly decrease CO_2 emissions and contribute to enhancing local air quality.

Impact 2# Enhance the involvement of local energy consumers and producers, preferably by creating energy communities in the development and the operation of local energy systems and test new business models

- LEC are created under the EH concept, improving the energy capacity and efficiency of the area by optimally designing and operating multi carrier energy systems.
- Local energy consumers are encouraged to participate in central optimisation goals through DR and other incentives, as well as participate in the P2P market trying to achieve the overall LEC objectives while also maintaining energy efficiency within their individual household.
- The LEC level can offer generic flexibility resources to the wider grid and in doing so generates additional revenue. Depending on the different business models that will be developed, such revenue can be distributed among participating consumers. e.g., 'Virtual energy account' for prosumers where bonuses are offered for provision of flexibility.
- The eNeuron tool will offer data analytics and communication to the LEC, encouraging local actor involvement.

Impact 3# Validate approaches, strategies and tools to safely and securely operate an integrated local energy system across energy vectors (electricity, heating, cooling, water, wastes, etc.) so that it is able to integrate higher shares of renewables – higher than it would in case of separate operation of infrastructures (business as usual)

The eNeuron tool considers the different carriers/vectors within an area and determines the optimal energy mix by calculating optimal dispatch and scheduling to achieve multi-objective criteria. This allows larger penetrations of RES to be integrated by employing a more diverse range of energy carriers, as efficiencies can be made in balancing energy between different vectors at different times of day. The eNeuron tool will develop strategies for accommodating a higher share

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of renewables by shifting generated energy to other energy carriers and/or storage. These strategies will be designed, simulated in labs, and deployed in the field through the four pilots.

Impact 4# Benchmark technical solutions and business models that can be replicated in many local regions and are acceptable by local citizens

- Develop a technical solution/business model matrix for quick assessment of the most viable solutions that can be applied to a given LEC. These will be assessed within each pilot, which are complementary but diverse.
- A solid methodology and exploitation plan will be developed with replicability in mind, which can be employed in most local regions and will encompass the lessons learned from the project pilots.

2.4.1 Quantified summary of expected eNeuron impact

A summary of the technical indicators of eNeuron are presented below, and will be used to measure eNeuron's progress against the technical measurable objectives presented in Section 2.2

Table 7 - eNeuron KPIs and connection to the project's objectives

Impact category / KPI	**Target**	**Connection to the objectives**
Roadmap report for mapping the multi vector energy systems.	**1**	**O1**
Report with the technological solutions that will be considered in the development of the eNeuron tool.	**1**	
Technological solutions to be introduced in the pilots.	**>4**	
Report describing the emerging technologies which could be part of a LEC, the key actors and the main issues with implementation and adaptation.	**1**	**O2**
Use cases for each pilot employing the eNeuron tool functionalities.	**>16**	**O3**
Business models based on the LEC concept aligned with the pilots' needs.	**>3**	
Report on the EH concept and the multi objective programming approach of an EH.	**1**	**O4,O5,O6**
eNeuron tool platform.	**1**	
Smart applications for LEC actors (with sub apps) and services for a variety of electricity sector stakeholders.	**≥3**	
Hardware eNeuron devices.	**≥ 40**	
Testing plan for all labs and cluster of labs	**≥1**	**O7**
Simulation scenarios of EH algorithms.	**≥ 15**	
Optimisation cycle for each product.	**≥3**	**O8**
Over 10 months of field validation in 4 large-scale demonstrations with different cases.	**≥10 months**	**O9**

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	4 pilots ≥12 cases	
Target flexibility as a percentage of annual energy consumption.	**>10%**	
Self-consumption, energy efficiency and flexibility management.	**>50%**	
Energy savings for consumers.	**30-35%**	
Reduction of levelised cost of energy for RES operators.	**~30%**	
Reduction of O&M Costs for network operators, RES operators and facility managers.	**~30%**	
Reduction of network losses.	**22%**	
Network and assets down-time reduction.	**40-50%**	
Regulated comfort and air quality in building environments.	**80%**	
Reduction in total annual cost for LEC (energy cost + annualised investment cost + O&M costs) as compared to conventional energy supply system (power grid, conventional boilers and electric chillers).	**30-35%**	
Reduction in daily energy cost for LEC as compared to conventional energy supply system (power grid, conventional boilers and electric chillers).	**30-40%**	
Reduction in daily and annual CO_2 emissions as compared to conventional energy supply system (power grid, conventional boilers and electric chillers).	**30-48%**	

2.4.2 Other Socio-economic and Environmental Impacts

eNeuron is expected to contribute to the avoidance of the anticipated curtailment of RES in the high RES scenario of the EU Energy roadmap 2050, estimated at 217 TWh. Subsequently, additional investments in conventional generation capacity will be avoided, offering significant economic savings estimated at €50B in deferred investment for peak generation capacity (75 GW of avoided conventional generation capacity) and respective transmission and distribution grid reinforcements. The avoidance of this extra conventional generation capacity will lead to 100 million tons of CO_2 emissions reduction annually while the (almost) full decarbonisation of the electricity grid with the integration of large shares of renewables (over 90%) until 2050 will result in over 1 billion tons annual CO_2 emissions reduction (through the avoidance of 2,500 TWh generated in conventional power plants). This is directly linked to the quality of air for the consumers as well.

Moreover, eNeuron will support the self-consumption model within LEC. Where the consumption patterns align well with onsite renewable generation, high rates of self-consumption and self-sufficiency can be achieved jointly. In this situation, renewable energy self-consumption can result in a number of benefits for both consumers and the whole energy system. It can facilitate consumer empowerment by allowing active participation and profit from energy markets, as well as encouraging smarter consumption patterns. Finally, self-consumption can make an important

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contribution to finance the energy transition. Commercial consumers (e.g. business, industries, SMEs, smart cities, etc.) can attain high rates of renewable electricity self-consumption (50%-80%). In socio-economic terms, the main impact of the proliferation of the eNeuron solution will be observed in employment. It is estimated that for every conventional GWh reduction, about 0.17 to 0.6 jobs are created in the EU. This could translate to anywhere between 40,000-150,000 jobs created in the long-term (until 2050) in the EU, only by avoiding the curtailment of 217 TWh of distributed RES output. Finally, eNeuron is expected to significantly contribute to the tackling of the energy poverty problem around the EU. Nearly 11% of the EU's population is in a situation where they are not able to adequately heat their homes at an affordable cost. eNeuron will contribute to effectively tackling this situation, both directly during the project, and also indirectly through the definition of a targeted exploitation / replication strategy, considering energy poverty-affected countries as a primary target group. Furthermore, wide deployment of the eNeuron solution can prove to be a highly effective way for increasing security of supply by contributing to the significant reduction of fossil fuels imports of the remote areas, on which heating heavily relies on. Analysis shows that every additional 1% of renewable energy integrated in the grid leads to reduction of about 2.6% in gas imports. Increased integration of RES facilitated by the full deployment of eNeuron can lead to 14% reduction in gas imports and €50B annually in the EU Energy Imports Bill.

eNeuron will produce several exploitable results with exploitation pathways both in the commercial and non-commercial areas as indicated in the table below.

Table 8 - eNeuron key exploitable results

Exploitable Result	**Description of result**	**Exploitation pathway**
Framework analysis of integrated local multi-vector energy systems	**<u>Type</u>:** Advancement in knowledge **<u>Access</u>**: Open **<u>IP ownership</u>:** WP2 partners **<u>IPR</u>:** Copyright in publications, SOFT IP (company know how) for internal leverage in partners' strategies	i) Instrumental to the execution of the project; ii) Scientific exploitation (further research, publications); iii) Links to D&C activities to enable leverage by key stakeholders outside the project
Use cases and business model of integrated local multi-vector energy systems	**<u>Type</u>:** Innovative models **<u>Access</u>**: Open **<u>IP ownership</u>:** WP3 partners **<u>IPR</u>:** Copyright in publications, SOFT IP (company know how) for internal leverage in partners' strategies	i) Embedded in business models of eNeuron partners and in particular in EPRI IncubateEnergy programme and, in the industrial area, in EDP, ENEA Operator and SKAGERAK strategy; ii) Launch of expert services/enhancement of existing services; iii) Scientific exploitation (further research, publications); iv) Links to D&C activities to foster uptake of the business model and replication of use cases across the EU

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Optimisation of Energy Hubs	**Type:** Methodology/guidelines/recommendations **Access**: Open **IP ownership**: WP4, WP7 **IPR:** Copyright in publications, SOFT IP (company know how) for internal leverage in partners' strategies	i) Embedded in business models and go-to-market of eNeuron partners; ii) Launch of expert services/enhancement of existing services (e.g. Derlab testing services, EDP/ENEA Operator new services to energy users); iii) Scientific exploitation (further research, publications); iv) Leverage in pilots for upscaling plans; v) Policy recommendations; vi) Links to D&C activities to foster replication as well as further technology developments
eNeuron Digital Tools	**Type:** Technologies **Access**: Restricted **IP ownership**: SINTEF, ENEA, UCY, IEn, TEC, DERlab, EPRI, UNIVPM, UPM, ENEIDA_ **IPR:** Software copyright, possible patent for the hardware component	i) Set up of a legal entity led by ENEIDA for the joint exploitation of the eNeuron tool; ii) Licensing of solutions (research centres and universities such as IREC); iii) Launch of enabled services/integration in existing portfolio (e.g. SINTEF, FOSS, ENEA); iv) Transfer to other organisations (UPM 50+ SME spin offs, EAC in Cyprus, etc.); v) Scientific exploitation (further research, publications); vi) Upscaling by partners in pilots; vii) Replicability plan outside project boundaries; viii) Links to D&C activities to drive market uptake.

Within the project time frame, all KERs above will be re-evaluated and linked directly with the KPIs to measure the impact and the replicability&scalability of the project's results. This will be done under the BRIDGE TF Replicability and Scalability that eNeuron is participating.

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3 Work Plan – detailed implementation

3.1 Summary of Work Packages

The work plan is structured to allow a logical progression of the required activities and follows the objectives and methodology described earlier. The project will be implemented through nine (9) WPs, which are briefly described below:

WP1 "Coordination and project management" aims at the timely delivery and high quality of the project results through overall monitoring, efficient organisational and financial coordination, as well as on-going quality control, and meeting contractual commitments to the European Commission (EC).

WP2 "Limitations and shortcomings for optimal use of local resources" aims at analysing the current status of integrated energy systems deployment in Europe, by identifying the limitations and shortcomings for the optimal use of local resources. The results of this WP will be used as input for the development of eNeuron use cases and business models in WP3 and for the functional specifications of the demos in WP6.

WP3 "Identification of the "Local Integrated Energy Community" subject and definition of the Use Cases" has the goal to identify the "Local Integrated Energy Community" subject based on the most recent regulatory developments and policies in Europe and in the countries represented in the consortium, as well as to define a detailed mapping of the main enabling technologies and the key actors for the implementation of this energy paradigm at local level. The eNeuron use cases and business models will be developed, considering the specific characteristics of the pilots. This WP will receive input from WP2, and will provide output to WP4 where the eNeuron tool will be developed, as well as to WP5 and WP6, where the energy hub solutions will be validated in a lab and field environments, respectively.

WP4 "Analysis, design and operation optimisation of the local energy systems: emergence of energy hubs" is the technical core of this proposal. The goal of WP4 is to provide a general methodology of optimising the design and operation of a multi carrier integrated energy system. This WP will develop the eNeuron tool and its functionalities that will support the proposal objectives and will be employed and tested in the pilots. Both software and hardware solutions will be developed within this WP, which will strongly interact with all the other technical WPs.

WP5 "Validation of energy hub solutions through simulation and testing in a lab environment" aims to simulate and validate in lab environment the technical solutions developed for the energy hubs in WP4. The main goal is to test the new concepts and use cases developed in eNeuron before pilot deployment. This WP will strongly interact with WP3 and WP4, in order to detect the

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bottlenecks that could exist prior to test the innovative concepts in realistic large scale scenarios in WP6.

WP6 “Pilot Roll out and Real world Testing” aims to deliver eNeuron solutions that are developed in WP4 and simulated within WP5 in real systems across Europe. Four different pilots are included to test all solutions and all functionalities to validate the eNeuron concept and approach. The pilots encompass a variation of energy carriers, which can bring added value to the project by employing different functionalities, or the same functionalities to foster different needs.

WP7 “Evaluation of results: Replicability and scalability” aims to evaluate and analyse the results from previous packages. Through this package a solid methodology to replicate and scale the solutions and achievements of the eNeuron proposal at European level will be built.

WP8 “Communication, Dissemination and Exploitation” aims to maximize the impact of eNeuron through the development of a proper C&D strategy which will be impact-driven, multi-stakeholder and multi-channel. This WP will ensure that the developed knowledge will be exploited on an international scale among industry, key users, national and international authorities, standardisation bodies and other relevant stakeholders. In order to present the external identity of the project in a consistent way in all communication material, a project visual identity will be developed through project logo, website, social media, flyers, brochures, newsletter, etc. Scientific results will be published as papers in technical journals and/or presented at international conferences, aiming at scientific dissemination of relevant outcomes. Knowledge transfer will be ensured through regular exchanges, physical workshops or other joint activities. In addition, a stakeholder analysis will be performed in order to establish cooperation and to get feedback on the project results and activities. Finally, a strategic exploitation plan will be developed in order to transfer the project results and models to the industry and identify the target groups in different market sectors.

WP9 “Ethics requirements” aims to set out the 'ethics requirements' that the project must comply with.

3.2 Work Packages description

3.2.1 Work Package 1 “Coordination and Project Management”

The main goals of WP1 are listed below:

- managing the project resources;
- ensuring compliance with the Grant Agreement and the Consortium Agreement;
- coordinating the interaction between partners and WPs;

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- ensuring that deadlines are met within the Consortium;
- coordinating the overall evaluation of results and deliverables;
- technical and financial reporting;
- managing administrative, legal and financial issues.

This WP is linked to all others and will ensure communication among WPs, and between the eNeuron Consortium and the EC. WP1 will receive information and results coming from WP2 – WP8 activities and from the linked activities within other relevant European platforms and initiatives.

WP1 runs for the entire project duration and consists of two tasks (described below) coordinated by ENEA with the support of the TPC and the involvement of all partners. The timeline for WP1 is shown in the table below.

No milestones are associated to this WP.

Table 9 - Timeline for WP1

Activity	Start	Stop	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WP1: Coordination and Project Management	1	48																								
Task 1.1: Procedural and quality management	1	48		D	D			D						D			D									D
Task 1.2. Management and reporting on administrative and financial aspects	1	48																								
			2020-11-01	2020-12-01	2021-01-01	2021-02-01	2021-03-01	2021-04-01	2021-05-01	2021-06-01	2021-07-01	2021-08-01	2021-09-01	2021-10-01	2021-11-01	2021-12-01	2022-01-01	2022-02-01	2022-03-01	2022-04-01	2022-05-01	2021-06-01	2022-07-01	2022-08-01	2022-09-01	2022-10-01

Activity	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
WP1: Coordination and Project Management																								
Task 1.1: Procedural and quality management						D	D					D									D		D	D
Task 1.2. Management and reporting on administrative and financial aspects																								
	2022-11-01	2022-12-01	2023-01-01	2023-02-01	2023-03-01	2023-04-01	2023-05-01	2023-06-01	2023-07-01	2023-08-01	2023-09-01	2023-10-01	2023-11-01	2023-12-01	2024-01-01	2024-02-01	2024-03-01	2024-04-01	2024-05-01	2024-06-01	2024-07-01	2024-08-01	2024-09-01	2024-10-01

Task 1.1 - Procedural and quality management (M1 - M48)

This task aims to establish the procedures and guidelines for a proper project management and quality assurance of the project results.

Within this task, a project handbook will be developed for the detailed description of work (DoW) in order to promote effective interdisciplinary work in the consortium, and ensure adequate communication among partners. The handbook will specify the scientific and technical approach for all WPs and related tasks, expected sources of knowledge, relationships among WPs and tasks, and a detailed time plan. A data management plan will be also provided to support the management of the data, which will be generated, processed and collected by the consortium. This task will also include a monitoring process for the identified technical indicators, which will be updated during the project execution based on the outcomes from the other WPs.

Moreover, the activities in this task will include the promotion of specific actions and control over gender issues along the project, including them annually in the reporting period's reports, through measuring indicators on the number and seniority level of female researchers participating in the project.

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Finally, interaction with the other European projects and networks will be ensured in order to promote continuous feedback and to effectively maintain the link with similar initiatives running in Europe.

This task will release 13 deliverables, which are under responsibility of ENEA and are listed below:

- D1.1 : Project management plan (first version) [M2] [2]
- D1.2 : Project management plan (second version) [M15]
- D1.3 : Project management plan (third version) [M31]
- D1.4 : Project management plan (final version) [M47]
- D1.5 : Project handbook [M3]
- D1.6 : Data management plan (first version) [M6]
- D1.7 : Annual progress report (first year) [M12]
- D1.8 : Annual progress report (second year) [M24]
- D1.9 : Annual progress report (third year) [M36]
- D1.10 : Annual progress report (fourth year) [M48]
- D1.11 : Final report [M48]
- D1.12 : Data management plan (second version) [M30]
- D1.13 : Data management plan (final version) [M45]

Task 1.2 - Management and reporting on administrative and financial aspects (M1-M48)

This task aims at managing administrative and financial issues of the eNeuron project and reporting to EC. In detail, the main objectives of this task are listed below:

- supervising the project and act as single point of contact towards EC (Project Officer);
- management of the compilation of periodic activity and financial reports according to the Financial Guidelines of the EC.
- internal reporting based on non-official reports and interim activity developed by WP leaders to monitor the activities' progress and budget spending for early detection of any issues that might arise, related to eventual overspending or underspending.
- management of the review meetings with the EC.

3.2.2 Work Package 2 "Limitations and shortcomings for optimal use of local resources"

The main objective of WP2 is to scope the study, based on the Pan-European de-carbonisation targets and consequent regulatory acts, trends and roadmaps. The study will further identify and

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benchmark the indicative status for deployment of integrated local multi-vector energy systems (including batteries and electric vehicles) and corresponding supporting mechanisms, tools and technologies in the Member States. The next step will identify the present (technical) limitations, shortcomings and obstacles to innovation, which may prevent the intended transformation of the European energy landscape towards local multi-vector energy systems with a high level of decarbonisation based on eNeuron.

Potential implications of these gaps and limitations will be qualitatively evaluated and the results will be used as an input to the functional specification of the demonstration and its test programs.

Table 10 - Timeline for WP2

Activity	Start	Stop	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
WP2 Limitations and shortcomings for optimal use of local resources (SINTEF)	1	15															MS
T2.1 Preliminary scoping of the study (SINTEF)	1	6						D									
T2.2 Status for deployment of integrated local multi-vector energy systems (UNIVPM)	1	9									D						
T2.3 Identification of limitations and shortcomings, input to specification (UPM)	6	15															D
			2020-11-01	2020-12-01	2021-01-01	2021-02-01	2021-03-01	2021-04-01	2021-05-01	2021-06-01	2021-07-01	2021-08-01	2021-09-01	2021-10-01	2021-11-01	2021-12-01	2022-01-01

The partners involved in the three tasks of WP2 are shown in the table below.

Table 11 - Participation in WP2

	ENEA	FOSS	IREC	SINTEF	TECNALIA	DERLAB	EPRI	UNIVPM	UPM	LABELEC	COB
T2.1 (SINTEF)											
T2.2 (UNIVPM)											
T2.3 (UPM)											

Task 2.1 - Preliminary scoping of the study based on the Pan-European de-carbonisation targets, regulatory acts and roadmaps (M1-M6)

The task will provide the project with the most recent regulatory framework status and roadmaps, which will be a key input for a number of the proceeding activities and tasks.

Task 2.2 - Status for deployment of integrated local multi-vector energy systems and corresponding enabling technologies and solutions (M1-M9)

The task will focus on the present status of local multi-vector energy system deployment, architectures, involved actors and interactions between them. A primary outcome will be the identification of the energy conversion and storage systems that grant the best integration capabilities between different energy vectors. The task will provide the pilots involved in the project a set of guidelines in terms of technological solutions aimed at meeting the goal of establishing effective LECs.

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Task 2.3 - Identification of limitations and shortcomings, input to specification of demonstration and test programs (M6-M15)

This task aims to identify the existing limitations and shortcomings detected by the crossed analysis performed in the previous tasks. Such identification will be performed by each country where restrictions may differ. In this regard, potential recommendations to overcome such limitations will be given.

The deliverables associated to WP2 are:

- D2.1 Local multi-vector energy systems within the European political and regulatory landscape: scope and key priorities for the study (M6, SINTEF)
- D2.2 Technical solutions for multi carrier integrated systems under the LEC concept: A review (M9, UNIVPM)
- D2.3 Limitations and shortcomings for optimal use of local resources (M15, UPM)

The milestone associated to WP2 is:

- MS1: The critical analysis of the deployment status of integrated local multi-vector energy systems is complete (M15, SINTEF)

3.2.3 Work Package 3 “Identification of the Local Integrated Energy Community subject and definition of the Use Cases”

The main goals of WP3 are:

- identifying the “Local Integrated Energy Community” subject basing the analysis on the most recent regulatory developments and policies in Europe and in the countries represented in the consortium;
- defining a detailed mapping of the main enabling technologies and the key actors for the implementation of this energy paradigm at local level;
- developing the eNeuron use cases and business models considering the characteristics of the pilots.

WP3 runs from M6 to M33 and consists of three tasks. The timeline for WP3 and its tasks are shown in the table below.

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Table 12- Timeline for WP3

Activity	Start	Stop	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
WP3 Identification of the "Local Integrated Energy Community" subject and definition of the UC (ENEA)	6	33																												MS
T3.1 Identification of the "Local Integrated Energy Community" (SINTEF)	6	14									D																			
T3.2 Mapping of the emerging technologies and analysis (ENEA)	12	22																	D											
T3.3 Definition of eNeuron use cases and new business models (EPRI)	17	33																												D
			2021-04-01	2021-05-01	2021-06-01	2021-07-01	2021-08-01	2021-09-01	2021-10-01	2021-11-01	2021-12-01	2022-01-01	2022-02-01	2022-03-01	2022-04-01	2022-05-01	2022-06-01	2022-07-01	2022-08-01	2022-09-01	2022-10-01	2022-11-01	2022-12-01	2023-01-01	2023-02-01	2023-03-01	2023-04-01	2023-05-01	2023-06-01	2023-07-01

ENEA is the WP leader, and the other partners involved are FOSS, IEn, IREC, SINTEF, DERLAB, EPRI, UNIVPM, UPM, EDP LABELEC, Eneida, Marinha as shown in the table below.

Table 13 - Participation in WP3

	ENEA	FOSS	IEn	IREC	SINTEF	DERLAB	EPRI	UNIVPM	UPM	EDP LABELEC	Eneida	Marinha
T3.1 (SINTEF)												
T3.2 (ENEA)												
T3.3 (EPRI)												

Task 3.1 - Identification of the "Local Integrated Energy Community" subject through the assessment of the current regulatory framework in Europe (M6-M14)

The main goal of Task 3.1, led by SINTEF, is to perform a detailed analysis of the most recent developments in order to identify the main characteristics of the entity "Local Integrated Energy Community", as well as its anticipated key roles and responsibilities, that among other things will be used as an input to creation of business models in Task 3.3. The task will also consider how local conditions (e.g. generation mix, existing infrastructure and availability of resources), current policies and practices will influence development of future energy communities in Europe.

Task 3.1 will start at M6 and will run until the end of M14. According to the Description of Action, the associated deliverable is D3.1 "Introduction and development of Local Energy Communities in Europe" which will be released at the end of the task.

Task 3.2 - Mapping of the emerging technologies and analysis of the key actors in the implementation of integrated energy communities at local level (M12-M22)

The main goal of Task 3.2, led by ENEA, is to provide a detailed mapping of the emerging energy and Information and Communication Technologies (ICT), which could be part of a Local Integrated Energy Community, at both household level and community level. Demand-side flexibility technologies will be also analysed, to understand the benefits of local flexibility and impacts on the larger system. The task will also provide an overview of the key actors and their interests in the implementation of LECs, by identifying interests that are in conflict with others. Finally, the

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identification of the key issues (technological, socio-economic, environmental and regulatory) for implementation and adaptation will be also covered.
Task 3.2 will start at M12 and will run until the end of M22. According to the Description of Action, the associated deliverable is D3.2 “Attributes of an integrated local energy community: mapping of emerging technologies, key actors and driving forces for implementation and adoption” which will be released at the end of the task. The task will generate inputs for identifying customer value propositions in a local integrated energy community in T3.3.

Task 3.3 - Definition of eNeuron use cases and new business models (M17-M33)
The main goal of Task 3.3, led by EPRI, is to identify what customer value propositions are made possible in a local integrated energy community by using enabling technologies identified in T3.2. Particular focus is placed on the long run and short term. Once the value propositions are defined, use cases and the business model alternatives will be constructed to underpin those use cases. Use cases will align with pan-European targets and include decarbonisation, efficiency improvement, resilience and enabling customer engagement. Emerging business models such as peer-to-peer trading or multi-vector local market designs will be evaluated in the context of the value propositions. A path of how different concepts and needs could co-exist (e.g. central LEC optimisation with peer-to-peer trading and LEC concept with web-of-cells concept) may be drawn.
Task 3.3 will start at M17 and will run until the end of M33. According to the Description of Action, the associated deliverable is D3.3 “Use Cases and Innovative Business models for the eNeuron pilot” which will be released at the end of the task. The task will generate inputs for WP4 for the development of the eNeuron tool, WP5 where the energy hub solutions will be validated in a lab environment, and WP6 for real world testing.

Task 3.3 plans to reach the milestone MS2 “eNeuron use cases and business models are ready to be shared with WP4-WP7” (EPRI).

3.2.4 Work Package 4 “Analysis, design and operation optimisation of the local energy systems: emergence of energy hubs”

WP4 is the technical core of this project, and has the goal to provide a general methodology of optimising the design and operation of a multi-carrier integrated energy system. This WP will develop the eNeuron tool and its functionalities that will support the project objectives and will be employed and tested in the pilots. Both software and hardware solutions will be developed within this WP, which will strongly interact with all the other technical WPs.
The main activities and outcomes of WP4 are the following:

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- Development of a general and operational architectural model for multi-carrier energy systems that will allow optimal integration of the different actors. The energy hub concept will be employed and different carriers and technologies will be included. The main outcome of this WP is a general methodology for integrating multiple vectors within the energy hub model considering the technical and economic constraints of the technologies. Moreover, the operational strategies of the selected vectors also need to be optimised while meeting the energy requirements of specific end-users and the LEC in general.
- eNeuron tool development for better monitoring, operating and control of the energy hub and its assets which will have the following basic characteristics:
    - Modular design
    - User-friendly graphical interface
    - Interoperability
    - Several energy carriers
    - Design and operation planning features
    - Advanced smart grid functionality support (flexibility, DR etc) through dedicated toolboxes
- Innovative hardware development that will be able to support the eNeuron tool functionalities and deliver them in a multi-energy integrated power system.

WP4 runs from M6 to M48 and consists of three main tasks. The timeline for WP4 and its tasks are shown in the table below.

Table 14 - Timeline for WP4.

Activity	Start	Stop	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
WP4 Analysis, design and operation optimisation of the local energy systems: emergence of energy hubs (FOSS)	6	48																																											MS
T4.1 Identification and analysis of the multi-objective problem and the innovative approach of energy hub (FOSS)	6	16											D																																
T4.2 General methodology approach for optimal design and operation of an energy hub (EPRI)	11	36																															D												
T4.3 eNeuron tool development (SINTEF)	14	48																																											D
			2021-04-01	2021-05-01	2021-06-01	2021-07-01	2021-08-01	2021-09-01	2021-10-01	2021-11-01	2021-12-01	2022-01-01	2022-02-01	2022-03-01	2022-04-01	2022-05-01	2022-06-01	2022-07-01	2022-08-01	2022-09-01	2022-10-01	2022-11-01	2022-12-01	2023-01-01	2023-02-01	2023-03-01	2023-04-01	2023-05-01	2023-06-01	2023-07-01	2023-08-01	2023-09-01	2023-10-01	2023-11-01	2023-12-01	2024-01-01	2024-02-01	2024-03-01	2024-04-01	2024-05-01	2024-06-01	2024-07-01	2024-08-01	2024-09-01	2024-10-01

FOSS is the WP leader, and the other partners involved are ENEA, IEn, IREC, SINTEF, TEC, DERlab, EPRI, UNIVPM, UPM, EDP LABELEC, Eneida and CoB as shown in the table below.

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Table 15 - Participation in WP4.

	FOSS	ENEA	IEn	IREC	SINTEF	TEC	DERlab	EPRI	UNIVPM	UPM	EDP LABELEC	ENEIDA	CoB
T4.1 (FOSS)													
T4.2 (EPRI)													
T4.3 (SINTEF)													

Task 4.1 - Identification and analysis of the multi-objective problem and the innovative approach of energy hub (M6-M16)

This task will provide an in-depth analysis of the literature surrounding the existing state of the art approaches, and define a path for how these can be improved and extended to fit the eNeuron approach.

A deliverable report will be submitted at M16, i.e., D4.1 Report on the energy hub concept and the multi objective programming approach of an energy hub (FOSS).

Task 4.2 - General methodology approach for optimal design and operation of an energy hub (M11-M36)

This task intends to develop a methodology for designing the optimal resource mix within a LEC. The methodology aims to consider all aspects of the LEC including existing infrastructure and capacity, current and future load requirements from all energy carriers, and available resources and associated costs. Based on these inputs, a long-term optimisation (months/years) can then be performed to determine the optimal system design for the energy hub to satisfy a number of objectives, including minimisation of costs and environmental impacts.

A deliverable report will be submitted on M36, i.e., D4.2 Development of the methodology for optimal design and operation of an energy hub within energy communities of energy islands (EPRI).

Task 4.3 - eNeuron tool development (M14-M48)

Task 4.3 is further divided into 3 smaller subtasks for the eNeuron tool development. By the end of M48, two deliverables have to be submitted for Task 4.3 as follows:

- D4.3: eNeuron tool for the optimal design and operation of local integrated communities
- D4.4: eNeuron tool user’s guide

Sub-Task 4.3.1: eNeuron core software (SINTEF) (M14-M48)

The innovative tool for offering a holistic approach for designing, validating and operating integrated energy systems will be developed. The core software of this task will be based on Task 4.2. It will act as the “brain” of the LEC and have a holistic approach on the optimal operation of the system, while interacting with the peers, and employ the functionalities needed for certain use cases.

Sub-Task 4.3.2: eNeuron functionalities toolbox (FOSS) (M20-M48)

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The functionalities toolbox will develop the software that will facilitate the operation of the tool and enable the use cases and business cases/market as identified in Task 3.3. Within this frame it will develop:

- The facilitator toolbox including forecasting services for the market, the load and RES .
- The interactive toolbox where interactive functionalities for different actors of the LEC will refine the core software to provide a real time management of the LEC e.g. through DR schemes.
- The apps toolbox where smart phone applications that enables the interactive toolbox e.g. peer-to-peer market, DR will be developed.

Sub-Task 4.3.3: Hardware device development (ENEIDA) (M14-M33)
A prototype will be developed within this subtask starting from M14 and being ready for testing by M24. By the end of M33, the full optimisation cycle will be completed along with the development of all devices required for the pilots. The device will be installed at micro energy hub level, allowing peer to peer interaction by participating in the local market and interaction with the "brain" when needed.

The milestones related to this package are:
MS3:Preliminary version of eNeuron tool is ready to be shared with WP5 and WP6(M24)
MS4:eNeuron approach for the optimal design and operation of an energy hub is ready(M36)
MS5:Neuron tool development is complete(M48)

3.2.5 Work Package 5 "Validation of energy hub solutions through simulation and testing in a lab environment"

The main goal of WP5 is to simulate and test the new concepts and use cases developed in eNeuron before their deployment in realistic large-scale scenarios in the pilot sites. The WP is also intended to detect the bottlenecks in the design of the energy hub solutions. This Work Package is strongly linked to WP3 (development of business cases), WP4 (optimal design and operation of the local integrated energy communities) and WP6 (implementation in the different pilots), where the information exchanges among the related WPs are summarized in the figure below.

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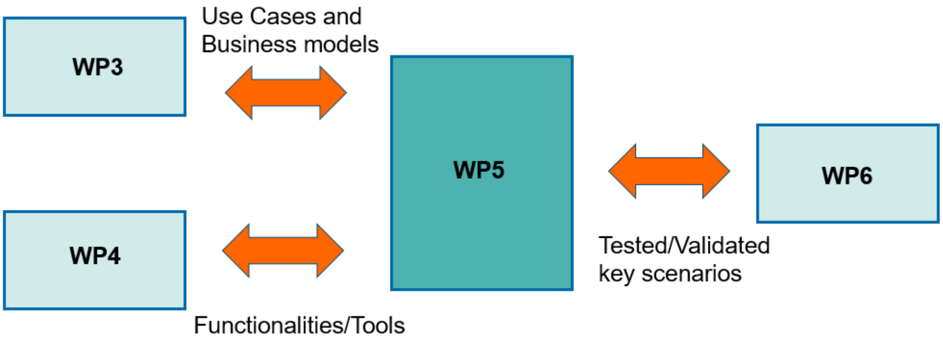

Figure 6 - Relationship of WP5 with other WPs of the project

The leader of the WP is TECNALIA and the other contributors are ENEA, FOSS, IEn, IREC, DERlab, UNIVPM, UPM, EDP and Eneida. The participation per partner in the four different tasks is summarized in the table below and will be further detailed in the breakdown per task:

Table 16 – Participation in WP5

	ENEA	FOSS	Ien	IREC	TECNALIA	DERLAB	UNIVPM	UPM	EDP	Eneida
T5.1. Modelling of flexibility elements and distribution grids (FOSS)										
T5.2. Design of scenarios for simulation (UPM)										
T5.3. Simulation of energy hub solutions in selected scenarios (FOSS)										
T5.4. Validation of the operation of energy hubs in a lab environment (TECNALIA)										

The WP starts in M6 and lasts up to the end of the project (M48). The different tasks are sequentially executed with a special focus on the connection and the feedback that some tasks need from the previous. The WP has three associated deliverables and two milestones.
The milestones represent the most important achievements of the WP and are located close to its end. MS6 “Simulations of the energy hub solutions in selected scenarios are complete”, to be reached in M43 is related to the completion of the simulations of the energy hub solutions in selected scenarios. The later milestone, MS7 “The operation of the eNeuron tool is validated in a lab environment”, concurring with the end of the project (M48) is the conclusion of the validation of the eNeuron tool in a lab environment.
The deliverables of the WP with delivery dates and leaderships are:

- D5.1. Design of scenarios for eNeuron tool simulations (M20. Lead: UPM)
- D5.2. Simulation results of eNeuron solutions (M43. Lead: FOSS)
- D5.3. Testing plan and testing results from the validation of eNeuron functionalities in a lab environment (M48. Lead: TECNALIA).

Next, a more detailed recap of the different tasks including objectives, leaderships, contributions, timeline and related milestones / deliverables is accomplished.

Task 5.1 - Modeling of flexibility elements and distribution grids (M6-M17)

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In this task, several components will be modeled for their use in the simulations, including distributed generation units (such as PV facilities), energy storage systems (such as EVs), and thermal components (heat pumps, Combined Heat and Power (CHPs), etc.) to be able to design hybrid models of the energy hubs.

Together with the flexibility models, a preliminary state-of-the-art will be carried out to select grid models that can be used to test the developments of the project. These grid models will represent European LV grids in terms of topology and distributed energy resources/flexibility assets installed. The objective is to find a set of grids with a trade-off among size, accuracy and tractability, while also considering which topologies are more suitable for representing LECs that can behave as energy hubs (residential/commercial, urban/rural, etc.). The accuracy should be high enough to provide significant results in terms of grid status (power flows, losses, voltage, etc.) without over-penalizing the computational cost. Due to the geographical dependence of renewable energy resource output, the location where measurements are available will also pose restrictions to the grid model that can be used.

The task will run between M6 and M17, according to the Gantt chart below.

Activity	Start	Stop	6	7	8	9	10	11	12	13	14	15	16	17
WP5 Validation of energy hub solutions through simulation and testing in a lab environment (TECNALIA)	6	48												
T5.1. Modelling of flexibility elements and distribution grids (FOSS)	6	17												
			2021-04-01	2021-05-01	2021-06-01	2021-07-01	2021-08-01	2021-09-01	2021-10-01	2021-11-01	2021-12-01	2022-01-01	2022-02-01	2022-03-01

The tasks will be fundamentally split into two subtasks dedicated to:

1) Select and/or develop the models needed to accurately represent the distributed generation and storage units to cope with the requirements of the local energy communities
2) Select and/or develop suitable grid models to represent the energy hubs.

Even there is no specific milestone or deliverable in this task, the description of the models, as well as the explanation about their suitability to be used in the project, will be documented as part of the deliverable D5.1. Two different points of attention have been identified for this task. On the one hand, it is important when referring to modeling to find those that are accurate enough for representing the elements of the energy hub without excessive computational effort, as thinking in the scalability of the problem. On the other hand, the eNeuron tool operated from a long-term planning phase to close to real-time and the models for different time scales have to be considered.

Task 5.2 - Design of scenarios for simulation (M9-M20)

In this task, the selected scenarios for the simulation will be designed. These scenarios will be derived from the use cases and business models defined in WP3, on the Pan-European de-carbonization targets, and different reports, outlooks and trends expected in the 2050 horizon. The distribution grid models selected in Task 5.1, combined with the models of the energy hubs, will

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create detailed scenarios for the simulation. These scenarios will also be consistent with the countries where the pilots are installed. The scenarios will be characterized by a specific time series associated with the generation sources and the different types of loads (residential, commercial, EVs, etc.). For the generation of those synthetic series, it is possible to use statistical models based on probability density functions to generate a random set of characteristic profiles based on known data of local energy communities, which represent the behavior of the energy hubs of interest. In the scenarios defined for the pilots, real data, which may have been previously registered, will be used if it is available. Otherwise, a similar statistical approach will be applied to generate diverse synthetic time series.

The task will run between M9 and M20:

Activity	Start	Stop	9	10	11	12	13	14	15	16	17	18	19	20
WP5 Validation of energy hub solutions through simulation and testing in a lab environment (TECNALIA)	6	48												
T5.2. Design of scenarios for simulation (UPM)	9	20												**D**
			2021-07-01	2021-08-01	2021-09-01	2021-10-01	2021-11-01	2021-12-01	2022-01-01	2022-02-01	2022-03-01	2022-04-01	2022-05-01	2022-06-01

The work in the task will be organized according to two complementary layers: the design of a high-level scenario based on the Pan-European targets, reports, etc. together with the business cases and use cases received as inputs from WP3 and the definition of a low-level scenario for simulation with a detailed definition of the involved distributed energy resources and the selection of the corresponding loads with their consumption patterns. Related to the data to be used in the models, it has to be considered the spatial-temporal relationship of several magnitudes, such as the weather-related variables and, in case of lack of significant data for the simulations, synthetic data based on statistical models can be used.
The results of this task together with the models of Task 5.1. will be collected in Deliverable D5.1 (M20).

Task 5.3 - Simulation of energy hub solutions in selected scenarios (M20-M43)
In this task, simulations of the eNeuron tool functionalities will be run and analysed for the different grids selected in T5.1. and the scenarios of T5.2. Sensitivities and variants will be produced, if necessary, to analyse uncertain variables. Results will be evaluated to suggest gaps and potential improvements for the eNeuron tool and also, if needed, to serve as an input for the refinement of the algorithms of WP4.

The task will run between M20 and M43:

Activity	Start	Stop	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
WP5 Validation of energy hub solutions through simulation and testing in a lab environment (TECNALI	6	48																								**MS**
T5.3. Simulation of energy hub solutions in selected scenarios (FOSS)	20	43																								**D**
			2022-06-01	2022-07-01	2022-08-01	2022-09-01	2022-10-01	2022-11-01	2022-12-01	2023-01-01	2023-02-01	2023-03-01	2023-04-01	2023-05-01	2023-06-01	2023-07-01	2023-08-01	2023-09-01	2023-10-01	2023-11-01	2023-12-01	2024-01-01	2024-02-01	2024-03-01	2024-04-01	2024-05-01

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The main subtasks will be the simulation and analysis of the selected scenarios, the execution of a sensitivity analysis to evaluate the response to uncertain variables and, with that information, the assessment of the results as well as the proposal of refinements of the eNeuron functionalities coming from WP4. In this task, there is a risk to monitor related to the integration of the different simulation models to create the relevant scenarios through the software contribution of the different partners.
This task has associated the milestone MS6 (M43) and the deliverable D5.2.

Task 5.4 - Validation of the operation of energy hubs in a lab environment (M27-M48)
This task is focused on the validation, at the lab level, by using the laboratory infrastructures made available by the Consortium of the solutions proposed in WP4 and simulated in T5.3. The testing will be done incrementally, from the operation of a micro energy-hub extending to a multi-energy hub case employing the use of advanced real-time simulation platforms (PHIL). Additionally, to expand the capabilities of labs equipped with different flexible energy carriers, and to exploit the possible synergies between them (acting as different EH/mEH), the coupling of geographically distributed installations will be considered. The tests accomplished in the different laboratories will be harmonized through the use of the common testing methodology developed in the framework of the H2020 project ERIGrid.

The task will run between M27 and M48:

Activity	Start	Stop	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
WP5 Validation of energy hub solutions through simulation and testing in a lab environment (TECNALIA)	6	48																	MS					MS
T5.4. Validation of the operation of energy hubs in a lab environment (TECNALIA)	27	48																						D
			2023-01-01	2023-02-01	2023-03-01	2023-04-01	2023-05-01	2023-06-01	2023-07-01	2023-08-01	2023-09-01	2023-10-01	2023-11-01	2023-12-01	2024-01-01	2024-02-01	2024-03-01	2024-04-01	2024-05-01	2024-06-01	2024-07-01	2024-08-01	2024-09-01	2024-10-01

In this task, a bottom-up approach will be followed: from the validation of the solutions at a micro-energy hub level to a multi-energy hub system. Considering that, probably, most of the facilities provided by the partners will not have all the required elements to faithfully represent the energy hubs, it is intended within this project to connect different geographically distributed laboratories to generate multi-energy vector scenarios.
This task that will last up to the end of the project, have associated the milestone MS7, when the eNeuron solutions will be validated at a lab-scale and the deliverable D5.4.

3.2.6 Work Package 6 “Pilot Roll out and Real world Testing”

WP6 covers the demonstration phase of the project, by validating the eNeuron approach developed in WP4 with its software or hardware in a real testing environment covering real needs of use cases

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and business use cases (identified in WP3) thus highlighting the replicability of the solutions. The goal of this WP is to ensure a timely start of the demonstration phase at M30 in order to have a full year of operation and thus a full year of optimisation cycles and lessons learned are captured by the end of the fourth year and the end of the project. This WP is strictly connected with other WPs as shown in the figure below.

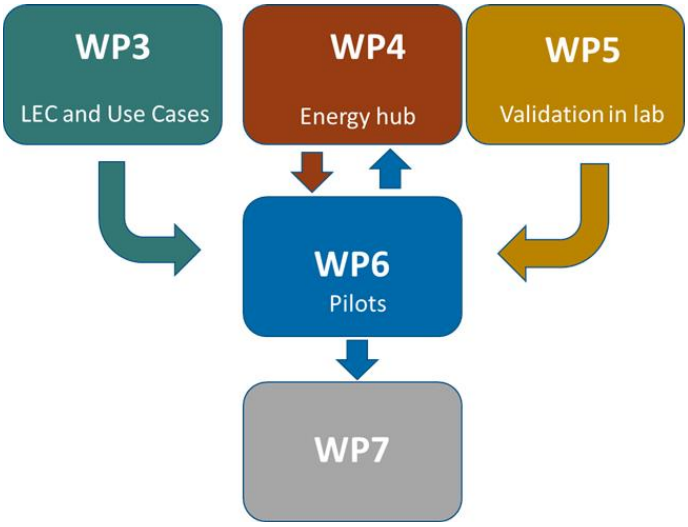

Figure 7 – Interaction of WP6 with the other project WPs.

The main objectives of WP6 are:

- guarantee that by the start of the third year all pilots are operating under the eNeuron approach so that a full year of operation and thus a full year of optimisation cycles and lessons learned are captured by the end of the fourth year and the end of the project;
- validate the eNeuron approach (developed in WP4 and simulated in WP5), with its software or hardware in a real testing environment covering real needs;
- demonstrate the replicability (WP7) across Europe of the solutions for the different use cases and business cases as identified within WP3.

WP6 starts at M13 with all the preparatory activities, which will lead to the full functional operation of pilots at M30. WP6 has 10 deliverables and 5 milestones. The detailed timeline for the completion of the six tasks in WP6 is shown in the table below.

Table 17 - Timeline for WP6

Activity	Start	Stop	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
WP6: Pilot Roll out and Real world Testing	13	48																
Task 6.1 Pilot roll out Poland	13	48																
Task 6.2 Pilot roll out-Norway	13	48																
Task 6.3 Pilot roll out-Portugal	13	48																
Task 6.4 Pilot roll out-Italy	13	48																
Task 6.5 Validation and techno-economical evaluation of the real testing outcomes	36	48																
Task 6.6 Optimisation and refinement	36	48																
			01/11/2020	01/12/2020	01/01/2021	01/02/2021	01/03/2021	01/04/2021	01/05/2021	01/06/2021	01/07/2021	01/08/2021	01/09/2021	01/10/2021	01/11/2021	01/12/2021	01/01/2022	01/02/2022

Activity	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
WP6: Pilot Roll out and Real world Testing																
Task 6.1 Pilot roll out Poland														MS		
Task 6.2 Pilot roll out-Norway														MS		
Task 6.3 Pilot roll out-Portugal														MS		
Task 6.4 Pilot roll out-Italy														MS		
Task 6.5 Validation and techno-economical evaluation of the real testing outcomes																
Task 6.6 Optimisation and refinement																
	01/03/2022	01/04/2022	01/05/2022	01/06/2021	01/07/2022	01/08/2022	01/09/2022	01/10/2022	01/11/2022	01/12/2022	01/01/2023	01/02/2023	01/03/2023	01/04/2023	01/05/2023	01/06/2023

Activity	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
WP6: Pilot Roll out and Real world Testing																
Task 6.1 Pilot roll out Poland				D												D
Task 6.2 Pilot roll out-Norway				D												D
Task 6.3 Pilot roll out-Portugal				D												D
Task 6.4 Pilot roll out-Italy				D												D
Task 6.5 Validation and techno-economical evaluation of the real testing outcomes																D
Task 6.6 Optimisation and refinement																D
	01/07/2023	01/08/2023	01/09/2023	01/10/2023	01/11/2023	01/12/2023	01/01/2024	01/02/2024	01/03/2024	01/04/2024	01/05/2024	01/06/2024	01/07/2024	01/08/2024	01/09/2024	01/10/2024

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The leader of WP6 is UNIVPM and all the partners of the Consortium are involved in the WP as shown in the table below.

	ENEA	FOSS	IEn	IREC	SINTEF	TECNALIA	DERLAB	EPRI	UNIVPM	UPM	ENEA Operator	Skagerak	LABELEC	Eneida.IO	Marinha	CoB
Task 6.1 (ENEA OPERATOR)																
Task 6.2 (Skagerak)																
Task 6.3 (EDP LABELEC)																
Task 6.4 (UNIVPM)																
Task 6.5 (EDP LABELEC)																
Task 6.6 (ENEIDA)																

Table 18 – Participation in WP6

The activity of WP6 will be carried out in 6 Tasks desvribed below.

Tasks T6.1-T6.4 – Pilot roll out. These tasks include the activities related to the preparations of each pilot and the use cases to be employed within. Description of use cases and business models, preparations of both software and hardware to be deployed will be carefully developed and tailor-made for each pilot. All preparatory actions will be performed by M30, so that there is a six month timeframe to install and preliminarily test the needed functionalities before going fully operational at M36.

Task 6.5 - Validation and techno-economical evaluation of the real testing outcomes (M36-M48)
Within this task the data analytics from both the mEH where the hardware is installed, as well as from the embedded software at the substation side are gathered and analysed. Techno-economical evaluation will be delivered at two levels as planned in Task 4.3 and discussed earlier. A validation of the hybrid approach of the two layers will be delivered as well as a techno-economical evaluation for all pilots will be performed.

Task 6.6 - Optimisation and refinement (M36-M48)
Within this task, feedback from the pilots are gathered. This feedback includes technical measurements from the field to evaluate the performance of the eNeuron solutions as a technical package but also, feedback from the actors and the users / citizens to evaluate the performance of the eNeuron solutions addressing the user friendly and social impact perspective. All data will be treated with appropriate sensitivity and analysed using various methodologies to draft an evaluation report and carefully design the path for addressing any shortcoming or bottleneck. Optimisation and refinement based on that will take place during the last year of the project.

The deliverables associated to WP6 are listed below:

- D6.1/D6.2 Report on Polish local energy community results (M36-M48, Lead: ENEA OPERATOR)
- D6.3/D6.4 Report on Norwegian local energy community results (M36-M48, Lead: Skagerak)
- D6.5/D6.6 Report on Portuguese local energy community results (M36-M48, Lead: EDP LABELEC)
- D6.7/D6.8 Report on Italian local energy community results (M36-M48, Lead: UNIVPM)

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- D6.9 Validation and techno-economical evaluation of pilots (M48, Lead: EDP LABELEC)
- D6.10 Report on optimisation and refinement of eNeuron solutions after piloting (M48, Lead: ENEIDA)

The milestones associated to this WP are listed below:

- MS8 The fully functional operation of the Polish pilot (M30)
- MS9 The fully functional operation of the Norwegian pilot (M30)
- MS10 The fully functional operation of the Portuguese pilot (M30)
- MS11 The fully functional operation of the Italian pilot (M30)
- MS12 Validated and evaluated pilots outcomes (M48)

3.2.7 Work Package 7 "Evaluation of results: Replicability and scalability"

The main objectives of WP7 are described below:

- assessing the impacts of the solutions implemented in the demo pilots;
- assessing the scaling up and replication potential of the solutions implemented in the demo pilots;
- finding obstacles to innovation, crucial factors to be taken into consideration and critical requirements to be met by other energy islands;
- suggesting - also in coordination with the BRIDGE initiative - common policy actions to setup the right conditions at European level (concerning legal and regulatory framework, business models, data management, consumer engagement) both for creating market opportunities to promote an increase of RES share in the LEC energy mix and for enabling large scale replication of the different solutions;
- elaborating recommendations and general guidelines - extracted from the results of the project and validated through direct consultation with stakeholders – to foster optimising the LECs / energy islands.

In the figure below, the interaction of WP7 with the other project WPs is depicted.

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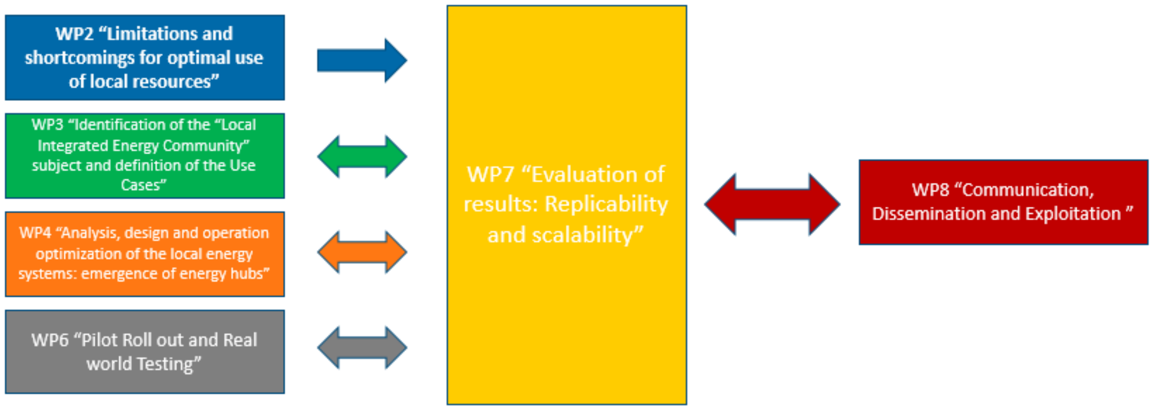

Figure 8 - Interaction of WP7 with the other project WPs.

The timeline of WP7 and the participation of partners in WP7 are depicted in the tables below.

Table 19 - Timeline for WP7

Activity	Start	Stop	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
WP7: Evaluation of results: Replicability and scalability	6	42																																	MS																MS
Task 7.1: Cross-comparison of demonstration results, assessment of impacts and extr	6	42																								D																									D
Task 7.2. End-users engagement and assessment of social impacts	6	48																								D																									D
Task 7.3: Assessment of Scalability and Replicability at European level	12	48																																												D				
Task 7.4: Roadmap and guidelines for optmising the LECs /energy islands	18	48																																																D
			2020-11-01	2020-12-01	2021-01-01	2021-02-01	2021-03-01	2021-04-01	2021-05-01	2021-06-01	2021-07-01	2021-08-01	2021-09-01	2021-10-01	2021-11-01	2021-12-01	2022-01-01	2022-02-01	2022-03-01	2022-04-01	2022-05-01	2021-06-01	2022-07-01	2022-08-01	2022-09-01	2022-10-01	2022-11-01	2022-12-01	2023-01-01	2023-02-01	2023-03-01	2023-04-01	2023-05-01	2023-06-01	2023-07-01	2023-08-01	2023-09-01	2023-10-01	2023-11-01	2023-12-01	2024-01-01	2024-02-01	2024-03-01	2024-04-01	2024-05-01	2024-06-01	2024-07-01	2024-08-01	2024-09-01	2024-10-01

Table 20 – Participation in WP7

	ENEA	FOSS	IEn	IREC	SINTEF	TECNALIA	DERLAB	UNIVPM	ENEA Operator	Skagerak	EDP LABELEC	ICONS	Eneida.IO	Marinha	CoB
Task 7.1 Cross-comparison of demonstration results and assessment of technical, regulatory, environmental and economic impacts (DERlab)															
Task 7.2 End-users engagement and assessment of social impacts (ICONS)															
Task 7.3 Assessment of scalability and replicability at European level (IREC)															
Task 7.4 Roadmap and guidelines for optmising the LECs /energy islands (DERlab)															

The WP consists of 4 tasks described in the following.

Task 7.1 - Cross-comparison of demonstration results and assessment of technical, regulatory, environmental and economic impacts (M6-M42)

In this task, the progress of the project will be monitored and assessed during the project runtime on a regular basis. The task includes 4 subtasks which assess the project impacts from technical, regulatory, environmental and economic points of view.

- **Sub-task 7.1.1 - Technical assessment (DERlab)**: The assessment will be realised through specific Key Performance Indicators (KPIs) that will be identified in this sub-task. The KPIs will be categorised in two groups consisting of:
    - Project KPIs to assess the contribution to the optimal design, operation and scheduling of LEC integrating distributed energy resources and multiple energy carriers.

  - Global KPIs to assess the technical contribution of the project concept to the Europan decarbonising targets, boosting the integration of local energy sources and activating local demand-response.
- **Sub-task 7.1.2 - Regulatory assessment (DERlab):** In this sub-task, the regulatory framework of the pilot countries will be analysed and barriers for implementing the technical solutions will be identified.
- **Sub-task 7.1.3 - Environmental assessment - Life Cycle Assessment (LCA) (ENEA)**: The work of this subtask focuses on the assessment of the environmental impacts of the solutions implemented in the demo pilots. In order to carry out this assessment, the LCA methodology will be used. It follows the main guidelines of the ILCD (International Reference Life Cycle Data System) Handbook and ISO 14040-14044 and will include the five main phases of a LCA: a) goal definition, b) scope definition, c) inventory analysis, d) impact assessment, e) interpretation.
- **Sub-task 7.1.4 - Economic assessment -Life Cycle Cost (LCC) (TECNALIA)**: This subtask will focus on the economic impact of the solutions proposed in the project. In close cooperation with WP5 and WP6, this subtask will identify the main economic implications of both the simulations and laboratory test on the one hand, and of the different demonstration pilots on the other. In addition, the task will closely work with the other subtask in this task to ensure that the impact of LEC integrating distributed energy resources and multiple energy carriers will be fully addressed.

The deliverables related to this task are listed below:
- D7.1 The outcome of technical, regulatory, environmental and economic impacts assessment (first version) [M24]
- D7.2 The outcome of technical, regulatory, environmental and economic impacts assessment (final version) [M48]

Task 7.2 - End-users engagement and assessment of social impacts (M6-M42)
The task will adopt a 3-step approach aimed at creating:
1. End-users/prosumers' engagement framework (local consumers, SMEs, commercial buildings): the first step will identify the most effective tools to engage with prosumers, including local participative workshops, social networks, online panels, other public consultations.
2. Social evaluation framework investigating what areas/factors lead to end-users/prosumers' acceptance and foster local energy systems: in this second step, an overall methodological framework will be created to identify social KPIs to be monitored and assessed over project's execution
3. Analysis of social acceptance in the demo sites based on the framework developed in point 2: in this last step, data will be collected from the demo sites and analysed to assess

prosumers' perceptions, acceptance, and changing behaviours, inform the replicability plan with relevant social aspects and provide recommendations that could be leveraged in other projects across the EU.

The deliverables related to this task are listed below:

- D7.3 The outcome of end-user engagement and social impacts assessment (first version) [M24]
- D7.4 The outcome of end-user engagement and social impacts assessment (final version) [M48]

Task 7.3 - Assessment of scalability and replicability at European level (M12-M48).

This task will leverage the experience gained by the partners in previous European projects on the scalability and replicability (SRA) analysis of smart grids demonstration projects (e.g from BRIDGE initiative) as well as their network of contacts. Technical, regulatory and consumer related requirements as well as required financial mechanisms will be addressed.

A “check list” of the most important factors affecting the scaling up and replication potential of demonstration projects to be used by the LEC will be delivered. As FOSS member leads this certain BRIDGE Task Force (TF), activities within this package will be aligned with BRIDGE objectives and contribute in enhancing the replication and scalability methodology allowing its application into other sites around Europe.

The only deliverable related to this task is D7.5 Scaling up and replication potential at European level [M44]

Task 7.4 - Roadmap and guidelines for optmising the LECs /energy islands (M18-M48).

The outcome of Tasks T7.1, 7.2 and 7.3 is used for the development of the building blocks of the roadmaps and guidelines for optimising the LECs/energy islands. If necessary, additional information is obtained from (external) experts and stakeholders through interviews and/or workshops. Special attention will be given to the interaction between eNeuron partners and BRIDGE TF on Energy Communities. Within this context, partners will contribute actively to this TF objectives and provide feedback of the eNeuron activities.

The building blocks in the figure below describe which milestones and actions related to the project concepts are required to implement the LECs.

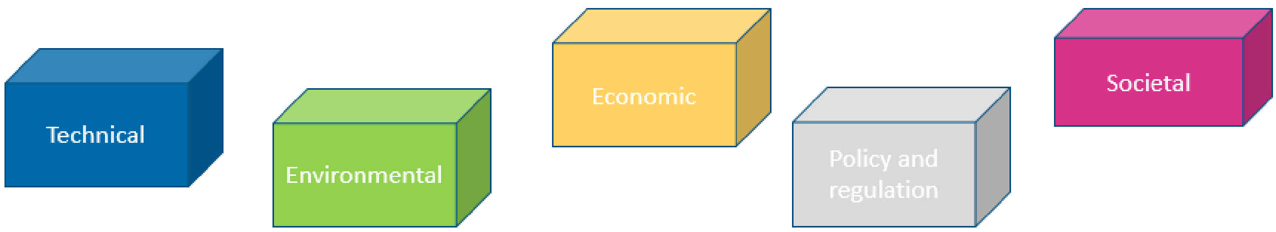

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Figure 9– Building blocks describing milestones and actions required to implement the LEC

Technology: The technology building blocks of the roadmap of the case studies includes:

- Identifying required key technical developments, actions and contributions (short-term and long-term) of the project concept
- Defining and analysing the contribution of alternative technologies and pathways to achieve those goals.

Environmental: The environmental building blocks of the roadmap of the cases studies will identify and quantify the environmental benefits related to the implementation of local integrated energy communities, by also exploiting results achieved in Task 7.1 (Subtask 7.1.3).

Economic: The economic building block of the roadmap of the case studies will identify and quantify the economic benefits related to the implementation of local integrated energy communities, by considering different perspectives related to the different LEC stakeholders. Results achieved in Task 7.1 (Subtask 7.1.4) will be also used for this aim.

Policy & Regulation: All policy and regulation related roadmap inputs from Task 7.1 and additional input are analysed in this subtask to:

- Identify drivers and barriers on policy & regulation based on the results from Sub-task 7.1.2 within the case studies countries, where the project pilots are planned.
- Propose policy & regulation changes and recommendations to overcome these barriers and to implement project solutions

Societal: All societal related roadmap inputs are collected in Task 7.2 and analysed in this subtask.

- The value chain, business models and related actions are analysed based on the collected information.
- Drivers and barriers are analysed for market penetration and recommendations developed.

The only deliverable related to this task is D7.6 Roadmap and guidelines for optmising the LECs /energy islands [M48]

The milestone to be achieved in the context of WP7 is MS13: Roadmap and guidelines for optimising the LECs/energy islands are complete [M48].

3.2.8 Work Package 8 “Communication, Dissemination and Exploitation”

This work package aims to maximise the impact of eNeuron by raising stakeholders' awareness and acceptance of the project's results, and it will also design an exploitation strategy.

The main objectives of WP8 are as follows:

- Develop and roll out an effective communication and dissemination strategy
- Foster long-term sustainability of eNeuron solutions by consolidating the project's visibility and by communicating its achievements to target audiences

- Facilitate collaboration and interaction with different stakeholder groups including end users, academia, public authorities, technology providers, other economic players
- Measure the impacts of the communication and dissemination using outreach data, quantitative performance indicators and key qualitative assessments
- Set out the project's exploitation strategy

As this work package is cross-cutting, it runs for the duration of the project – from M1 to M48 – and involves all partners to varying degrees. It includes six tasks and two milestones. The milestone MS14 occurs at M4 and corresponds to the release of the first version of the communication and dissemination plan. The milestone MS15 occurs at M18 and corresponds to the release of the library of exploitation results. The WP8 timeline is shown below:

Table 21 - Timeline for WP8

Activity	Start	Stop	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
WP8 Communication-Dissemination-Exploitation																										
Task 8.1 Communication-dissemination strategy	1	48				MS	D																			D
Task 8.2 Project identity and communication channels	1	48						D																		
Task 8.3 Public outreach and awarness	1	48																						D		
Task 8.4 Dissemination & stakeholder dialogue	6	48																						D		
Task 8.5 Mapping exploitation results	6	18																	MS							
Task 8.6 Exploitation plan	12	48																								D

Activity	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
WP8 Communication-Dissemination-Exploitation																								
Task 8.1 Communication-dissemination strategy																								
Task 8.2 Project identity and communication channels																								
Task 8.3 Public outreach and awarness																								D
Task 8.4 Dissemination & stakeholder dialogue																D						D		D
Task 8.5 Mapping exploitation results																								
Task 8.6 Exploitation plan																								D

Task 8.1 - Communication and dissemination strategy (M1-M48)

This task aims to develop and deliver an effective multi-channel and multi-stakeholder communication and dissemination plan to increase eNeuron's visibility and outreach.

- Identify target audiences in order to build a community of interest around the project and identify the best channels and tools for reaching these audiences;
- Prepare key messages and narratives to inform all identified stakeholders about the project's objectives, benefits and impacts;
- Establish related C&D actions, channels, tools, timing and geographical coverage;
- Describe the internal consortium processes for the effective and efficient management of C&D activities and different geographical levels.

The deliverable relating to Task 8.1 – the document setting out the communication & dissemination strategy – Deliverable 8.1 due in Month 4 and updated in Month 24.

Task 8.2 - Project identity and communication channels (M1-M48)

This task involves designing the project's logo, graphic elements, reporting templates, communication materials and setting up the social media channels and the website. It also involves producing ongoing content and updates to animate eNeuron's website and social media channels throughout the project. Key outputs include:

- eNeuron visual identity

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- Project brochure and video presentation (Deliverable 8.3)
- Roll up poster
- Linkedin and Twitter accounts
- eNeuron website (Deliverable 8.2)

The activities will cover the whole project duration, therefore from M1 to M48, as they include ongoing content and management of the social media and website. However, the bulk of this Task will take place during the first few months of the project.

Task 8.3 - Public outreach and awareness (M1-M48)

This task involves raising awareness about the goals, achievements, benefits and impacts of the project via specific formats to address wider audiences including citizens. C&D content will be regularly produced with contributions from all partners and distributed via different channels. Key activities include:

- Producing press and new releases on specific project themes and at milestones;
- Running social media campaigns to leverage project content using ad-hoc postcards, GIFs and video clips;
- Producing journalistic articles/interviews about the project topics, written by professional journalists addressing a wider audience and distributed via EU and global news multipliers, online media and dedicated portals;
- Implementing awareness strategies locally and nationally - social media campaigns, events, distribution of local news and press releases. This will be local C&D teams with support from the C&D secretariat.

Some of the above actions will be implemented when appropriate during the project, generally coinciding with project achievements, milestones and outside events.

Task 8.4 - Dissemination and stakeholder dialogue (M6-M48)

This task is broken down into two subtasks – Dissemination Formats and Networking/Clustering. The former relates to specific dissemination formats for target audiences while the latter is about EU-level and international outreach.

Subtask 8.4.1: <u>Dissemination formats</u> led by ICONS. This involves knowledge sharing and dissemination among stakeholders at all levels, from local to European. The aim is to foster engagement with and acceptance of project results and ultimately increase uptake potential.
Key activities include:

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- Producing a periodic newsletter for key identified stakeholders and registered users of the website;
- Producing dedicated exploitation info packs on different eNeuron solutions and outcomes
- organising webinars on specific project topics addressing professional audiences and local energy communities and including developers, operators and end users;
- Producing scientific and technical publications to position the project in peer reviewed journals, sectoral magazines and conference proceedings;
- Producing a tutorial video in English with subtitles in the pilot site languages to explain eNeuron solutions, for use at events, workshops and via social media and elsewhere online;
- Producing the eNeuron best practices book in electronic and print form.

Subtask 8.4.2: Networking and clustering led by FOSS: This aims to foster dialogue and engagement with key European and international stakeholders, as well as with potential promoters and adopters of eNeuron solutions.
Internal steps

- Networking with key European and international stakeholders and associations such as EERA, IEEE, ETIP-SNET to enhance international cooperation and outreach;
- Participating in external events such as conferences and workshops on local energy islands, smart grids and energy efficiency topics;
- Organising eNeuron events including the project's final event at EU level to present results and achievements. Such events could take place as part of sector-related EU events and initiatives;
- Clustering with fellow EU-funded projects and with the BRIDGE initiative to exploit synergies.

Some of the above actions will have specific dates while others will be scheduled in line with project progress and with external events and opportunities as they arise during the project.

Task 8.5 Mapping exploitable results (M6-M18)
The task aims to identify eNeuron KERs and define their IPR strategy in order to timely address any issue that may hamper future exploitation. To this aim, the task foresees the following key activities:

- Identification, mapping and analysis of all KERs covering also a preliminary assessment of their deployment strategy, value proposition, key messages, planned use and channels;
- Definition of partners’ role and involvement in each KER;
- Analysis of KERs’ accessibility and ownership;

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- Agreement on proper IPR measures.

The activities will start at M6 and last until M18, when D8.7 “Library of exploitable results” will be delivered. ICONS will lead task 8.5 in close cooperation with all partners. Each partner will contribute to the task by discussing their own exploitable results, their IP/IPR and exploitation strategy. eNeuron library of exploitable results will be an xls database, detailing all key projects’ results with a potential to be exploited after the project’s end. It will include all types of results (tangible and intangible -- such as knowledge or models; commercial and non- commercial), cover all potential uses (e.g. scientific, societal, commercial/economic, etc.) and highlight partners’ strategy and intentions for future exploitation. The library poses the basis for eNeuron exploitation strategy by identifying key results and anticipating key aspects of their exploitation roadmap.

Task 8.6 - Exploitation plan (M18-M48)
The task aims to create a roadmap to market for each project’s key exploitable result, and design a solid strategy for the deployment & sustainability of the eNeuron tool. To this aim, the task foresees:

- The definition of partners’ individual exploitation plans after the project’s end to leverage results for commercial and non-commercial purposes in their operations, service portfolio, scientific activities, knowledge transfer, etc.
- Creation of a joint plan to ensure the sustainability of the eNeuron tool, by leveraging the appropriate governance and business model.

The activities will start at M12, last until M48 and result in the definition of the first and final version of the eNeuron Exploitation plan, at M24 and M48 respectively.
ICONS will lead task 8.6 in close cooperation with all partners. Each partner will contribute to the task by discussing and defining a clear strategy for each result for which they contribute to, and actively participating for the development of joint strategies (with a particular focus on the sustainability of the eNeuron tool).

3.2.9 Work Package 9 “Ethics requirements”

WP9 sets out the 'ethics requirements' that the project must comply with. It covers the entire project duration, and is led by ENEA with support of all partners.
WP9 consists of the two following tasks:

Task 9.1 - Involvement of human participants (M1-M48)
This task aims to:

- Define the procedures and criteria that will be used to identify/recruit participants (e.g., prosumers, stakeholders participating to workshops or interviews, etc.).
- Define the informed consent procedures that will be implemented for the participants.

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- Establish the templates of the informed consent forms and information sheets (in language and terms intelligible to the participants.)

The results of this activity will be collected in deliverable D9.1: H – Requirement No.1 to be submitted at Month 3.

Task 9.2 - POPD (Protection of Personal Data collected or processed) (M1-M48)

This task aims to:

- Explain how all of the data processed is relevant and limited to the purposes of the research project (in accordance with the ‘data minimisation‘ principle).
- Define technical and organisational measures that will be implemented to safeguard the rights and freedoms of the data subjects/research participants.

The results of this activity will be collected in deliverable D9.2: POPD – Requirement No.2 to be submitted at Month 3.

No milestones are associated to this WP.

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4 Project as a whole

4.1 Transdisciplinary work

eNeuron is a challenging project that suggests transdisciplinary work to serve its own objectives. The integrated systems' approach in the power grid that includes different energy carriers and different emerging technologies to formulate the micro-energy and energy hubs concepts, presupposes a great extent of multi-discipline work and collaboration in multi domains. Moreover, the implementation of the different use cases and eNeuron solutions under the smart grid domain adds on perplexity of the undertaking.

Having said that, the Consortium is a multi-disciplinary, multi-objective consortium, which is representative of the cross-cutting sectors on the integrated energy systems value chain, as required to successfully meet the project target and successful project execution.

Each partner has specific and high value knowledge in all scientific and technological branches, which are required to meet the project objectives. Moreover, the partners benefit and complement one another's knowledge, and this allows a structure to be established, which can be efficient at European level. The consortium as a whole allows to cover all competencies required for the development and the validation of multi-objective optimisation tools for local integrated energy systems and the eNeuron solutions. The complementary expertise of the consortium together with the transdisciplinary work that is needed is illustrated in the table below.

Table 22 - Expertise of the Consortium

COMPETENCE	Optimization algorithms	DER modeling and optimization	Multi-carrier energy systems modeling and optimization	Control algorithms	Laboratory testing	Energy policy and regulation	Experimental validation	Dissemination and exploitation activities	Energy consultancy (business plans, market etc)
ENEA	x	x	x	x	x	x		x	x
UCY	x	x	x	x	x	x		x	x
IEn		x		x	x		x		
IREC	x	x	x	x	x	x	x		
SINTEF	x	x	x	x	x	x	x		
TEC	x	x	x	x	x		x		
DERlab		x		x	x	x	x	x	
EPRI	x	x		x	x		x	x	
UNIVPM	x	x	x	x	x		x		x
UPM	x	x	x	x	x	x			
ENEA OPERATOR							x		
Skagerak							x		
EDP LABELEC							x	x	
ICONS								x	x
ENEIDA				x	x		x		
Marinha								x	
CoB			x					x	

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It is important to note that the majority of the consortium members already have a working relationship through EU projects or existing commercial and research activities. Importantly, each partner has their own goal and objective for the overall project vision and for their own commercial interest which is complementary to the other partners; hence there is no conflict with respect to individual business interests. As such, the consortium will work effectively to reach the project goal as a result of also achieving their own commercial interests so that they will get the most out of the project for their business.

As already discussed, eNeuron project consists of 9 WPs with related Tasks which are strongly correlated each other, as shown in the Pert Chart below.

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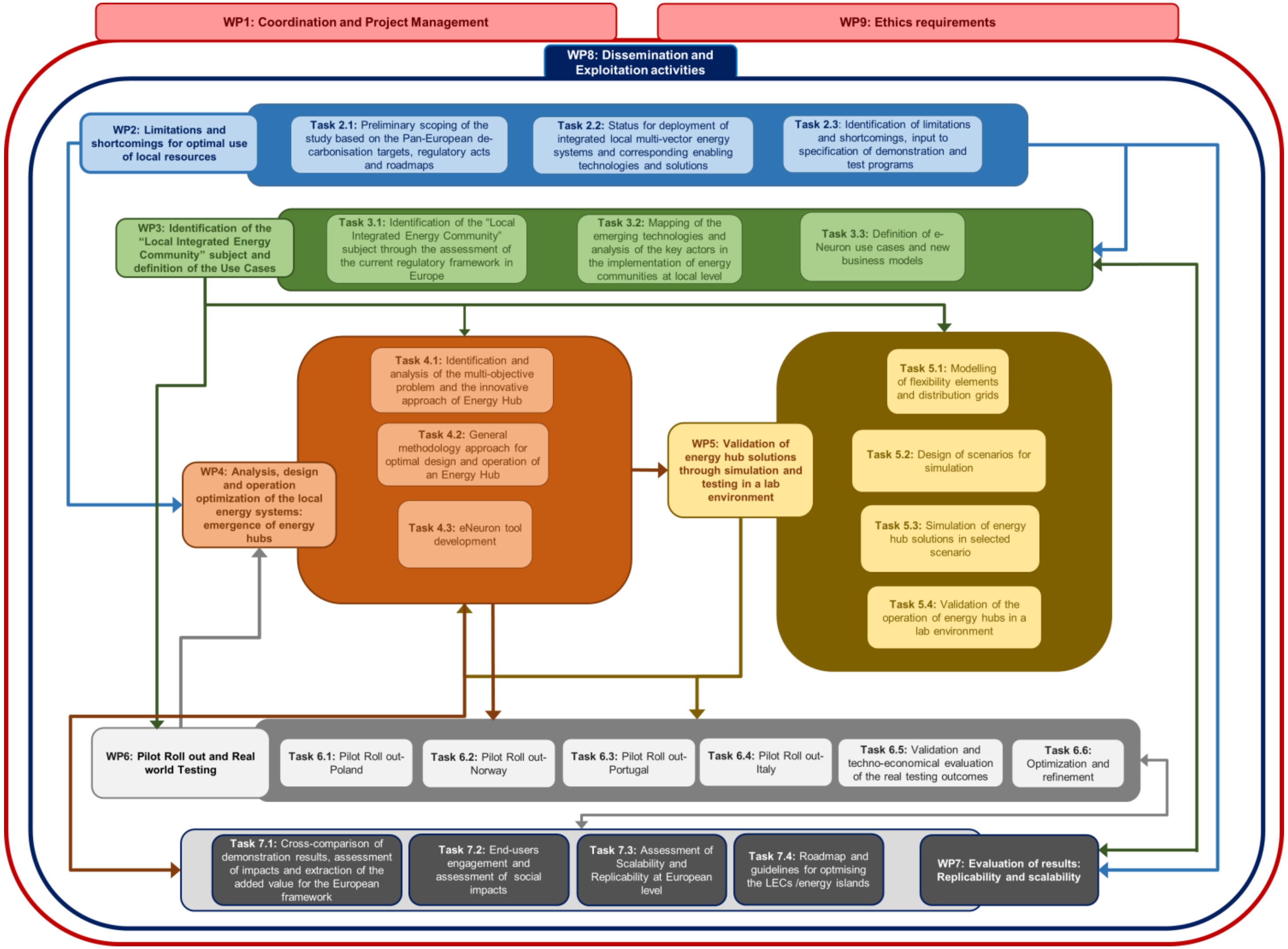

Figure 9 - eNeuron Pert Chart

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4.2 Timing of the different work packages

The timing of the different WPs and their tasks is shown in the following GANTT chart.

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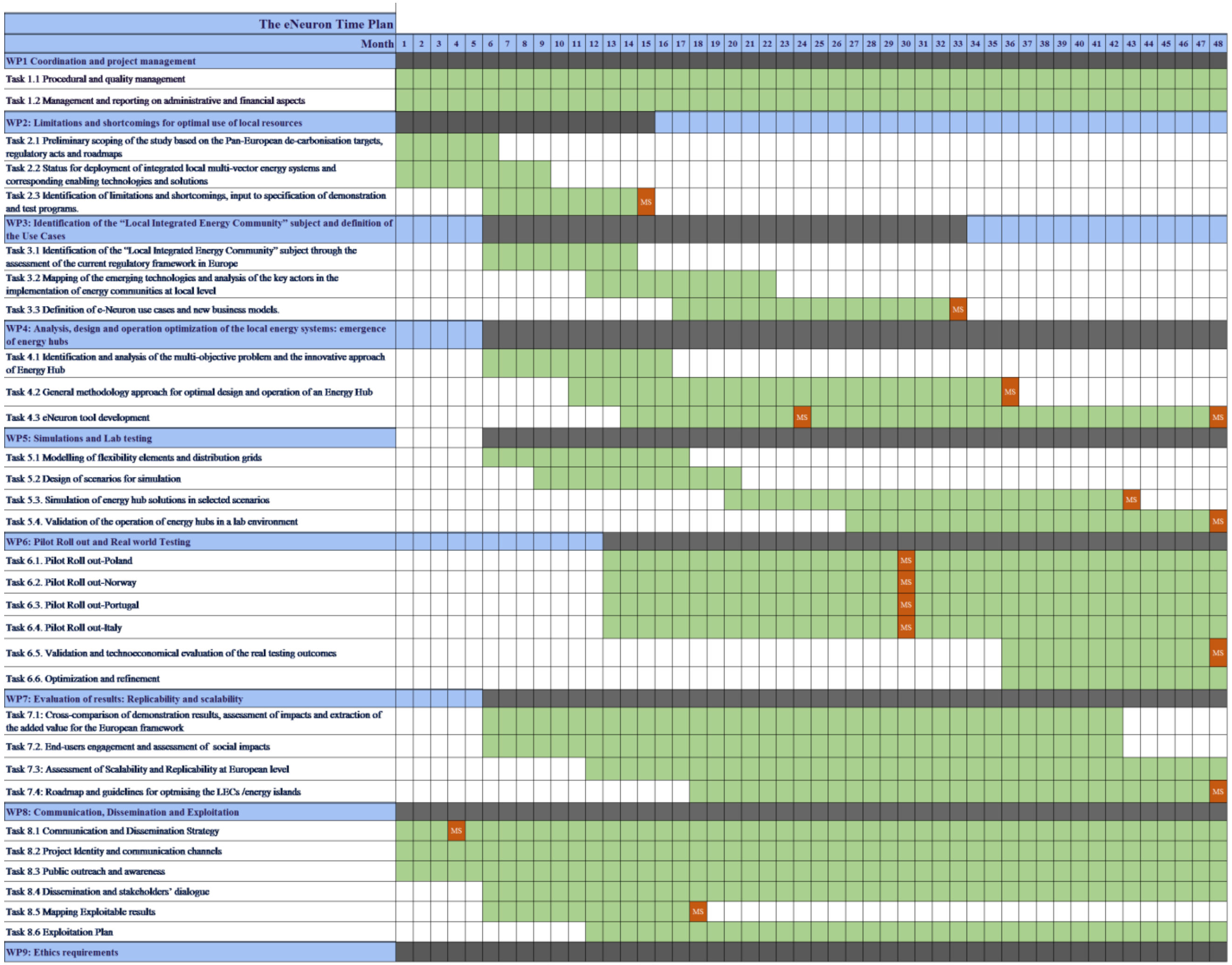

Figure 10 - eNeuron GANTT

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5 Communication guidelines

5.1 Project repository

Since its start in November 2020, the project has relied on a specific project repository based on ONLYOFFICE tool managed by DERlab. eNeuron portal is password-restricted and accessible to the partners only, and it is the primary platform for the project documentation and for managing all documents. It is a web-based document management system and therefore enables all participants to access it via a web-browser. The portal area is structured according to the project work-flow. All documents and files are uploaded, managed, and updated in the corresponding WP folders.

The main functionalities of eNeuron portal are described in the following:

- Collecting contact details of all project members also with photos;
- Visualizing the status of deliverables under preparation;
- Changing in real-time deliverables under preparation, to share information among partners;
- Collecting all documents/data produced throughout the project's duration;
- Planning internal milestones;
- Visualizing the interactive GANTT Chart;
- Visualizing a calendar for events;
- Notifications on project status and updates also related to partners' activities on the portal.

The creation of group chats based on SLACK tool is also foreseen to facilitate the discussion among partners.

Any personal data should be managed according to the terms of General Data Protection Regulation (GDPR) and the Consortium Agreement (Ch.4.4), including using Data Controller and other routines.

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5.2 Web-meetings

In order to discuss the technical progress of eNeuron project with all WPLs, regular TC web-meetings will be organized monthly by the PC and the TPC. These web-meetings are explicitly announced by the TPC via email a week before, by also including a brief agenda.

Partners are invited to check the agenda and add items to be discussed. Likewise, each WPL is expected to attend the web-meetings in an active and reliable manner. If anyone is unable to be present, he / she ought to give prior notice to the PC and the TPC and send feedback to relevant points raised in the agenda.

The agenda usually focuses on the following areas of discussion:

- progress within each WP with a particular focus on due deliverables;
- management issues.
- recent and coming events attended by eNeuron members;
- communication, dissemination and exploitation activities.

The TPC will take care of distributing the minutes of TC meetings to the participating partners.

Moreover, other web-meetings are scheduled on a regular basis within individual WPs. These web-meetings are announced via email by the respective WPL. This latter is also responsible for writing minutes. Finally, to guarantee an effective management of each Task within the Project, web-meetings are also scheduled at Task level, with Task leader responsible for announcement of meetings via email and for writing minutes.

5.3 Physical meetings

Regarding physical meetings, when Europe will be COVID-free, they will be organised regularly with the following frequency:

- Technical Committee - every 6 months
- Steering Committee - every year
- Advisory Board - every year (same time and venue as Steering Committee)

As agreed in the proposal phase, these meetings will be organised every 6 to 8 months at the premises of ENEA, FOSS, SINTEF, IEn, TECNALIA, UNIVPM and EDP LABELEC.

The organiser of the physical meetings is responsible for the logistical organisation of the meeting and preparation of the meeting agenda together with the PC and TPC. The organiser of the physical meetings is also responsible for taking the meeting minutes and sharing them with all the relevant participants and project bodies.

In case the pandemic will persist, these meetings will be organized virtually (as already done for the kick-off meeting) under the responsibility of the partners identified above.

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Moreover, three Technical Review Meetings will take place under convocation of the EC. During these meetings, the EC, with the potential help of external evaluators, will evaluate the progress of the project during the reporting period of reference. The official review is scheduled after the submission of the periodic reports of the project (M16, M32 and M48).

Besides the PC, the TPC, the WPLs and all partners in general could be requested to participate at the discretion of the Coordinator or under specific request of the EC.

5.4 Mailing lists

As agreed during the kick-off meeting, the internal mailing lists consist of:

- Mailing list of all partners including technical and administrative contacts;
- Mailing list for SC members;
- Mailing list for TC members;
- Mailing list for pilot providers.

These mailing lists are managed by ICONS as leader of WP8 through an excel document available in the project repository. Mailing lists at WP level are also foreseen and will be managed by the corresponding WPL.

5.5 Project logo and templates

The eNeuron logo was designed starting by the identification of the project objectives represented by the features, the main characteristics and the elements that highlight its uniqueness and that the consortium wants to raise when communicating the eNeuron project.

In the identification of the brand identity, WP8 leader, ICONS, directly involved the coordinator and technical coordinators, ENEA and FOSS, in a first brand personality identification. Based on this first brainstorming, three logo proposals were developed and afterwards discussed with the coordinators. The same were presented to the partners who voted for their preferred logo through a democratic process during the eNeuron Kick-off meeting.

The logo and visual identity will be coherently applied to all channels and materials, ensuring recognition, uniqueness and visibility to the eNeuron project. In line with the project's visual identity, a Word and Power Point template have been created for their regular use in public reports, deliverables to be submitted to the EC, official presentations of the project, together with other communication materials, such as the brochure and the project presentation video.

To acknowledge the EU funding and branding, the EU flag and a reference text must accompany the use of the logo. The following branding references will be used for eNeuron publications and materials.

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Table 23 – References to be used in eNeuron publications and materials.

Reference	Label	Content
No. 1	The eNeuron logo	
No. 2	Acknowledgement of EU Funding	*“This project has received funding from the European Union’s Horizon 2020 Programme for research, technological development and demonstration under grant agreement No. 957779”*
No. 3	EU Flag[1]	
No. 4	Acknowledgement of eNeuron project for dissemination-scientific publications	*“The result presented in this paper is part of the eNeuron project (www.eneuron.eu) This project has received funding from the European Union’s Horizon 2020 Programme for research, technological development and demonstration under grant agreement No. 957779”*
No. 5	Acknowledgement of eNeuron project for communication (Press Releases, ppt other media contacts)	*eNeuron is coordinated by the Italian Agency for New Technologies, Energy and Sustainable Economic Development and the University of Cyprus in cooperation with 15 other partners: This project has received funding from the European Union’s Horizon 2020 Programme for research, technological development and demonstration under grant agreement No. 957779*
No. 6	Acknowledgement of eNeuron project for communication (press releases, technical literature papers, publications)	*The information reflects only the author’s view and the Commission is not responsible for any use that may be made of the information it contains.*

[1]The style guide for using the EU flag here: http://publications.europa.eu/code/en/en-5000100.htm

5.5 Procedures for communication, publication and dissemination of the projects results

Public content about eNeuron will be edited and widely used to promote the project to multiple audiences, including the media and the general public. Communication content will be packaged in different formats: news items, social media posts, videos, journalistic articles. Topics for journalistic articles will be proposed by ICONS to the coordinator, prior to their commissioning and production. ICONS will be free to publish and distributed communication contents through the project's official online channels and through other external multipliers (online media, portals, information hubs).
Dissemination refers to any public disclosure of the project's results by any appropriate means, including but not limited to, by means of scientific publications, presentations at a scientific conference, dedicated publications addressing targeted stakeholders (adaptive re-use blueprints such as info-packs, guidelines, recommendations, policy briefs, technical brochures, best practices book), etc.

5.6 Social media strategy

The overall objective of the eNeuron social media strategy is to ensure adequate coverage of project activities on the social networks and engagement of both academic and professional audiences as well as the general public. eNeuron social media accounts will act both as a communication, dissemination and engagement channel and as a participatory tool to foster dialogue, enhance public understanding, acceptance and engagement of stakeholders' and citizens.

The project visual and written identity (including, key messages and tone of voice) have been reflected in the social media networks that have been set up to engage an online community represented by a wide and multi-level audience, including the project partners, key stakeholders, end-users, the general public, the EU Commission, all the networks and associations with whom cooperation and open communication channels will be established.

eNeuron social media accounts have been launched on Twitter (@neuronproject) and LinkedIn (www.linkedin.com/company/eneuronproject). Social media networks will be managed by ICONS in a dynamic manner so as to maximize outreach, increase interest and foster direct engagement with those enablers that will guarantee the sustainability of the project beyond its termination. Social media contents will be produced and distributed by ICONS. The social media strategy that ICONS will develop and apply will include cross-linking and interaction with other accounts (partners' and EU accounts) tackling eNeuron-related topics.

Active participation from the consortium partners' social media accounts is strongly encouraged to maximise the outreach and engagement potential with their existing online communities.

6 Quality management

6.1 Management structure

To guarantee the efficient coordination of the activities that will be carried out in the eNeuron project by investing into the expertise of the consortium, as well as a smooth decision process, a proper management structure is needed.

Figure 11 shows the eNeuron management structure, with interactions among the various bodies involved. Beyond the project coordination, the leadership structure includes a Steering Committee (SC), a Technical Committee (TC), and Advisory Board (AB), as briefly described below.

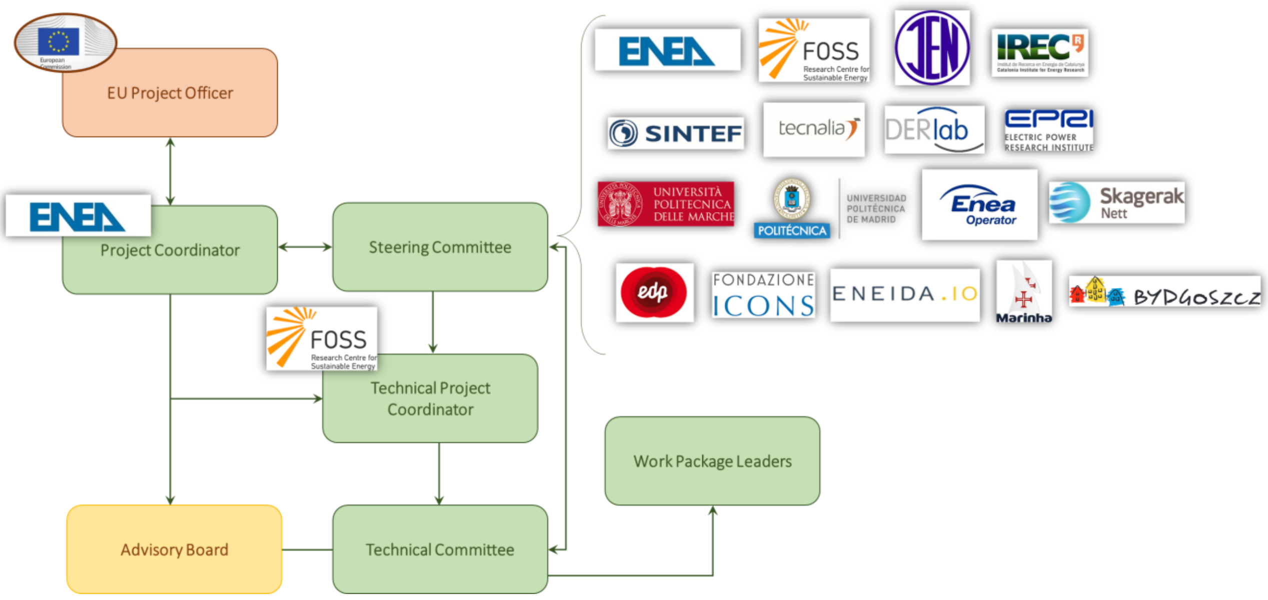

Figure 11 - eNeuron management structure

The Project Coordinator (PC) is ENEA, that will ensure the overall planning, execution and control of the eNeuron project and constitutes the legally identified interface of the consortium with the EC for legal and financial issues. The specific requirements of these actions necessitate extensive contact between the EU project officer (PO) and the PC. As such, the coordination of the project is fulfilled by the Coordinator whose tasks and responsibilities are namely to deal with specific actions on behalf of or for the Consortium, and in particular contractual, financial, legal, technical and policy issues.

The Technical Project Coordinator (TPC) of eNeuron is FOSS. The TPC will chair and activate the Technical Committee (TC). In compliance with the decisions of the PC and the SC, the TPC will be responsible for all technical aspects of the project, working in conjunction with the WP leaders for the achievement of the intermediate and final results of eNeuron.

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The Steering Committee (SC) is composed by representative(s) of each partner involved in the eNeuron consortium and is in charge of the evaluation and the validation of the work performed by each WP. The SC is the decision-making body of the project and its decisions are binding upon all parties. The duties of the SC include: scope management, validation and control. schedule management, financial management, risk management, conflict management and consortium management.

The Technical Committee (TC) is the supervisory board for the execution of the project and shall report to, and be accountable to, the SC. The TC will consist of the PC, the TPC, and WPLs, chaired by the TPC. The TC will carry out the operational technical management of the project and support the necessary decisions in coordinating and administrating the project. The TC is also responsible for the implementation of the entire project, and it will supervise the progress of the project and the timely completion of the tasks.

The Advisory Board (AB) will provide an arena for external members to participate in the eNeuron project. The involvement of these stakeholders will extend the eNeuron network and will provide valuable input to the TC, thereby constituting a consultative body for the WPLs. The AB will also have an important role in supporting transfer of knowledge and dissemination. The progress and results will be presented to the participants, as it will be described in detail in the eNeuron dissemination plan.

The AB will comprise a maximum of 10 members and it will be chaired by the PC and managed by the SC.

At present, the following organisations have already accepted the eNeuron invitation and sent a formal Letter of Support (LoS) to the project during the proposal preparation, also appointing a high-level representative to the AB:

- European Technology and Innovation Platform (ETIP SNET);
- European Association representing local energy distributors (GEODE);
- European Energy Research Alliance - Joint Programme on Smart Grids (EERA JP SG);
- European Energy Research Alliance - Joint Programme on Smart Cities (EERA JP SC);
- Municipality of Aglantzia of Cyprus;
- Electricity Authority of Cyprus (EAC);
- Iberdrola España;
- Centre for Intelligent Electricity Distribution (CINELDI).

6.2 Process of deliverables preparation

In accordance with the GA, the deliverables are classified according to the following types:

- R: Report

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- D: Demonstrator
- O: Other
- ORDP: Open Research Data Pilot

As for the confidentiality levels, according to the GA, the following two levels of security are considered:

- PU: Public Usage. No restrictions on access (in secured PDF format).
- CO: Confidential, only for members of the consortium (including the Commission Services).

The official eNeuron template to be used for all deliverable reports has been made available by ICONS and shared with all partners through the project repository.

The use of the deliverable template is mandatory for all project partners and for all deliverable reports.

The review process of deliverables is shown in the figure below. The draft document will be reviewed at Task level, WP level and TC level. In all sub-steps, the draft document will come back to Task level if revisions are needed.

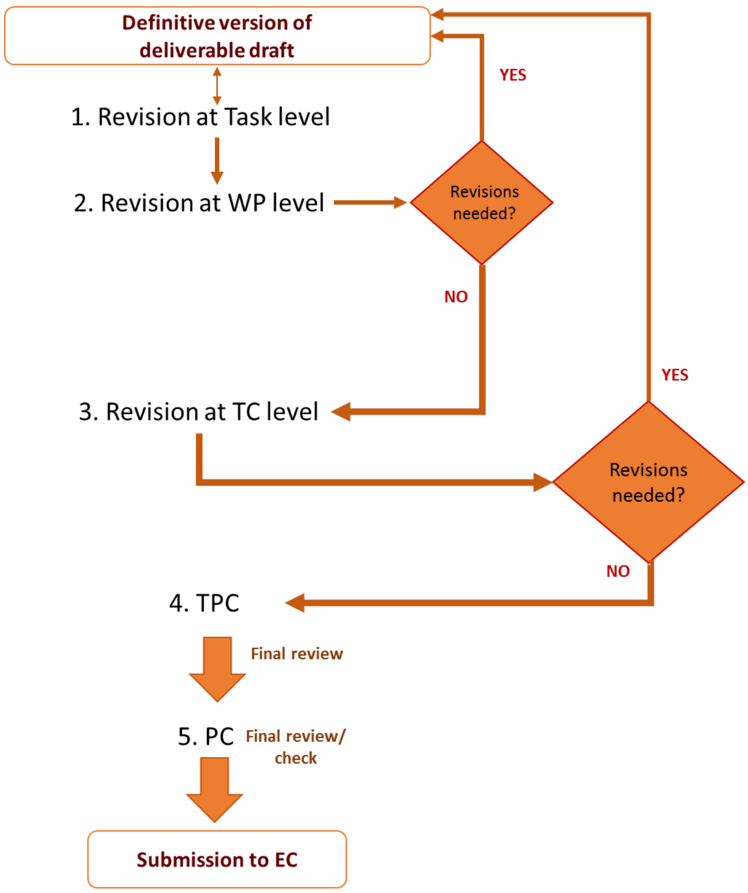

Figure 12 - Review process of eNeuron deliverables

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For revision at TC level, reviewers (at least 2) will be chosen among members of the TC during ordinary web-meetings. These reviewers will represent the TC as a whole and will make an independent technical review of the draft document, directly discussing with the Task leader and, whenever necessary, with the corresponding WPL. The internal interaction will be tracked through the revision page of the draft document, by using the dedicated portal. Once all revisions (if any) will be addressed, the entire draft document will be submitted in due time by WPL to the TPC for the final review, before handling it to the PC for the final review and check and the delivery of the Deliverable (uploading in the Portal).

Deliverables are created and shared through the project repository, which also allows to collaboratively work on, and have versioning control of the documents. The review activities will be also coordinated via the above mentioned repository. The WPL of the respective deliverable is responsible for its final approval.
In case of delays in deliverables preparation, which reflects delays in submission, the PC informs the PO accordingly if encountering more than a one-month delay and provides feedback from the partners involved in the WP and specifically in the deliverable at issue.

For the timely production of deliverables, the following timeline and work schedule is suggested to be used by all partners:

- Process of drafting the first complete version of the deliverable: to be completed at latest 8 weeks before the deadline;
- Process of internal review: to be completed from three weeks and one week before the deadline;
- Process of final review and check: to be done during the last week before the deadline.

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7 Dissemination and communication with external stakeholders

Dissemination and communication to external stakeholders forms part of an overall strategy that will be established in WP8. It is an integrated approach designed to foster awareness, acceptance and uptake as shown in the diagram below.

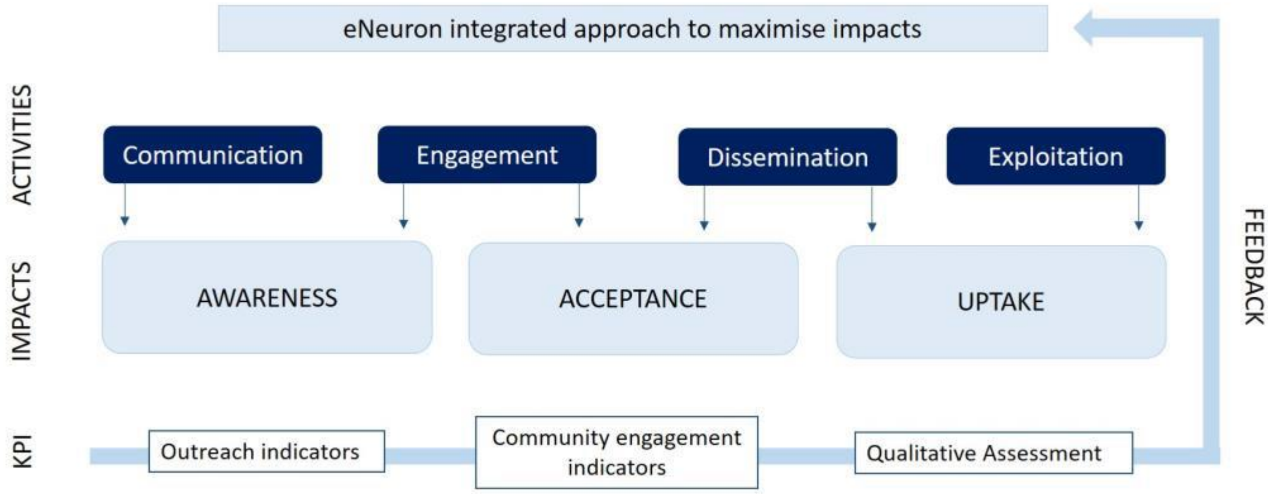

Figure 13 - eNeuron integrated approach to maximise the impacts

The strategy will be implemented both at a European/international and local level through a defined management structure. At central level, eNeuron C&D Secretariat (led by WP8 leader in cooperation with the coordinator) will manage official communications of the project and external relations with European/international stakeholders. At local level, pilot partners will establish local C&D teams. Due to its particular focus on LEC, the local C&D teams will play a very significant role in eNeuron dissemination activities. Academic and technical partners with extended networks and communities), shall act as multipliers of the C&D activities carried on by the Secretariat and the local teams. The Secretariat will coordinate the C&D activities of the whole project, guaranteeing the sound implementation of the C&D Plan and the harmonisation of the activities carried out at local and national level. Those external stakeholders who can bring additional value to the development, evaluation, uptake and exploitation of these outcomes will be identified and encouraged to participate.

Through the exploitation of mainstream communication channels, the consortium will increase awareness and enhance societal perception on how eNeuron can tackle emerging challenges and positively impact society, while increasing visibility and information flow among EU citizens on the vital role of H2020 projects in realizing and achieving ambitious societal, economic and sustainable growth goals. A continuous monitoring activity of the KPIs will allow the eNeuron team to properly

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evaluate the efficacy of the C&D strategy and to scale it in the course of the project to reach the expected impacts

All public documents such as articles, interviews, press releases and videos undergo a quality check by ICONS Editorial Manager. ICONS will work in close collaboration with the project coordinators to ensure accuracy of the information published.

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8 Conclusions

This D1.5 document presents the detailed description of the work to be done in eNeuron project. The document describes the project's goal, by also presenting the specific and measurable objectives which will be attained within the project duration through its nine work packages. The concept underpinning eNeuron, the innovative methodology proposed, as well as the expected impacts are presented.

It also presents the work plan with description of the nine work packages with definition of partners' roles, tasks, deliverables, and milestones.

To guarantee the flexible coordination of the activities, a smooth decision process and a prompt management of risks and unforeseen events, a proper management structure is needed. Therefore, the management structure is presented through a brief description of each body involved.

The key aspects of internal and external communication are discussed through definition of the main channels such as eNeuron project repository, web-meetings, physical meetings, project logo and templates and strategy for the usage of social media.

Finally, the issue of communication of stakeholders is also addressed since one of the main objectives of the consortium is to work closely with the industry, operators, prosumers, and policy entities for responding effectively to their needs and creating the right bi-directional communication and response for validating the identified solutions and developments.

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Abbreviations and acronyms

AB	Advisory Board
AMI	Advanced Metering Infrastructure
BESS	Battery Energy Storage Systems
C&D	Communication and Dissemination
CCHP	Combined Cooling Heating and Power
CHP	Combined Heat and Power
DER	Distributed Energy Resources
DR	Demand Response
DSO	Distribution System Operator
EC	European Commission
EERA	European Energy Research Alliance
EH	Energy Hub
EMS	Energy Management System
EU	European Union
EV	Electric Vehicle
HCPV	High-Concentration PV Systems
HEMS	Home Energy Management System
HV	High Voltage
HVAC	Heating, Ventilation and Air Conditioning
ICT	Information and Communication Technologies
ILCD	International Reference Life Cycle
IP	Intellectual Property
IPR	Intellectual property Rights
KER	Key Exploitable Result
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
LCC	Life Cycle Cost
LEC	Local Energy Community

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LoS	Letter of Support
LV	Low Voltage
mEH	Micro Energy Hub
MS	Milestone
MV	Medium Voltage
O&M	Operation and Maintenance
OPE	On Premise Environment
P2P	Peer to peer
PC	Project Coordinator
PO	Project Officer
RES	Renewable Energy Sources
SC	Steering Committee
SRA	Scalability and Replicability Analysis
TC	Technical Committee
TF	Task Force
TPC	Technical Project Coordinator
TSO	Transmission System Operator
WP	Work Package
WPL	Work Package Leader

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References

[1] *Clean energy for all Europeans package, 2015, https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en*

[2] *eNeuron, deliverable D1.1 : Project management plan (first version), Confidential, December 2020.*

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APPENDIX 1: Project calendar

Month	1	2	3	4	5	6	7	8	9	10	11	12
	2020-11-01	2020-12-01	2021-01-01	2021-02-01	2021-03-01	2021-04-01	2021-05-01	2021-06-01	2021-07-01	2021-08-01	2021-09-01	2021-10-01

Month	13	14	15	16	17	18	19	20	21	22	23	24
	2021-11-01	2021-12-01	2022-01-01	2022-02-01	2022-03-01	2022-04-01	2022-05-01	2021-06-01	2022-07-01	2022-08-01	2022-09-01	2022-10-01

Month	25	26	27	28	29	30	31	32	33	34	35	36
	2022-11-01	2022-12-01	2023-01-01	2023-02-01	2023-03-01	2023-04-01	2023-05-01	2023-06-01	2023-07-01	2023-08-01	2023-09-01	2023-10-01

Month	37	38	39	40	41	42	43	44	45	46	47	48
	2023-11-01	2023-12-01	2024-01-01	2024-02-01	2024-03-01	2024-04-01	2024-05-01	2024-06-01	2024-07-01	2024-08-01	2024-09-01	2024-10-01

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