



ECOFLEX

Report of the 1st Advisory Board meeting

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1. ECOFLEX AB members and roles

The ECOFLEX Advisory Board (AB) will offer broad expert and user consultation. It is assembled with different actors in the value chain in Belgium (TSO, aggregators, technical parties and knowledge partners) and its objective is to follow the project progress and steer the project planning. The members of the AB are:

Name	Company	E-mail	Comment
Alexandra Vanhuysse	Snowball		
Anton Koninckx	VEKA		
Bart Vannoppen	VOLTA		
Guillaume Cambier	ORES		
Thomas Buisseret	ORES		
Luc Huysmans	FEBEG		
Marijn Maenhoudt	CREG		
Michel Verschuere	YUSO		
Kevin Milis	Synergrid		
Patrick Reyniers	Synergrid		
Simon Lachi	RESA		
Simon Gerard	RESA		
Eric Monami	Edora		
Mathieu Waucomont	CWAPE		Not available the 20 th of Sept.
Jo Robbelein	FOD Economie SPF Economie		Not available the 20 th of Sept.
Alan Delferiere	FOD Economie SPF Economie		Not available the 20 th of Sept.
Joni Rossi	Flux50		

1.1 First AB meeting

The 1st AB meeting took place on September 20th, 2023, on the premises of FLUX50. The agenda included the following items:

- Welcome, Project & Partners introduction
- Presentation of the AB and its members
- Break
- ECOFLEX general concept
- Results, Outputs
- Pilot Sites
- Q&A
- Networking coffee break
- Next steps and closure of the meeting

Partners who supported and participated in the AB meeting:

- Stella Arapoglou (VUB)
- Andy Putratama (VUB)
- Rémy Cleenwerck (UGENT)
- Joni Rossi (FLUX50)
- Marc Vermeeren (FLUX50)

Advisory Board members who participated:

- Alexandra Vanhuyse (Snowball)
- Anton Koninckx (VEKA)
- Bart Vannoppen (VOLTA)
- Guillaume Cambier (ORES)
- Thomas Buisseret (ORES)
- Luc Huysmans (Febeg)
- Marijn Maenhoudt (CREG)
- Kevin Milis (SYNERGRID)
- Simon Lachi (RESA)
- Patrick Reyniers (SYNERGRID)

1.2 Outcome

As this was the first AB meeting, it was more of an introductory session: the main project objectives and the structure of the different Work Packages were presented, in order to explain the project scope. The attendees showed great interest in the topic. Afterwards some preliminary results as well as the main challenges were highlighted and discussed. Thanks to the expertise of the attendees, the AB meeting quickly became interactive. This resulted in fascinating discussions which provided valuable feedback for the continuation of the project. However, not only a lot of input was generated, but also interesting food for thought and research questions raised. Notably, the discussions orchestrated the ECOFLEX consortium to refine the project's flexibility ecosystem, as explained in the following sub-section.

1.2.1 ECOFLEX Ecosystem

The ECOFLEX project aims to unlock the potential of electric cars and energy communities to balance the grid in a climate neutral way. To achieve this, multiple aspects are researched, going from the development of new energy management system (EMS) technologies towards the development of a novel platform to provide flexibility from low-voltage assets such as energy communities and e-mobility.

To achieve this, a 'universal flexibility platform' or UFP will be developed which will ensure the interaction with the local EMS at a renewable energy community as well as with the e-charging controller (or CPO) at a e-charging parking (see Figure 1). The challenge here is to not only communicate with the EMS but also determine the potential flexibility that can be provided based on the pool of assets connected to the UFP. In this aspect, a distinction is made between a classic EMS ❶ and a more advanced version of the EMS ❷ (the advance EMS will be developed within the project).

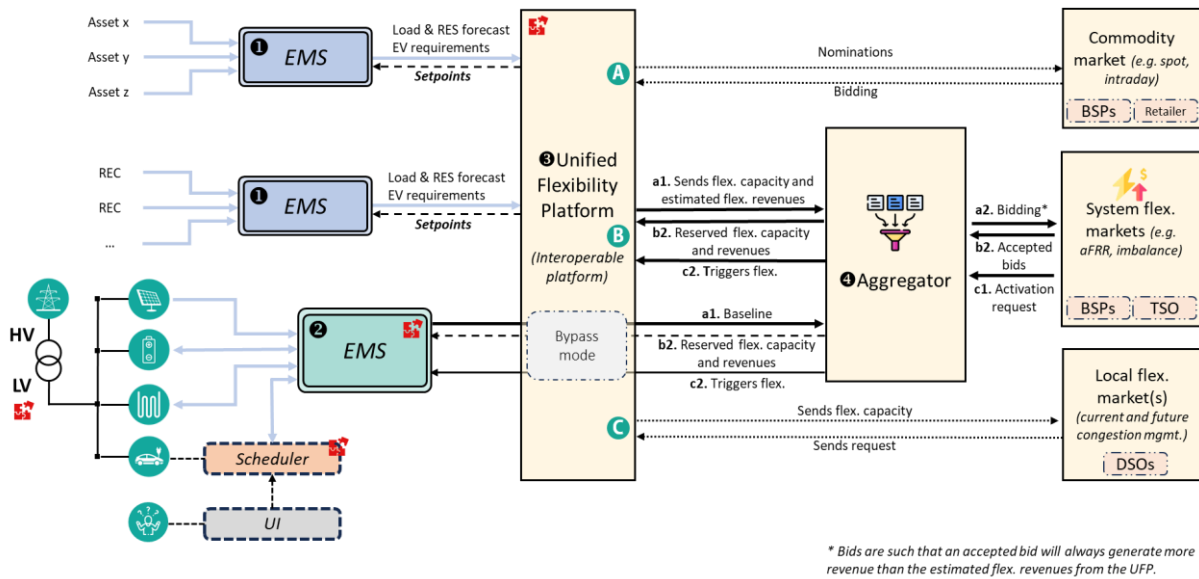


Figure 1: Overview of the project structure

Here, we define a classic EMS as a typical commercial version of an energy management system which is mainly triggered by certain signals (e.g., price signal of dynamic tariff) or able to perform peak-shaving etc.). Besides, the advanced version of the EMS will be capable of not only fulfil the function of a classic version, but also to perform real-time optimizations based on the EV-driver requirements and asset forecasting, this by considering local grid constraints. In the former case the grid constraints must be respected by the UFP. Therefore, the flexibility platform aims to be interoperable, thus allowing various types of management systems to participate.

Based on the number of participants and market situation, the UFP will select the most advantageous market or combination between different markets, to participate to. This can be (i) directly to the commodity markets, or (ii) via an aggregator to the system flexibility markets or finally via a novel market which is designed by DSOs in order to control the local flexibility. The latter aims at controlling the congestion within the low-voltage network and is currently already operating in the Wallonia.

This brings us to the novelties (🇧🇪) that are created by the UFP, which can be listed as:

- Interoperability to control EMS for flexibility services;
- The integration of different kinds of flexibility;
- Integration of e-mobility (on LV side) as flexibility provider and
- Contribution to reduce the local congestion.

Reflecting to the advanced EMS, the latter has the ability to define the baseline to provide flexibility. Compared to a classic EMS which follows setpoints initiated by the UFP, the advanced EMS bridges the gap between the limitations of a classic EMS and the requirements from an aggregator to participate to the ancillary markets. Not only will this EMS have the ability to control the assets connected to it, but it will also provide a forecast of the RES production, optimise the EV charging behaviour through a novel scheduler which will be connected to this EMS.

Furthermore, the battery energy storage systems (BESS) connected to this EMS can be either triggered by signals send via the UFP or make the direct link to an aggregator via the bypass mode. Which brings us to the next novelties of the project (🇪🇺) :

- Development of a new generation of EMS for flexibility valorisation;
- A scheduler for e-mobility which enhances the local grid.

Initially the BESS connected to the advanced EMS, which is part of one of the pilot sites within the project, will be directly controlled by the aggregator. The modus operandi where a battery system on low-voltage side participates to the aFRR is a premiere (🇪🇺).

1.2.2 Project Timeline

The graph below presents the overview of the timeline of ECOFLEX. The complete Gantt chart of the project is also available at the end of this document.

ECOFLEX Timeline

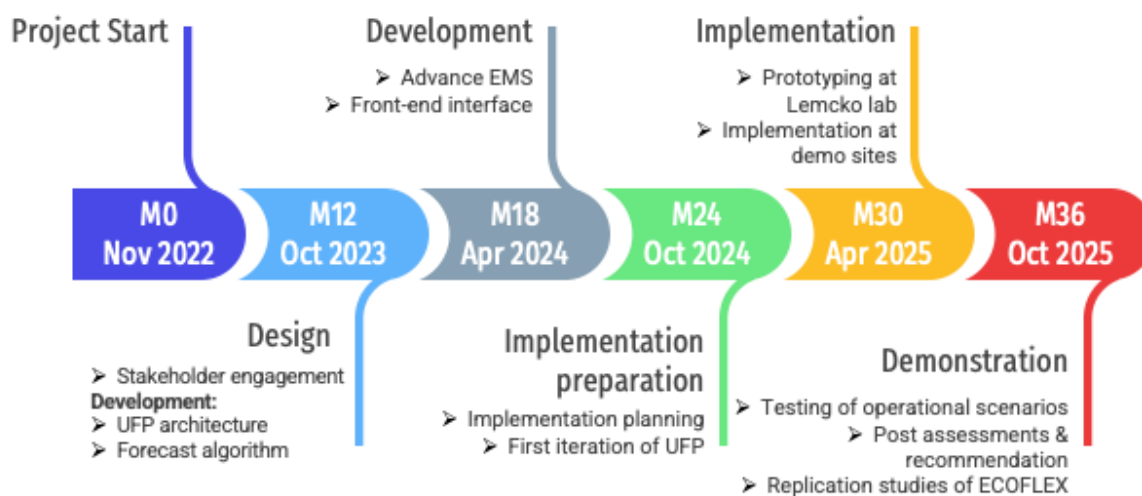


Figure 2 Overview of ECOFLEX Timeline

Detailed Gantt chart

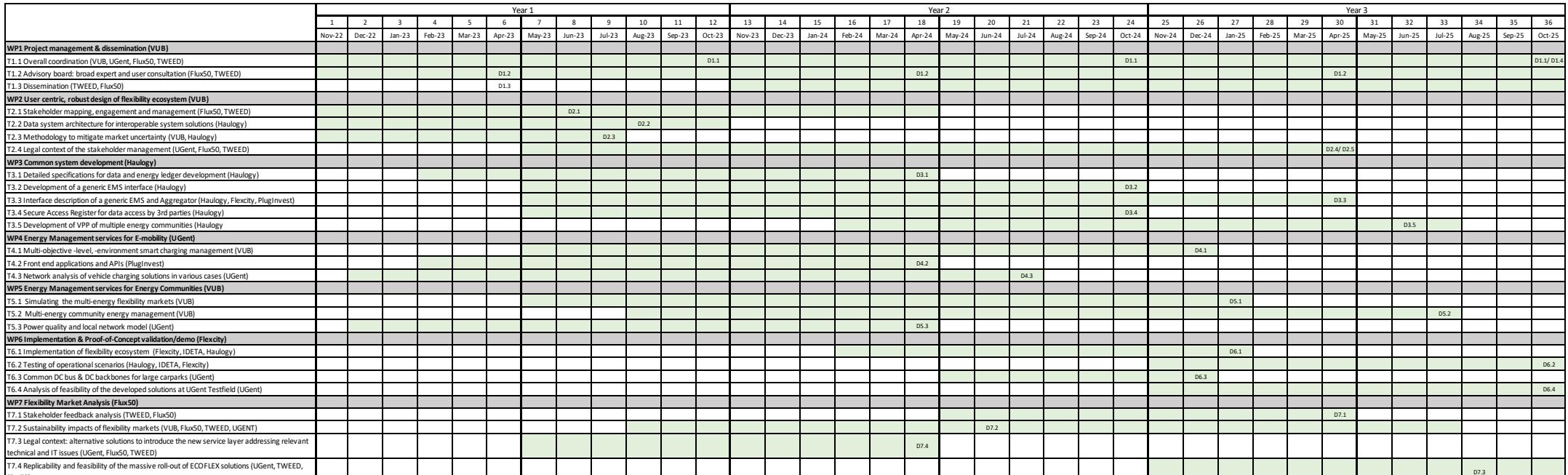


Figure 3 Detailed Gantt Chart

1.2.3 List of questions and topics of interest

Below is the list of main questions posed by the AB members alongside with the explanation on how the project will address that (in blue):

1. Given that the scope of the project is very broad, to what extent will this project provide a final solution and for whom (e.g. prosumers, aggregators, etc.)? And given this scope, how do you see the timeline?

The project timeline is presented in the previous section. The implementation phase will start on mid of year 2. This phase will start by creating the implementation plan for all three demonstration sites. The consortium targets the flexibility ecosystems (e.g., advance EMSs, UFP) to be implemented by the beginning of year 3, and immediately start the demonstration at phase after the implementation.

2. Where will the final version of the Unified Flexibility Platform run and what protocols will it work with, i.e. is it likely to be open source and therefore accessible to everyone?

In the initial planning (proposal stage), open source is not part of the solution that will be provided by ECOFLEX. Note that although the solution may not be open source, the algorithms, interfaces and documentations that will be developed in the project will be freely accessible. UFP will be developed in an iterative manner. We target the first version of UFP will be ready by mid year 2, and the development will continue until year 3 in order to update further (adding features) the UFP driven by stakeholder consultations and change of regulations (e.g., opening aFRR for LV customers)

3. How and to which extend will the obtained results be useful for the pilot sites? Additionally, how will these pilot sites test this unified flexibility platform? Can you also refer to the timeline for this.

The main interests for the pilot sites to join the UFP is to be able to valorize their flexibility and be connected to different flexibility markets. The demonstration activities are foreseen in Year 3 of the project;

4. From an economical point of view, will there be an economic parameter for the participation on the markets, i.e. will it be worth to provide flex. to the market and will

this be included in the UFP -- related to work packages 4 and 5. Also, what makes UFP different to a typical VPP?

The main economic parameter is cost reduction of the sites (e.g., communities). To achieve this, both UFP and advance EMS shall be able to look on different alternatives in the markets, such as optimizing dynamic price, and look for explicit flexibility valorisation – e.g., participating to balancing markets. Although it is quite similar, the UFP differs from a typical VPP due to several innovations:

- **From sites perspectives:** the UFP will allow integration of any kind of EMS to valorise flexibility. To achieve this, one solution is by developing an internal market scheme within the UFP portfolio. For classical EMS, the UFP will provide internal dynamic flexibility pricing so that they can respond to this price to manage their assets.
- **From market perspectives:** The UFP will be able to connect communities to any kind of markets and arbitrage/select between them to maximize revenue.

In addition, the main core innovation also lies on the management of local grid congestion (including voltage congestion) that is currently a big challenge on flexibility valorisation in low-voltage grid, due to the present of massive assets in the system (such as distributed energy resources, electric vehicles).

5. Related to the previous question: (i) what is the business case behind the UFP? And (ii) why would people want to participate to the UFP instead of going directly through an aggregator?

As in the previous section, one of the innovative business cases is that the UFP will allow the creation of internal market scheme for sites within its portfolio. Moreover, the UFP itself can be further commercialized and be operated by a new actor. This aspect is currently under investigation by the consortium.

The main advantage to join the UFP is that it allows any kind of EMSs, including classical EMSs to valorise their flexibility. In order to participate to the balancing markets EMSs need to fulfil the requirements (e.g., min. amount of power etc.) while the UFP would cover this by allowing smaller assets to participate and provide this pool to an aggregator which on his turn can use this to optimize his portfolio to bid on the markets.

6. How grid constraints will be managed, will there be a signal from the DSO?

For the moment, there is no such congestion signal from the DSO. If it is possible in the future, this case will be considered in the EMS algorithm that we are developing. In the existing approach, grid constraints impact can firstly be assessed using existing smart meter data. With smart meter, we can estimate the grid topology and parameters and forecast the possible impact of assets integration, including defining the site hosting capacity. An alternative solution that is foreseen is to integrate optimal power flow formulation in the EMS using the model that will be generated using smart meter data.

7. How do you consider the needs of the LEC, as communities have their own needs (e.g., in terms of sustainability ,...) that can or will interfere with the needs or business case from the UFP?

When defining a flexibility potential of a particular site, the EMS will take into consideration the needs of the site (e.g., cost reduction, CO2 reduction, etc). In other words, the needs of prosumers will be accounted within the algorithm that will be developed in the advance EMS. As the UFP will source flexibility from sites, it cannot interfere the sites' preference as the preference is implicitly defined when the sites provide its flexibility potential to the UFP.

8. Will the cost of participating to the markets also be studied, i.e. the cost of battery deterioration compared to the gains of providing flex to the markets?

The typical objective of the EMS is to maximize the revenue or minimize cost reduction. Hence, it is possible to take into account the battery degradation in the algorithm.

9. The framework of the project is clear and the problem to solve is relevant, but very complex as you try to tackle a lot of research questions, which is very ambitious. Maybe a tip would be to better delineate the framework and focus on a select amount of research questions that can be researched in dept instead of increasing the complexity. As ECOFLEX is a fundamental research project, innovations will be the core objective of the project. However, the consortium agrees that this will increase the complexity, especially with the 3-year time constraints. To address this, the consortium has defined two development directions:

- **Fundamental Research:** in which we target to tackle all the research questions that we have to develop this new flexibility ecosystem. However, as we will take into consideration different future scenarios, it may not be possible to demonstrate the “complete” solution in real-life. Hence, not all of the solution will be real-life demonstrated, but the development will be documented based on reporting/deliverables/ or publications.
- **Implementation:** for implementation, we will target based on what is possible in the current regulatory framework for valorising flexibility at low-voltage grid.
From another perspective, the development for implementation can be regarded as the initial version of the flexibility ecosystem (UFP and advance EMS). The UFP and advanced EMS will be continuously developed in order to achieve the research objectives.

1.2.4 List of project deliverables

Due M	D	Title	Lead
6	D1.2	Workshops with advisory board v1.0	FLUX50
6	D1.3	Project website	TWEED
8	D2.1	Market schematic	FLUX50
9	D2.3	Market and Flexibility Forecast Algorithms	VUB
10	D2.2	Data system architecture	HAULOGY
12	D1.1	Intermediate Progress Report v1.0	VUB
18	D1.2	Workshops with advisory board v2.0	FLUX50
18	D3.1	Specification list for ledger	HAULOGY
18	D4.2	Front end applications for charge scheduling	PLUGINVEST
18	D5.3	Development of charging strategies as a function of local grid properties	UGENT
18	D6.6	Report on the legal context of the new market model	UGENT
20	D6.5	Life Cycle Assessment Data provision	VUB
21	D4.3	Digital twin model of a public distribution network predicting maximum hosting capacity	UGENT
24	D1.1	Intermediate Progress Report v2.0	VUB

24	D3.2	Generic Energy Management System Interface	HAULOGY
24	D3.4	Integration Access Register	HAULOGY
26	D4.1	Report on different smart charging management structure for electric vehicles	VUB
26	D6.3.1	Determination of the optimal voltage level from efficiency aspect	UGENT
26	D6.3.2	Design rules a DC backbone as a function available RES, envisaged load infrastructure and flexi	UGENT
27	D5.1	Report on short-term and longterm forecasting of multi-energy local flexibility market	VUB
27	D6.1	Operational algorithms for a flexibility ecosystem	FLEXCITY
30	D1.2	Workshops with advisory board v3.0	FLUX50
30	D2.4	Guidelines legal enabling framework for energy management service providers	UGENT
30	D2.5	Cost Benefit Analysis of role energy management service provider	UGENT
30	D3.3	Report on Interface description	HAULOGY
30	D7.1	Stakeholder feedback analysis	TWEED
32	D3.5	VPP tool for multi-energy communities	HAULOGY
33	D5.2	Report on the multi-energy community model	VUB
34	D7.2	Report on the Sustainability impact	UGENT
36	D1.1	Intermediate Progress Report v3.0	VUB
36	D1.4	Final Report	VUB
36	D6.2	Report on Testruns in the demo site	HAULOGY
36	D6.4	Refinement guidelines to improve the proposed models	UGENT