

FLEXERGY

Deliverable 15 - Project Management and Governance Structure

Activity 7:
Project Management

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FLEXERGY ABSTRACT

The FLEXERGY project aims at the development of an advanced management solution, highly innovative and provided of artificial intelligence, for the management of assets of battery energy storage systems, integrated with renewable energy sources or for application within a microgrid

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Document

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In order to fully understand the content of this document, it is therefore recommended that the reader possesses a language proficiency equivalent to B1 level, according to European Language Levels

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Executive Summary

This deliverable addresses the management of several processes of the FLEXERGY project, including documentation, execution and governance structure.

The role of the internal and external stakeholders towards the project achievement is addressed in this document, describing the governance structure.

Along the document, the reader will be able to learn about the tool used at corporate level for documentation management also adequate for the project purposes, as well as the structure of documentation, the role of users, the overall workflow steps for documentation management and the related lifecycle management.

Moreover, the reader will also learn about the innovation management process implemented within the project, namely regarding the technology radar, innovation risks management, intellectual property management and impact of innovation derived from the project.

The project aims at using the existing integrated microgrid and energy storage demonstrator testbed available at Efacec - developed along the DEMOCRAT project - for demonstrating the outcome of the FLEXERGY project. Therefore, the document also addresses the operational and execution management aspects of such integration and demonstration.

Table of Contents

EXECUTIVE SUMMARY	5
GLOSSARY	8
1. INTRODUCTION.....	9
2. PROJECT GOVERNANCE STRUCTURE	10
2.1 OVERVIEW	10
2.2 PROJECT TYPOLOGIES	10
2.2.1 Typology 1.....	10
2.2.2 Typology 2.....	10
2.2.3 Typology 3.....	10
2.2.4 Typology 4.....	10
2.3 PROJECT MANAGEMENT AND RELATED STAKEHOLDERS	11
3. DOCUMENTATION MANAGEMENT PLAN	13
3.1 OVERVIEW	13
3.2 FOLDER STRUCTURE	14
3.3 USERS' ACCESS	15
3.4 DOCUMENTATION WORKFLOW MANAGEMENT	15
3.5 DOCUMENTATION LIFECYCLE MANAGEMENT	16
3.6 SIMPLICITY OF USE	17
4. INNOVATION MANAGEMENT PLAN.....	18
4.1 OVERVIEW	18
4.2 TECHNOLOGY RADAR	18
4.3 INNOVATION RISKS MANAGEMENT.....	19
4.4 INTELLECTUAL PROPERTY MANAGEMENT	20
4.5 IMPACT ASSESSMENT OF INNOVATION.....	21
5. OPERATIONAL AND EXECUTION MANAGEMENT PLAN.....	22
5.1 OVERVIEW	22
5.2 INTEGRATION AND VALIDATION MANAGEMENT	22
5.3 TESTBED ASSETS AND HUMAN SAFETY MANAGEMENT	22

List of Figures

Figure 1 - The governance structure of the FLEXERGY project.....	11
Figure 2 - Link to Synergynet from the Efacec corporate intranet	13
Figure 3 - Synergynet options, comprising SharePlace	14
Figure 4 - Lifecycle workflow.....	16
Figure 5 - Example of document revision tracking.....	17
Figure 6 - Preliminary technology/business radar	18

List of Tables

Table 1 - Internal and external stakeholders' role within the project typologies	12
Table 2 - Critical risks and mitigation measures	20

Glossary

KPI	<i>Key Performance Indicator</i>
ASE	<i>Automation and Smart Energy - an Efacec business unit</i>
BoD	<i>Board of Directors</i>
CEVE	<i>Cooperativa Eléctrica do Vale d'Este</i>
DSO	<i>Distribution System Operator</i>
EDP	<i>Energias de Portugal</i>
HEDNO	<i>Hellenic Electricity Distribution Network Operator</i>
HTTP	<i>Hypertext Transfer Protocol - set of rules for transferring files on the World Wide Web</i>
IPR	<i>Intellectual Property Rights</i>
LV	<i>Low Voltage</i>
MV	<i>Medium Voltage</i>
PDF	<i>Portable Document Format - a file format for copying and sending electronic documents</i>
QAS	<i>Quality, Environment and Safety - the Portuguese related acronym</i>
R&D	<i>Research and Development</i>
TRL	<i>Technology Readiness Level</i>

1. Introduction

This deliverable describes the project governance structure, comprising the internal and external stakeholders whose contribution is relevant for the project goals accomplishment.

The deliverable describes also the documentation management plan and the innovation management plan, especially designed for the FLEXERGY project.

The document is divided in four main sections:

- Project Governance Structure
- The Documentation Management Plan
- The Innovation Management Plan
- The Operational and Execution Management Plan

The Project Governance Structure is described in a specific section.

The Documentation Management Plan describes how documentation will be managed within the FLEXERGY project, addressing specific subjects such as:

- Electronic platform
- Editing, reviewing and approval workflow
- Roles and responsibilities
- Overall directory for all FLEXERGY documentation-like deliverables

The Innovation Plan describes how innovation is managed along the FLEXERGY project lifecycle, addressing specific subjects such as:

- Technology radar
- Innovation risks management
- Intellectual property management
- Impact assessment of innovation within FLEXERGY towards the strategic technology roadmap of the energy storage business

The Operational and Execution Management Plan describes how the outcome of the FLEXERGY project validation and demonstration will be managed, namely by using the DEMOCRAT project demonstration facilities. The Plan addresses specific subjects as:

- Integration and validation management
- Testbed assets and human safety management

2. Project Governance Structure

2.1 Overview

There are two kinds of stakeholders that have coordinated roles within the FLEXERGY project management: internal and external.

Their coordinated role is meant to leverage the project outcomes towards an effective goals' achievement, as the FLEXERGY project has ambitious commercial targets through the application of the developed technology. Their participation in the project is performed around the activities and tasks, these being organised in different topologies regarding Innovation, Research and Development.

The following sections describe these categories as well as the types of stakeholders and their role in the project.

2.2 Project Typologies

The project is divided in four typologies regarding Innovation, Research and Development.

2.2.1 Typology 1

This typology comprises tasks of "industrial research", including critical studies for the formulation of the innovative concept going beyond the state of the art and taking it as a reference.

In this scope, it also includes the definition of use cases and the general and detailed definition of requirements, as well as the architecture definition of the energy storage asset management solution.

Also included in this scope is the modelling of the energy storage system aiming at performing its simulation and validation. These models will serve as reference for the definition of KPI, for benchmarking the performance of the solutions that are intended to be developed and validated.

2.2.2 Typology 2

This typology also comprises tasks of "industrial research", but specific to the technological development of the project solutions, following a cascade methodology, with interaction upstream and downstream, from the initial specification tasks of typology 1, including eventual concept tests, until validation and verification of the technology in the laboratory.

2.2.3 Typology 3

This typology addresses "experimental development" tasks, focused on the development of the technology and developed solutions, in order to be demonstrated in the Efacec testbed - DEMOCRAT demonstrator -, for its suitability as an industrial solution, available to the market after the conclusion of the project. These tasks include performing integration trials and functional tests necessary to ensure that the solutions developed correspond to the expectation of a TRL 8.

2.2.4 Typology 4

This typology corresponds to the "Technical Project Management" tasks, focused on the dissemination of project results, be it in the technical-scientific scope or in the business development.

2.3 Project Management and related Stakeholders

The FLEXERGY project is managed according to the principles and methods defined by the International Project Management Association. Thus, within the framework of the R&D activity plan, milestones, start and end dates of the different activities and tasks were defined, delivery dates for deliverables (deliverables), definition of responsibilities, as well as the allocation of human and financial resources required to execute the project.

Given the importance and complexity of the project, as well as of the different internal and external organic entities involved, the FLEXERGY project has a global manager, responsible for supervising the evolution of the project and coordinating all activities, focusing on external interactions.

The manager has a seat in a Steering Committee of composition already identified, including Board members of the Automation Business Unit, members of the Technology Management Office of the Efacec Group and participants from INESC TEC - the project subcontracted entity -, as well as invited personalities from industry, academy and research institutes. The role of the Steering Committee is to provide guidance for the project, with a strong focus on innovation and project quality.

The manager supervises the development of the project in terms of plan and technical content and, in close collaboration with the Steering committee, he ensures the development and maintenance of the vision and achievement of the project objectives, he addresses opportunities and threats, he reconciles positions of internal and external stakeholders, and he ensures the execution of the roadmap and the project calendar.

In particular, the manager will interact with INESC TEC as the subcontracted entity, as well as with the managing entity of the funding program, when applicable. He will also interact with the Efacec corporate Administrative and Finance department, responsible to establish the non-technical relation with the managing entity of the funding program.

The manager also interacts with the DEMOCRAT project manager when the demonstrator testbed is meant to be used for the validation of the FLEXERGY's outcomes, namely new management features for microgrids enabled by energy storage.

The manager may also interact with the corporate Board of Directors for addressing any more complex issue preventing the project to progress conveniently.

The governance structure described above is depicted in Figure 1.

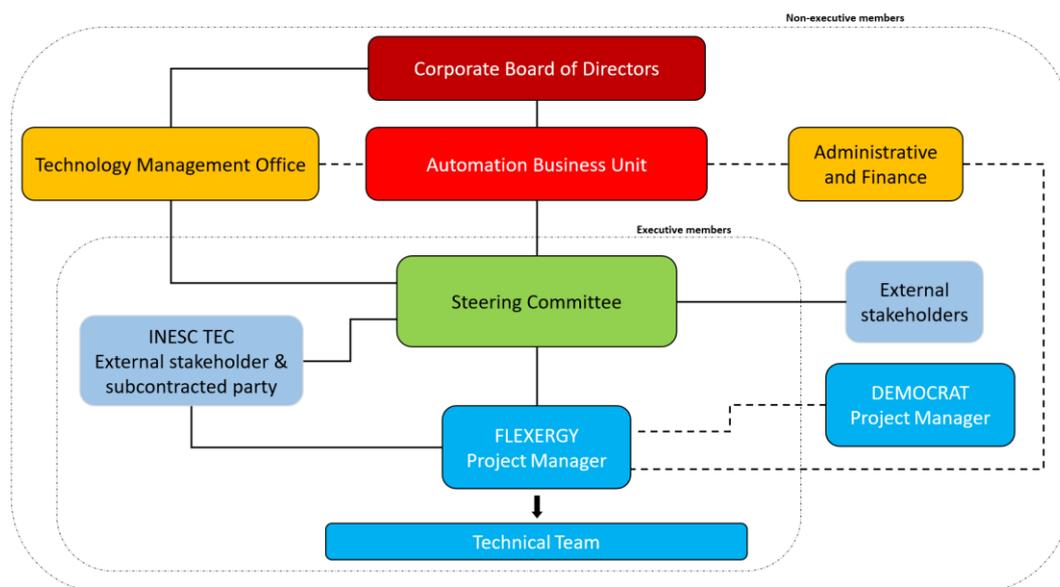


Figure 1 - The governance structure of the FLEXERGY project

The Steering Committee is composed by the following entities:

- Project Manager (Efacec)
- Energy Storage division R&D Manager (Efacec)
- Automation Business Unit managing board member (Efacec)
- Automation Business Unit strategic projects manager (Efacec)
- INESC TEC managing board member
- EDP New/CNET member
- Faculty of Engineering of the University of Porto member
- University of Minho / Basque Centre for Materials member

The relation of the internal and external stakeholders with the mentioned project typologies is depicted in Table 1.

Stakeholders	typology 1 industrial research	typology 2 industrial research	typology 3 experimental development	typology 4 technical project management
Corporate Board of Directors				Addressing complex issues preventing the project to progress;
Automation Business Unit board				Addressing complex issues preventing the project to progress; Participation in the Steering Committee; Guidance on the overall project goals execution;
Administrative and Finance department				Interface with the managing entity of the funding program;
Technology Management Office				Participation in the Steering Committee;
Steering Committee				Project Follow-up; Guidance on the overall project goals execution;
External Stakeholders				Participation in the Steering Committee;
INESC TEC	Use cases definition and general and detailed definition of requirements; Modelling of the energy storage system;	Development of specific models and a software library to be integrated in the Efacec solution;	Integration trials and functional tests;	Subcontracted entity to closely team-up with the project team; Participation in the Steering Committee;
Technical Team	Use cases definition and general and detailed definition of requirements; Modelling of the energy storage system, namely comprising the thermal behaviour of the battery system;	Validation of INESC TEC's software library;	Integration trials and functional tests;	Report to the project manager of all ongoing tasks and project execution;
DEMOCRAT Project Manager				Collaborate with all requests for using the demonstration testbed;
FLEXERGY Project Manager	Supervision of the ongoing works;	Supervision of the ongoing works;	Supervision of the ongoing works	Overall project coordination; Interaction with the Administrative and Finance department; Report to the Automation Board and/or to the Corporate Board of Directors; Interaction with the DEMOCRAT project manager, responsible for the demo testbed; Call the Steering Committee and chair its meetings;

Table 1 - Internal and external stakeholders' role within the project typologies

3. Documentation Management Plan

3.1 Overview

Documents for strategic projects such as FLEXERGY, are managed in the in-house application named SharePlace.

SharePlace is a web-based application suitable for documentation management. It was developed in Efacec and is widely used by all business units across the Efacec Group. It includes different applications designed to optimize and simplify many user tasks and thus increasing user productivity.

The computational platform beneath Shareplace offers all needed features regarding persistency and backup, data protection against viruses and other threats, as well as cyber-security, as such platform is managed by the Efacec corporate services, namely by the Digital Office.

SharePlace is a set of integrated applications. It covers almost all business functional areas, comprising Production, Engineering, Commercial, Logistics, etc., as well as R&D.

This is an online tool available through the Intranet “Synergynet” folder link, as it can be depicted in Figure 2.



Figure 2 - Link to Synergynet from the Efacec corporate intranet

Once selected, a menu within Synergynet allows the duly user to select the suitable application which, in the scope of documentation is SharePlace, as it can be depicted in Figure 3.

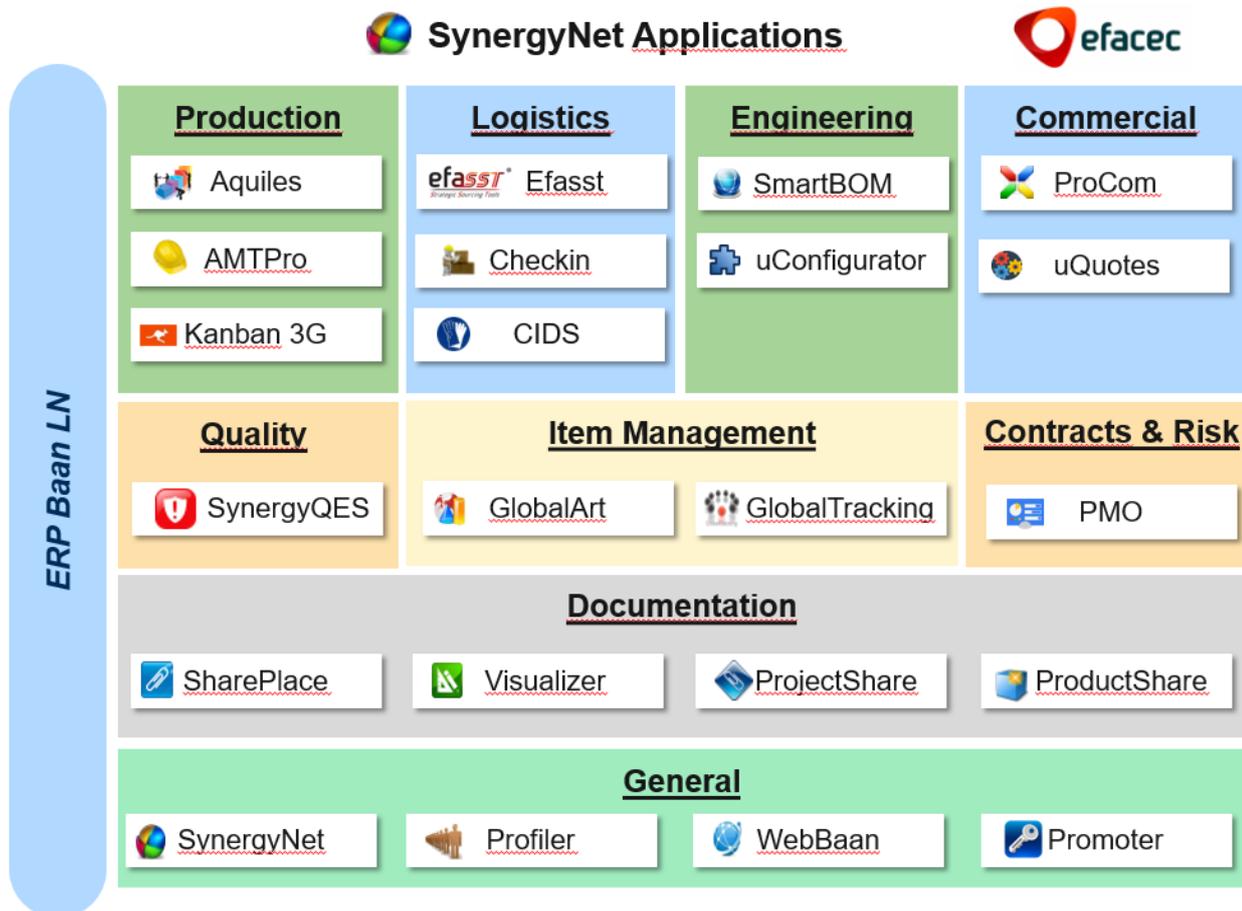


Figure 3 - Synergynet options, comprising SharePlace

The application for project document management is ProjectShare, where all users can visualize documents associated to projects.

Key users are primarily defined so they are in charge of the assignment of write and read permissions. In addition, for each project, the project manager can add or remove users' access of the projects.

3.2 Folder Structure

The selected folder structure to manage the project FLEXERGY is common to other R&D and demonstration projects and it is as follows:

01. Requirements and Specifications
02. Architecture and Design
03. Plans and Test Results
04. Meetings
05. Financial Management
06. Supplementary Documents
07. Communications

The previous structure addresses all required documentation needs for FLEXERGY, as it allows managing, comprising the creation, editing and reading of important documents achieved along the project lifecycle. Such folder structure is used in the project for the following purposes:

01. Requirements and Specifications - project deliverables regarding technical aspects of the project, comprising use cases and pilot definitions

02. Architecture and Design - project deliverables regarding the demonstrator architecture for the demonstrator and also for the IT system managing it, as well as the algorithms design and their implementation
03. Plans and Test Results - project deliverables regarding unitary, integration and site testing, comprising their planning and test results
04. Meetings - minutes of all meetings
05. Financial Management - project deliverables regarding financial management of FLEXERGY, as well as their supporting files
06. Supplementary Documents - project deliverables, addressing other scopes, namely this specific D1.0 deliverable - Documentation Management and Innovation Management Plan - or any other deliverable related to dissemination and exploitation
07. Communications - this folder is used to keep all important e-mails and related attachments associated to the lifecycle management of FLEXERGY

3.3 Users' Access

Not all users have reading access, as it is limited to R&D group that reflects the organization structure. In fact, all groups defined are mirroring the company hierarchical chart granting adaptability and avoiding the need to be constantly managing users by the Project Manager.

The SynergyNet allows the definition of roles that fit exclusive responsibilities, such as the **Project Manager** and the **Project Team**.

In case of one-off situations - those where users belong to external groups not related to the project - specifically when other user requires the access, the project manager is in charge of assigning him the reading or writing access.

The Project Manager is set at first when creating the project. Moreover, it can be defined one or more users. This role means that the project manager and any other duly user may approve documents, reject drafts, insert or remover users, etc.

3.4 Documentation Workflow Management

The ProjectShare tool is targeted for documents management.

New documents are sequentially and automatically numbered. The main features are:

- Create new documents (the numbering is automatic)
- Select the type of document (generic, manual, datasheet, roadmap, report...), most suitable for FLEXERGY
- Set different levels of confidentiality (low, medium or high)
- Define lifecycle (1 step approval or No Approval at all)
- Define a creator team (equals the same writing permissions as the document owner)
- Define revision schemes (0.0; 1.A, or no revision at all)
- Add new step to approval process

In the SharePlace context, a document is a *container* that may include more than one file, typically, an editable file format and a PDF file that is readable for the remaining users.

Besides these, one can save on the same container other files in different languages, or a zipped folder.

There's no limit of files to be saved in SharePlace.

In this stage, the new document is created under a Draft status; it's when the owner and his team work in the same file or files.

There is a check-in and check-out feature to prevent parallel edition so, a message appears to warn when someone is editing the files.

3.5 Documentation Lifecycle Management

After the contributions of one or more members, the owner changes the document status from Draft to Under Approval. The Project Manager instantaneously receives a notification to visualize it and then approve it. He can also reject the file, returning it to the owner who will start the process from the beginning.

If the document is approved, all participants of the project are notified with an automatic email. This happens only if the project owner (Project Manager) forces that subscription. But, the users can subscribe themselves the documents or folders that they want to be notified of.

When a new revision is required, the document owner or someone of the project team can create a new revision. The status returns to Draft and the process starts again.

Figure 4 briefly describes the workflow associated to documentation verification, validation, revision and approval.

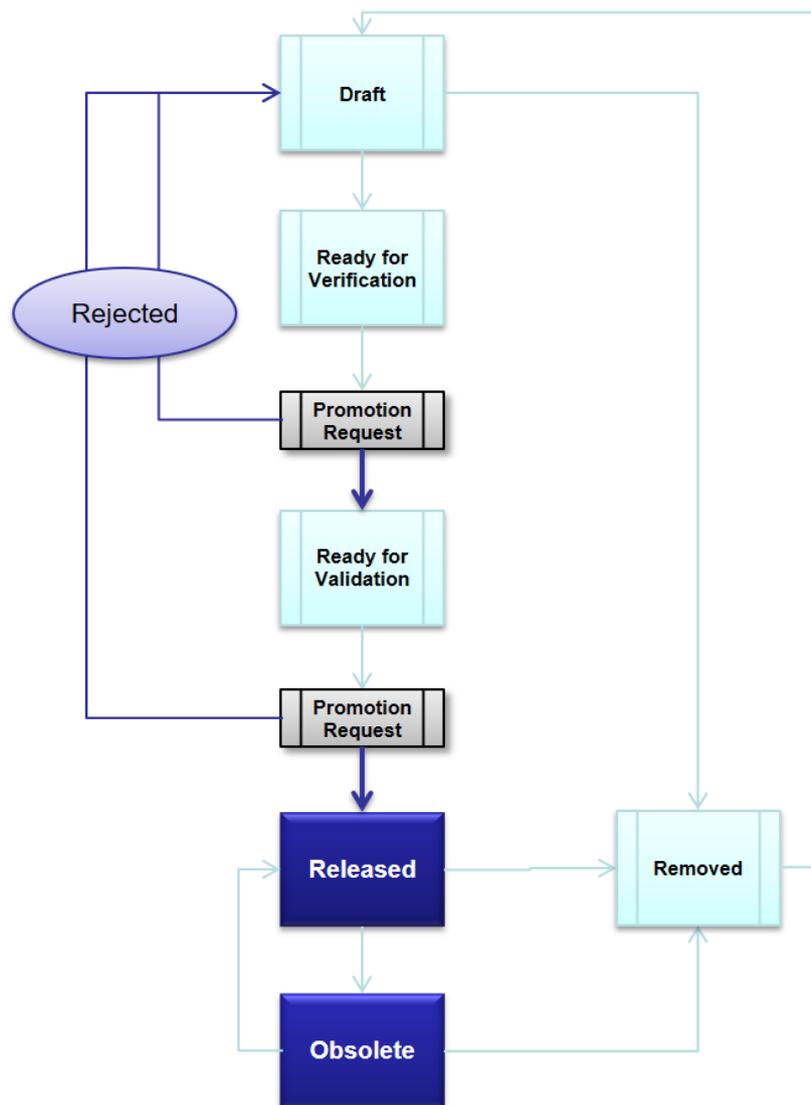


Figure 4 - Lifecycle workflow

SharePlace maintains older revisions. For instance, a document with a third approved revision keeps revisions 1 and 2. The interface of the application only shows the last one, however, previous revisions are displayed under the Revision Log option of the Document as it can be observed in Figure 5, highlighted by the red rectangle.

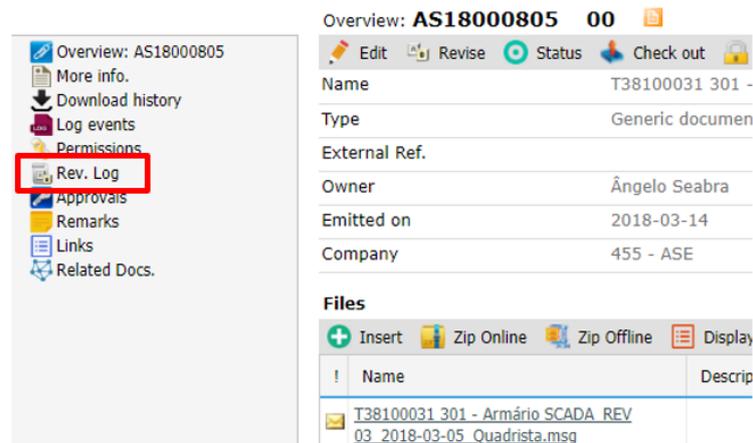


Figure 5 - Example of document revision tracking

A log is kept with all the revisions, so, the information is never lost, and the user can compare different revisions and see the reasons for revision throughout time.

There is a great advantage of using SharePlace: the user can bind the same document to different references. That is, a specific document can be visualized in the FLEXERGY project and at the same time, if applicable, in a Product or even in another project; basically, there is an interaction with different documents, and the user can always unbind them.

This binding is quite flexible, as the user can bind the last revision of a document to the first revision of the second document bound.

The access is dependent on the permissions assigned in each reference, addressing both projects or products.

Apart from the document characteristics as stated above, the application allows to give different attributes that help to distinguish the documents. This is a totally optional feature. Attributes as event date, HTTP link, related documents or event dates, are some of those examples.

3.6 Simplicity of Use

The upload of files can be made by drag-and-drop, where the user can select a package of files and drag it to SharePlace, thus, simplicity and speed is assured.

It is possible to drag more than one file and the tool is able to differentiate, whether one container is created for lots of files, or a container per file; it depends on the user will.

4. Innovation Management Plan

4.1 Overview

The present plan for innovation management is focused on the following main topics:

- Technology radar
- Innovation risks management
- Intellectual property management
- Impact assessment of innovation within FLEXERGY towards the strategic technology roadmap of the energy storage business

4.2 Technology Radar

The FLEXERGY project addresses several business aspects of smart grids, addressing the scope of energy storage within microgrids enabled by renewable energies, with a significant presence of electric vehicle charging. As part of its business role, Efacec has determined that the team involved in the FLEXERGY project, as any other involved in other R&D or demonstration projects, should follow up technology and market trends, namely by establishing a technology radar.

Such technology radar will be defined considering internal perspectives of technology, internal processes and business commitment, as well as external perspectives regarding business awareness, namely comprising customers, competitors and market fit.

A preliminary study was already performed, resulting in the technology/business radar diagram depicted in Figure 6.

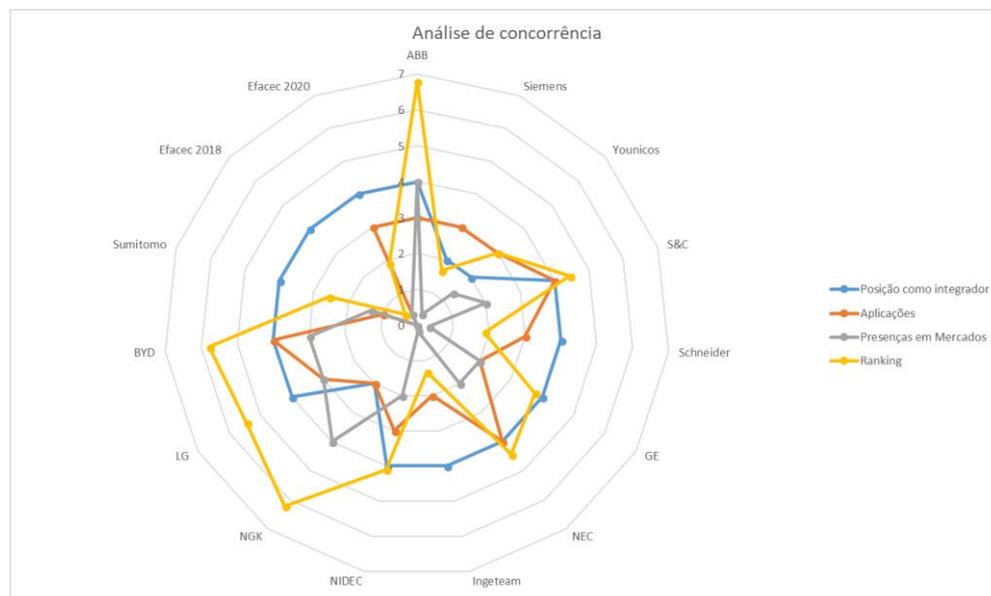


Figure 6 - Preliminary technology/business radar

The preliminary study addressed five business segments, comparing the Efacec expectation for 2020 against its competitors:

- Grid storage
- RES integration
- Islanded / off grid systems
- Micro-grids
- Industrial/EV integration

The same study comprised an assessment of market potential for Efacec and the current presence of its competitors in Europe, Africa, USA and Canada, Latin America, Asia and Australia.

4.3 Innovation Risks Management

Innovation risks comprise all related contingencies that may put the project at risk. The risks that may arise are presented in Table 2, which also comprise the related mitigation measure.

It is worth mentioning that as FLEXERGY is mainly an innovative demonstration project involving the installation of an electrical infrastructure and related smart grid and energy storage components in the Efacec premises located in Maia, Portugal, not only research and development risk aspects may affect the overall progress of the project, but also other aspects regarding multiple participation of Efacec internal stakeholders may affect the project as well. The internal stakeholders of Efacec are the following:

- Board of Directors
- Automation and Smart Energy business unit (ASE), comprising the General Manager and three business divisions:
 - Smart Grids
 - Energy Storage
 - Inverters
- Quality, Environment and Safety corporate department (QAS)
- Infrastructures department, also comprising the Electrical Infrastructure Responsible Consultant

Risks (impact, probability)	Proposed mitigation measure
Agreement risks	
Smart Grids division, Storage division and Inverters division (the project teams) cannot agree (Medium impact, Low probability)	<p>The project management foresees clear conflict resolution and decision procedures to mitigate and resolve any related impact;</p> <p>As the mentioned teams belong all to the same business unit (ASE) and have a long track record working together in R&D and other demonstration projects, the current collaboration framework is considered as suitable to overcome any conflicting situation.</p> <p>The role of each division manager as well as the role of the business unit General Manager are crucial to enable risk management, thus mitigating any risk impact;</p>
The project team and the infrastructures team cannot agree (High impact, Low probability)	<p>The role of the Infrastructures management and senior staff, of the involved division managers as well as the role of the business unit General Manager are crucial to enable risk management, thus mitigating any risk impact;</p>
The project team and the QAS team cannot agree (Low impact, Low probability)	<p>The role of the QAS management and senior staff, of the involved division managers as well as the role of the business unit General Manager are crucial to enable risk management, thus mitigating any risk impact;</p> <p>Quality, Environment and Safety procedures are core competencies of any Efacec business or project, therefore the overall approach does not leave space for ambiguities or lack of compromise between involved teams.</p>
Expertise Risks	
Departure of key experts (Medium impact, Medium probability)	<p>Any departing key expert will be replaced by a different expert. Presently, Efacec owns a comfortable overlap of key experts regarding the project related technological and management skills.</p>
Technological risks	
Under estimation of project effort (High impact, low probability)	<p>The project implements an Agile methodology with short work cycles, giving detailed planning and early working versions of components. These mitigate the risk of delaying or not achieving project outcomes.</p> <p>The project has also received internal funding approved by the BoD as part of the investment effort Efacec is doing for the new “energy storage” business. Therefore, the project team may be reinforced, provided it is justified and framed within the approved investment plan.</p>

<p>Consensus on technical interoperability issues is not achieved (High impact, Low probability)</p>	<p>Efacec is used to provide integrated solutions, aligned with the “open systems” paradigm. The internal teams are used to work together and know already the interoperability aspects that need to be considered, when defining, developing and integrating system components.</p> <p>The integration of third parties’ components will always be considered in full respect of the above-mentioned paradigm.</p>
<p>Implementation risks</p>	
<p>Ongoing Efacec site refurbishing agenda does not match the FLEXERGY project construction needs (High impact, High probability)</p>	<p>The BoD is supervising the ongoing Efacec site refurbishing civil and electrical works. Any conflicting aspect of the agenda or any delay contingencies will be framed along with the FLEXERGY project as well.</p> <p>There is a joint task force to supervise some of the major ongoing infrastructures refurbishing civil and electrical works. The joint task force comprises the Infrastructures corporate department senior staff, the Electrical Infrastructure Responsible Consultant, as well as members from the three involved divisions (Smart Grids, Storage and Inverters). Their role is to supervise the ongoing works and to find mitigation plans to jointly address any constraints derived from the refurbishing civil and electrical works.</p> <p>Further considerations are made in “Deliverable D1.2 - Identification of Risks and respective Mitigation Plan”, section 3.1.</p>
<p>Take up risks</p>	
<p>The technology is not accepted by industry (High impact, low probability)</p>	<p>The project team is aware of how important stakeholder take up is for the impact of the FLEXERGY results. Therefore, the project has considered the participation of relevant stakeholders in its Steering Committee, through the invitation of personalities from the Portuguese and Greek DSO (respectively EDP Distribuição and HEDNO), from a LV distribution cooperative (CEVE), from the Portuguese Scientific and Technological system (University of Coimbra and INESC TEC) and from the Innovation sector (EDP Inovação).</p> <p>The comprehensive and dedicated communication plan of the project will also contribute for a wide dissemination of results, which will also contribute to demonstrate the project outcomes.</p>

Table 2 - Critical risks and mitigation measures

Risk management for the FLEXERGY project is based on an iterative risk management process:

- *Planning* - definition of risk management procedures and responsibilities
- *Identification* - identification of risks before they turn into threats
- *Analysis* - assessment of risks and their impact, ranking of risks
- *Response* - definition of mitigation procedures to address any risky contingency
- *Monitoring* - tracking of risks and evaluation of the effectiveness of the response procedures

4.4 Intellectual Property Management

Efacec owns all intellectual property rights (IPR) derived from the outcome of FLEXERGY project. Special care will be considered when disseminating specific project outcomes resulting from any of the scheduled R&D tasks.

The project team activities are always under the scrutiny of the Efacec corporate Technology and Innovation Board of Efacec, which supervises the IPR terms, namely patents that could result from the project. It is the role of the Technology Board to advise the FLEXERGY team to establish the bridge with identified external consulting companies offering IPR services. Should that be the case, the Legal Department will also be involved.

4.5 Impact assessment of Innovation

The impact assessment of innovation resulting from FLEXERGY project will be performed.

Regularly, the Technology and Innovation Board organises corporate conferences to follow-up projects' progression, namely, to highlight their outcome and how they have contributed to enhance each business' solution portfolio. Those conferences are also open for strategic stakeholders of Efacec, namely those among which Efacec has made the invitation to participate in the FLEXERGY Steering Committee.

The FLEXERGY project will be subject of these corporate conferences' agenda, namely addressing the project progression towards the validation of its strategic technology roadmap for the Energy Storage business, and how the innovation outcomes of this project will or may impact the overall business.

5. Operational and Execution Management Plan

5.1 Overview

The Operational and Execution Management Plan describes how the outcome of the FLEXERGY project validation and demonstration will be managed, namely by using the DEMOCRAT project demonstration facilities. The Plan addresses specific subjects as integration and validation management, as well as testbed assets and human safety management.

5.2 Integration and Validation Management

The project comprises a specific Activity 5 (*Integração do software, ensaios funcionais e ensaios de sistema*) which includes a set of tasks, all fitting the above-mentioned Typology 3, meant to address all functional and integration testing, therefore assuring the management process specifically regarding Integration and Validation.

The involved stakeholders are INESC TEC - as the outsourcing entity - and the Efacec project Team. The project Leader supervises all ongoing validation and integration tasks.

The role of each technical contributing stakeholder is as follows:

- Efacec Project Team is responsible for all Activity 5 Tasks, namely Task 5.1 (*Integração dos módulos funcionais de gestão e do Dashboard no produto "ES Manager"*), Task 5.2 (*Preparação do piloto de demonstração, segundo os casos de uso definidos*), Task 5.3 (*Ensaio funcionais e de integração*) and for Task 5.4 (*Validação do sistema de gestão no piloto de demonstração*).
- INESC TEC also contributes in Task 5.1 (*Integração dos módulos funcionais de gestão e do Dashboard no produto "ES Manager"*) and in Task 5.4 (*Validação do sistema de gestão no piloto de demonstração*), as outsourcing partner.

In Task 5.1, both involved parties will establish the integration protocol so that any specific outcome of their own development responsibility will fit appropriately. At that stage, all data models, all performance KPI and other requirements defined in Activity 3 (*Especificação de uma plataforma de gestão do sistema de armazenamento de energia e do respetivo Dashboard*) will be already developed or ongoing, as a result of Activity 4 (*Desenvolvimento de funções avançadas para o sistema de armazenamento de energia e do respetivo Dashboard*).

Once Tasks 5.1 and 5.2 are concluded, the Deliverable DV10 will be published (*Relatório de integração dos módulos funcionais e lições aprendidas*). This deliverable reports the integration outcome and lessons learnt. Those lessons will reflect the options made regarding any integration problem mitigation.

Once Tasks 5.3 and 5.4 are concluded, the Deliverable DV11 will be published (*Demonstração de resultados e relatório de validação*). This deliverable reports the outcome of the demonstration, highlighting the validation results.

The project leader will supervise all ongoing management processes and the overall Activity 5 progression.

5.3 Testbed Assets and Human Safety Management

The rollout of the FLEXERGY project will be conducted over the existing Microgrid and Energy Storage testbed installed in the Efacec facilities, in Maia, Portugal. Such testbed was implemented under the DEMOCRAT (<http://www.democrat-project.efacec.com/>) project.

As the DEMOCRAT testbed assets will be used, also the DEMOCRAT project leader will collaborate with all requests for using the demonstration testbed, as part of his role within the typology 4 of the project, namely addressing the Technical Project Management. This way, the scheduling of the testbed use by different teams will be managed correctly, not affecting any ongoing works.

As the testbed is a real microgrid connected to a 3-phase LV source at 400 V and to a 3-phase MV grid source at 15 kV, both being operated on a mutually exclusive way, there are safety measurements to be observed, for the sake of involved staff and assets. Those measurements were designed and implemented within the DEMOCRAT project, briefly described as follows:

- The mutual exclusive operation of the microgrid connected to the LV and MV grid tie points is performed via a manual switchover with a physical key interlock. The control system also performs logical interlocks for setting up the proper micro grid electric circuit layout, according to the Use Case selected. The management system of the microgrid receives the LV/MV switchover key interlock status.

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- The use of a real circuit serving a significant part of one of the main building's loads is also subject to another manual switchover with its own physical key interlock.
 - Any testing being performed with the energy storage system will be conducted outside the containerised solution, as the human presence inside each container prevents any ongoing use of the storage system, according to the intrusion detection features and to the way they impact on the digital interlock features implemented.
 - Both containerised solutions - the Battery Block and the Power Conversion System Block - have their own embedded fire prevention and extinction mechanisms.

It is worth mentioning that the involved team has participated in a training course regarding “works in the presence of high voltage”, performed by ISQ in 2018.