

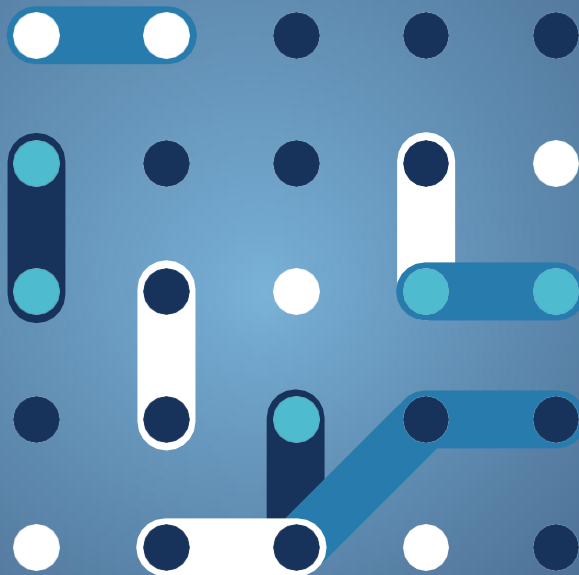


# bridge

## New Use Case Repository

Updated report 2025

Data Management Working Group



October 2025



# New Use Case Repository

Data Management Working Group

October 2025



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# INDEX

List of Acronyms and Abbreviations .....	6
List of Figures .....	7
List of Tables.....	8
List of References .....	9
Executive Summary .....	10
Introduction .....	11
<b>1 Background.....</b>	<b>12</b>
<b>2 Action #1 approach and methodology .....</b>	<b>13</b>
2.1 Standard IEC 62559-2 .....	13
2.2 Contributions .....	14
2.3 Joint activities with other BRIDGE WGs/TFs.....	14
<b>3 New Use Case Repository .....</b>	<b>15</b>
3.1 Use Case Repository Development. ....	15
3.2 Use Case Template .....	17
3.3 How the New Use Case Repository Works .....	19
3.3.1 Get Access.....	19
3.3.2 Use Case Drafting.....	23
3.3.3 UC Review, Comments and Publish.....	28
<b>4 Conclusions and Next Steps .....</b>	<b>34</b>
<b>5 Annex 1: Use Case Example .....</b>	<b>37</b>



# List of Acronyms and Abbreviations

DMWG	Data Management Working Group
DSO	Distribution System Operator
EC	European Commission
ECL	Europa Content Library
HEMRM	Harmonised Electricity Market Role Model
IEC	International Electrotechnical Committee
JRC	Joint Research Centre
SES	Smart Electricity Systems
SGAM	Smart Grid Architecture Model
TSO	Transmission System Operator
UC	Use Case
WG	Working Group



## List of Figures

Figure 1 - IEC 62559 standard series (source [3]) .....	14
Figure 2 - Flowchart of the process for UC creation.....	15
Figure 3 - Screenshot of SES-JRC home page .....	20
Figure 4 - Use Case repository section on the JRC portal.....	21
Figure 5 - Repository view for a Visitor .....	22
Figure 6 - Repository view of “my use cases area” for an Author.....	22
Figure 7 - Repository view for an Evaluator .....	23
Figure 8 - Screenshot of the UC form .....	24
Figure 9 - Screenshot of the “Save” icon with the privacy statement to check .....	25
Figure 10 - Screenshot of the change of state functionality .....	26
Figure 11 - Screenshot of the editing UC after the first save of draft .....	27
Figure 12 - Screenshot of the “delete” tab.....	27
Figure 13 - Screenshot of the “comment & revision” list.....	28
Figure 14 - Error message for missing mandatory fields .....	28
Figure 15 - Complete workflow for a UC publication from the Actor and Evaluator perspective .....	29
Figure 16 - Screenshot of the “Latest unpublished Version & Workflow Actions” .....	31
Figure 17 - Screenshot of my-uc area for a published UC being edited.....	31
Figure 18 - Screenshot of my-uc area for an updated published UC .....	32
Figure 19 - Example of a notification email with the state changed from “Under Review” to “Publish” .....	32
Figure 20 - Next steps in DMWG Action#1 for the next 12 months.....	34



# List of Tables

Table 1 - UCs states vs functionalities available for an Author .....30



## List of References

- [1] BRIDGE, “BRIDGE General Assembly 2020 Main conclusions and next steps”, Report of the Bridge General Assembly 2020, February 2020, [On line] available at: [https://bridge-smart-grid-storage-systems-digital-projects.ec.europa.eu/sites/default/files/download/BRIDGE-GA2020\\_Conclusions-and-next-steps.pdf](https://bridge-smart-grid-storage-systems-digital-projects.ec.europa.eu/sites/default/files/download/BRIDGE-GA2020_Conclusions-and-next-steps.pdf)
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## Executive Summary

The BRIDGE Data Management Working Group (DMWG) has developed a new use case repository as part of its ongoing efforts to enhance data exchange, interoperability and collaboration among BRIDGE projects. This initiative aligns with the European Commission's objectives under Horizon Europe Energy, facilitating the standardisation and integration of energy data management practices across actors and other key entities.

The repository aims to serve as a knowledge hub for use cases (UCs) developed within BRIDGE projects, ensuring that best practices and technical solutions are widely accessible. It is a centralised repository based on the IEC 62559-2-2015 standard to facilitate data exchange and ensure compatibility with diverse energy systems through a user-friendly interface.

A preliminary version of GitHub was developed in 2022, and then, in 2023, it was migrated to the EIRIE platform. Between the end of 2024 and the beginning of 2025, due to technical and administrative challenges with the previous platform, a brand new repository was developed within the Smart Energy System webpage of the JRC. The IT team of JRC has developed the Repository with the support of Action#1 leader, who provided indications on the expected result and tool usability.

Key upgrades in the new repository include:

- A structured workflow for creating, reviewing and publishing use cases.
- Enhanced user roles, distinguishing between Visitors, Authors, and Evaluators to streamline content management.
- Automated notifications and tracking of version histories for transparency and efficiency.
- Improved usability through a web-based interface hosted within the European Commission's SES-JRC platform.

This report illustrates the activities carried out in November 2024 when Action#1 started back after EIRIE was downsized at the end of 2023. By describing the features and functionalities, this report also serves as an instruction document for the new UC Repository.

After initial tests from the SES-JRC team and ETRA as Action#1 leader, the UC repository was moved to a production environment at the end of the second week of March 2025. The repository is now ready to enter its final testing phase with the rest of Action#1 participants before public release to the BRIDGE community. Any future maintenance or additional development of the repository is the responsibility of the JRC as the administrator of the web portal and thus of the Repository itself.

This repository represents a significant advancement in data-driven energy sector collaboration. It will enhance knowledge transfer, research alignment, and innovation across BRIDGE projects by providing a structured, transparent, and secure platform for UC sharing.



# Introduction

The Data Management Working Group aims to cover a wide range of aspects, from the technical means for exchanging and processing data between interested stakeholders to the establishment of rules for exchange, including security issues and responsibility distribution in data handling. Accordingly, the WG identified 3 areas of collaboration:

1. **Communication Infrastructure**, embracing the technical and non-technical aspects of the communication infrastructure needed to exchange data and the related requirements.
2. **Cybersecurity and Data Privacy**, entailing data integrity, customer privacy and protection and general security of energy systems.
3. **Data Handling**, including the framework for data exchange and related roles/responsibilities, together with the technical issues supporting the exchange of data in a secure and interoperable manner, and the data analytics techniques for data processing.

This report is part of the 3<sup>rd</sup> area, “Data Handling”, and covers the topic of a “Reference Framework” for interoperability.

held during the BRIDGE General Assembly in February 2020 [1] at Parallel Sessions 4 “Interoperability of flexibility assets” and 5 “TSO-DSO Cooperation #2 – Data Management”, the need for a readily available use case (UC) repository was identified.

The objective of this repository is to develop an industry-wide knowledge hub for BRIDGE projects’ use cases that can be used for alignment of BRIDGE projects and serve as a foundation for future research activities, process design and the development of requirements.

In summary, the objectives of Action #1 of the BRIDGE DMWG – Set up a use case repository are:

- Create an easily accessible use case repository, hosted under the umbrella of BRIDGE.
- Develop and agree (high-level/specific) use cases from previous BRIDGE projects and new ones.
- The repository would focus on data use cases – use cases agnostic to specific business processes, i.e., applicable to several business processes and/or to several market designs, e.g., access to data, balance management, market for flexibilities, operational planning and forecasting and services related to end customers.
- It will be an input to other topics (interoperability, data exchange architecture, role definition, etc.).

In 2023-2024, the work around the use case repository focuses on the following topics:

- Engaging with new ICT technical personnel for repository development (from JRC)
- Establishing the workflows for UC creation and publication
- Developing the first version of the new Repository
- Importing inputs from the old EIRIE UC repository to the new one
- Testing the new repository.

At the time of writing, the initial testing phase performed by JRC and ETRA has just been completed, the repository is publicly available online, and it is ready to be tested by a small team of evaluators from Action#1.



# 1 Background

In 2022 an initial version of the use case repository [2] was developed. Its description is reported in [3]**Errore. L'origine riferimento non è stata trovata.** Considering the follow-up of activities already described in that document, the repository was migrated to the EIRIE platform [4] in 2023, and developed under the PANTERA H2020 project [5]. In the first half of 2023, the new use case repository was started, populated with several test UCs. At that time, the work was mostly focused on the repository implementation and correct operation rather than evaluating the content uploaded. At that time, the IT task for the repository development and integration in EIRIE was outsourced to an external consultant of DG Energy.

By the end of 2023, the contract for the IT support was over, and it took several months to identify a replacement. In this period, the activities of Action #1 were on hold. At the same time, the leadership of the Action passed from the X-Flex project to the R<sup>2</sup>D<sup>2</sup> project. The UC Repository on the EIRIE platform was stuck, as some final improvements were needed for its correct operation.

At the beginning of 2024, the Joint Research Centre was identified by DG ENERGY as technical support for the UC repository development and maintenance. In February 2024, conversations started between Ugo Stecchi (Action#1 leader and Project Coordinator of R<sup>2</sup>D<sup>2</sup>) and the JRC team in Smart Energy System (SES), about taking back the repository and completing its development.

During the BRIDGE General Assembly 2024 [6], the use case repository was presented with a short demo and tentative planning of activities for the next 12 months (depending on the availability and timing of the SES-JRC technical team for the final improvements aforementioned).

After some weeks of preliminary activities, the SES-JRC team informed the Action#1 leader about the impossibility of continuing the development of the UC repository within the EIRIE platform. The alternative solution proposed was to migrate the repository into the SES-JRC portal. In December 2024, a preliminary version of the UC repository was presented by the JRC team to the Action 1 leader, and starting from there, several iterations were launched to improve the repository and make it available for the BRIDGE community. Therefore, practical activities in the last year have been the SW development by the SES-JRC team to prepare the new UC repository, and the coordination between ETRA and JRC to ensure a proper repository operation.

Considering the fact that the activities in Action#1 have been on hold since the second half of 2023 (since the change of IT technical support), this report is aimed at describing the restart of the work in this action and the development of the new UC repository.



## 2 Action #1 approach and methodology

The use case repository developed as part of Action #1, is based on the use-case methodology set out in the standard IEC 62559-2:2015 for the purposes of projects in software engineering, as use cases are the first building blocks of such projects. UCs should describe system functionalities in a technology-neutral way and identify participating actors. The UC template provided by the methodology has been adapted to better link with the scope of BRIDGE.

The final purpose of this action is not to provide a revision of the methodology set out by the standard, but a common place where all BRIDGE projects can share their UCs with the rest of the community. Therefore, the action does not cover the internal discussions within each BRIDGE project to define its own use cases, nor does it try to interfere with the internal decisions of any project. The action simply provides a mechanism to easily feed a repository with the final agreed specification of use cases that each project is tackling.

Considering that the outcome – the repository – follows the IEC 62559 methodology, the final adoption of the template adapted to the special needs of the BRIDGE Community was agreed since 2022 [3] with the partners [3] participating in the action. .

In the last year, the main goal was to resume the activities from where they had stopped in 2023, recovering and confirming the same approach and methodology from [3] already agreed upon since then.

### 2.1 Standard IEC 62559-2

This section explains how Action#1 applies this standard, and it is taken from [3] because it is valid and applicable. Hence, the application of IEC62559-2:2015 [7] is confirmed as it was originally adopted in [3].

For complex systems, the use case methodology supports a common understanding of functionalities, actors and processes across different technical committees or even different organisations. Developed as a software engineering tool, the methodology can be used to support the development of standards as it facilitates the analysis of requirements in relation to new or existing standards. Further arguments for the use case methodology and background information are available in IEC 62559-1. **Errore. L'origine riferimento non è stata trovata.** provides an overview of the intended first parts of the IEC 62559, mainly describing the relation between IEC 62559-2 and IEC 62559-3.

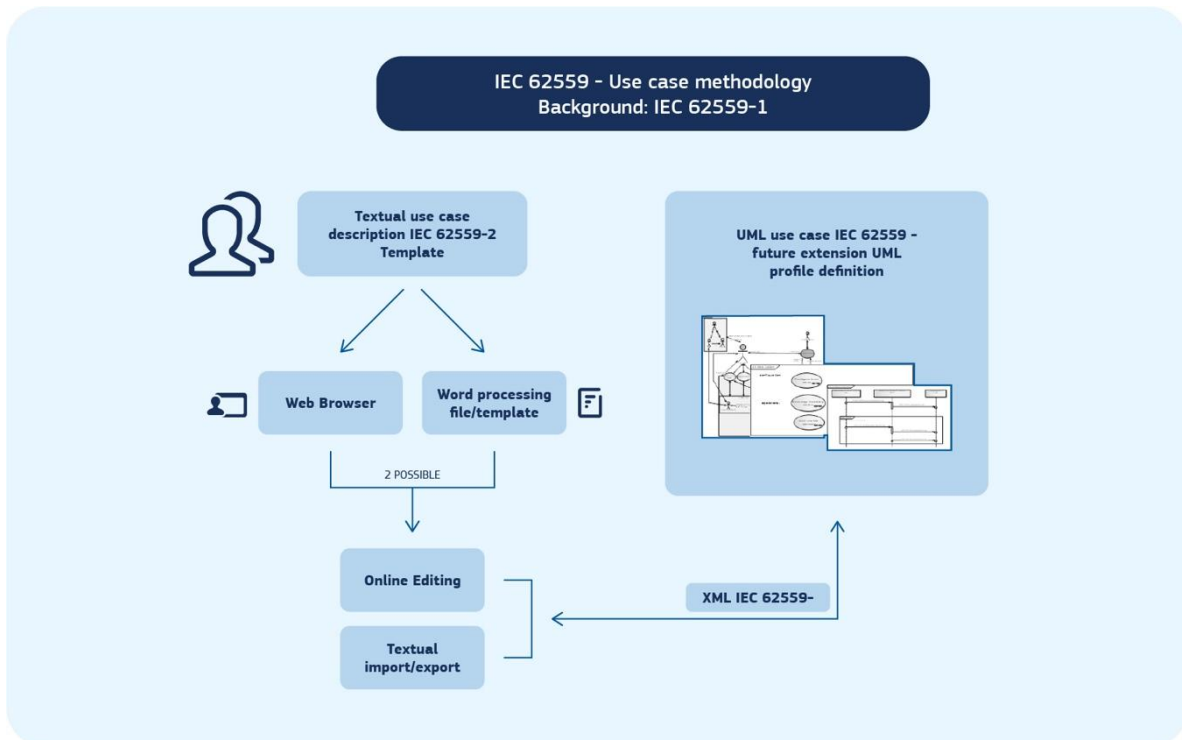


Figure 1 - IEC 62559 standard series (source [3])

## 2.2 Contributions

R<sup>2</sup>D<sup>2</sup> has led the work together with the SES-JRC team to develop the new UC repository with indications from ETRA as the Action 1 leader. Progress and vision were shared with the WG chair and other Action leaders.

## 2.3 Joint activities with other BRIDGE WGs/TFs

The use case repository is the major outcome of Action#1 and it is intended to be publicly available on the web, thus the information included is completely public. All projects participating in BRIDGE (the rest of the Actions in the DMWG, and the other WGs) will contribute to the repository, and therefore it is crucial for the collaboration of all projects to populate the repository with the highest number of UCs in all the energy domains and technologies covered by BRIDGE projects.

Moreover, during the development phase, there is a clear dependency with other Actions in the same DMWG. In particular, interactions are established with:

- Action #3 Reference Framework: to adopt the same standardised actors' list. In this case, the actors' list created in Action#3 has been adapted and uploaded to the repository, so Authors find a set of standardised actors by default. This list is planned to be updated in the following months, and the same updates will be applied to the UC repository (see § 4).
- Action #4 BRIDGE Standards User Group: for the future input of UC in XML format as originally conceived in a preliminary version of the repository.



## 3 New Use Case Repository

This section describes the new use case repository developed by JRC in coordination with the Action#1 leader and the template of the Use Case form based on the IEC 62559-2:2015 standard and the findings from [3].

### 3.1 Use Case Repository Development.

The section reports the activities for the basic development of the UC repository. As described in previous sections, since it was not possible to reuse the former repository in the EIRIE platform, a brand new UC repository has been developed by the SES-JRC team. The basic functionalities and features of the repository are described in the following sections. Further improvements are planned for the next phases, which will require additional developments.

The development work for the current repository started by reusing what had previously been done in EIRIE and importing it into the SES-JRC portal by the technical staff in charge of maintaining the site. An open-source content management system called Drupal [8] was used for the creation of the UCs form and its management. Once a preliminary version had been prepared by the JRC team, it was shared with Ugo Stecchi from ETRA I+D, as Action1 leader.

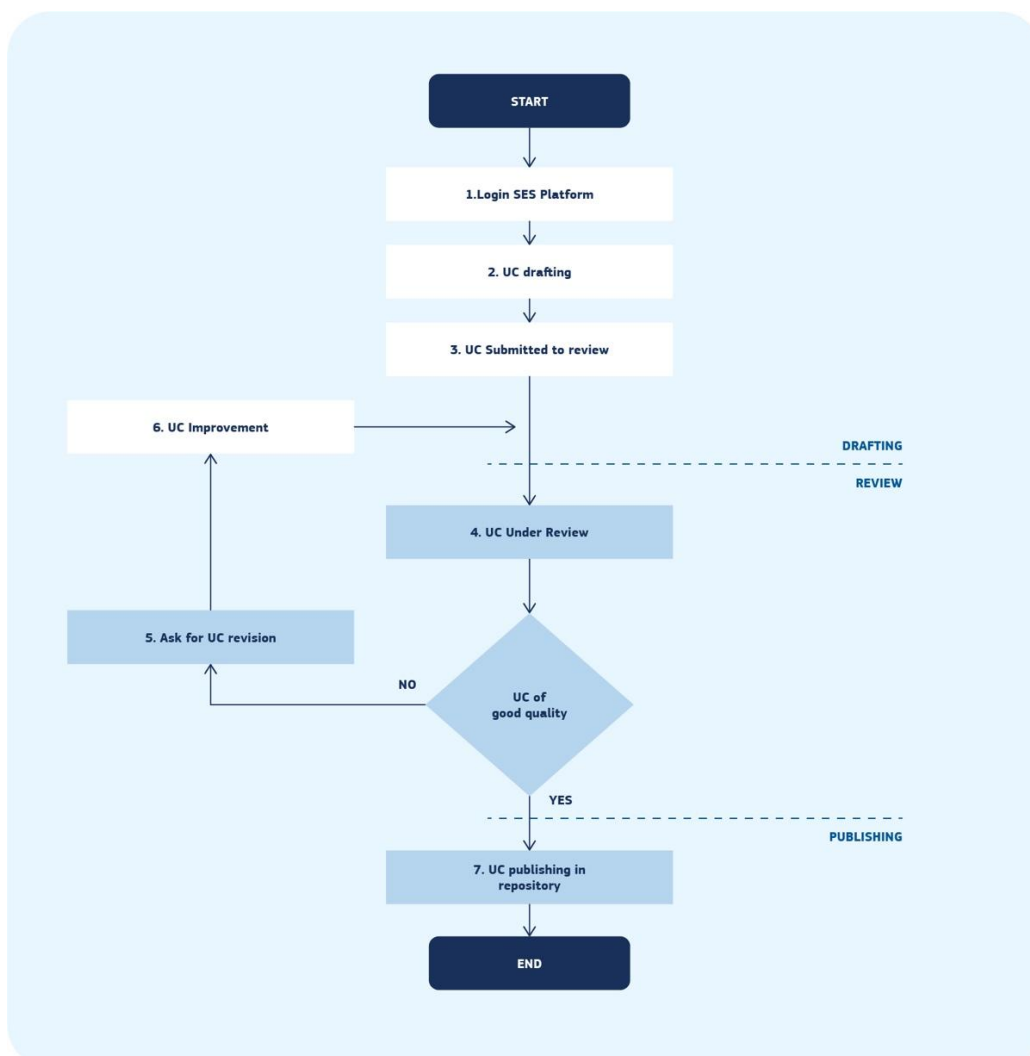


Figure 2 - Flowchart of the process for UC creation



Following the same logic adopted for the EIRIE platform, the repository will be accessible to any visitor, while only users logged in with their ECAS account can create a UC.

The activities then continued in synergy between JRC and ETRA staff to adapt the content of the form to the needs of the contributing users. In addition, a review system was implemented for the evaluation of UCs based on work sessions that are alternately switched on and off between the user who creates a UC and the evaluator.

The overall process adopted for the UC creation, evaluation and publishing is represented in the flowchart of **Errore. L'origine riferimento non è stata trovata.** The Author can create a UC Draft, and once completed, it is possible to submit for review. The session is then activated by the Evaluator. A UC under review can be changed to a draft in case of further improvements (session back to the Author) or be published if it is of good quality.

Having completed an initial version of the repository, SES-JRC staff worked with the Action#1 leader to set up and test the repository according to the principles already established by [3] and adopted in the EIRIE platform.

Compared to the previous versions in Github and EIRIE, the main differences of this new repository are:

- i. **Workflow is organised per session.** It is possible now that the Author and Evaluator can work alternatively on a UC; it means if the session is on the Author's side, the Evaluator is not allowed to edit and vice versa (similarly to what happens in the funding & tender EC portal)
- ii. **Notification system.** Authors and Evaluators no longer need to stay coordinated via email to inform each other about the state of the UC. The system automatically generates notifications with the change of state and the comments shared.
- iii. **Review process.** The evaluation of a UC is now well mapped in the repository. As stated in §2, the main purpose of Action#1 is not to question the correctness or the technicalities of a UC, but it is good that all UCs published present all mandatory fields properly filled in with a minimum quality of readability and comprehensibility. Older repositories published content that was not reviewed in this sense. Moreover, the comments and logs remain available in the UC history.
- iv. **UC uploading.** UCs can be created only by filling out the online form. At the moment, it is not possible to upload an XML file to import a UC. This possibility is not ruled out for the future, but the priority is to bring the repository back to life (see § 4 for more information about this).
- v. **Visual Identity and graphics.** The repository now also complies with the visual identity of EC, being hosted on a website under its sub-domain.

Several tests were done by importing previously created use cases and creating new ones. At this stage, the testing possibilities were limited to a few ECAS users only (belonging to ETRA staff) for security reasons in the pre-production environment. Hence, the need to work closely only between the Action#1 leader and the JRC technical support.

Testing and fine-tuning of repository functionalities include:

- Correct implementation of the working sessions between the Author and Evaluator
- Notification systems between Author and Evaluator
- Input of Actors and creation of a pre-established Actors' list in cooperation with DMWG Action#3 (section 3.2 of the template form)
- Adapting and correctly displaying Scenarios and step descriptions (section 4 of the template form)
- Adapting and correctly displaying of Category of Requirements and related Requirements (section 4 of the template form)
- Additional fields in section 8 of the template for information about the Bridge project and the Author
- Overall troubleshooting of the process and functionalities



## 3.2 Use Case Template

Below are all the fields to be included in the UC form of the repository, based on the IEC 62559-2:2015 standard. The template is organised into nine different sections (see **Errore. L'origine riferimento non è stata trovata.**) presented in the following list:

### **1 Description of the use case**

#### *1.1 Name of use case*

- *Use case ID \*\**
- *ID Area/ Domain(s)/Zone\**
- *Name of use case \*\**

#### *1.2 Version management*

- *Version No.*
- *Date*
- *Name of author(s)*
- *Changes*
- *Approval status*

#### *1.3 Scope and objectives of use case*

- *Scope\**
- *Objective(s)\**
- *Related business case(s)*

#### *1.4 Narrative of use case*

- *Short description\**
- *Complete description\**

#### *1.5 Key performance indicators (KPI)\**

- *ID*
- *Name*
- *Description*
- *Reference to the mentioned use case objectives*

#### *1.6 Use case conditions\**

- *Assumptions*
- *Prerequisites*

#### *1.7 Further information on the use case for classification/mapping*

- *Relation to other use cases*
- *Level of depth*
- *Prioritisation*
- *Generic, regional or national relation*
- *Nature of the use case*
- *Further keywords for classification*

#### *1.8 General remarks*

- *General remarks*

### **2 Diagrams of the use case**

- *Diagram(s) of use case\**



### **3 Technical details**

#### **3.1 Actors\***

- *Actor name*
- *Actor type*
- *Actor description*
- 

#### **3.2 References**

- *No.*
- *References type*
- *Reference*
- *Status*
- *Impact on use case*
- *Originator/organisation*
- *Link*

### **4 Step by step analysis of use case**

#### **4.1 Overview of scenarios\***

- *Scenario No.*
- *Scenario name*
- *Scenario description*
- *Primary actor*
- *Triggering event*
- *Pre-condition*
- *Postcondition*
  - *Step No.*
  - *Event*
  - *Name of process/activity*
  - *Description of process/activity*
  - *Service*
  - *Information producer (actor)*
  - *Information receiver (actor)*
  - *Information exchanged (IDs)*
  - *Requirement, R-IDs*

#### **5 Information exchanged\***

- *Information exchanged, ID*
- *Name of information*
- *Description of information exchanged*
- *Requirement, R-IDs*

#### **6 Requirements\***

- *Categories ID*
- *Category name for requirements*
- *Category description*
  - *Requirement R-ID*
  - *Requirement name*
  - *Requirement description*

#### **7 Common terms and definitions**

- *Term*
- *Definition*



### 8 Custom information

- Custom information
- Key
- Value Refers to section
- Publisher Organisation\*
- High-Level Use case\*
- Related Project\*
- Technologies for use cases
- Cordis Link\*

### 9. Save

- (accept the privacy statement)\*

The items denoted by \* are mandatory for submitting a UC for review, and the items denoted by \*\* are the minimum mandatory fields for creating a UC draft.

Some adaptations from the original template described by the IEC 62559-2:2015 were necessary to visualise the form on the webpage. In particular:

- Section 3 Actors' list is not organised in groups, and this field does not appear in this first version of the repository. As mentioned in § 2.3, a standardised list of Actors is already available, even though Authors are allowed to create new Actors specific to their UC if necessary.
- Section 4.1 scenarios are not grouped in a unique table or subsection, but each scenario is followed by its steps.
- Section 8 has some additional fields to provide essential information about the related Horizon project:
  - High-level Use Cases:
  - Related Project
  - Cordis link: the Cordis link

An example of a published UC is reported in Annexe 1.

## 3.3 How the New Use Case Repository Works

This section explains the main features and functionalities of the UC repository. It shows how to access it and, create a UC, and it goes over the review and publishing process too.

### 3.3.1 Get Access

The repository is accessible through the SES-JRC website. Users can just visit the SES-JRC website at the URL: <https://ses.jrc.ec.europa.eu/>. In **Errore. L'origine riferimento non è stata trovata.** a screenshot of the home page is presented with the indication of the new section for UC repository. In the horizontal bar menu, the “Maps & Tools” tab can be found and, from there, a drop-down menu allows user to select “Use Case Repository”.

The repository is also directly accessible through the URL: <https://ses.jrc.ec.europa.eu/use-cases>. In this section of the portal (**Errore. L'origine riferimento non è stata trovata.**) it is possible to see an initial disclaimer introducing the UC repository and the BRIDGE initiative. A central banner with a button icon “Go to UC



Repository” corresponding to the URL: <https://ses.jrc.ec.europa.eu/uses-cases-list> brings the user to the public list of published UCs. At the bottom of the page, the “Manage your UCs” corresponds to the link <https://ses.jrc.ec.europa.eu/my-uc> and it brings the user to the list of UCs they created (whether they are published or not). This is only accessible if the user is logged in with an ECAS account.

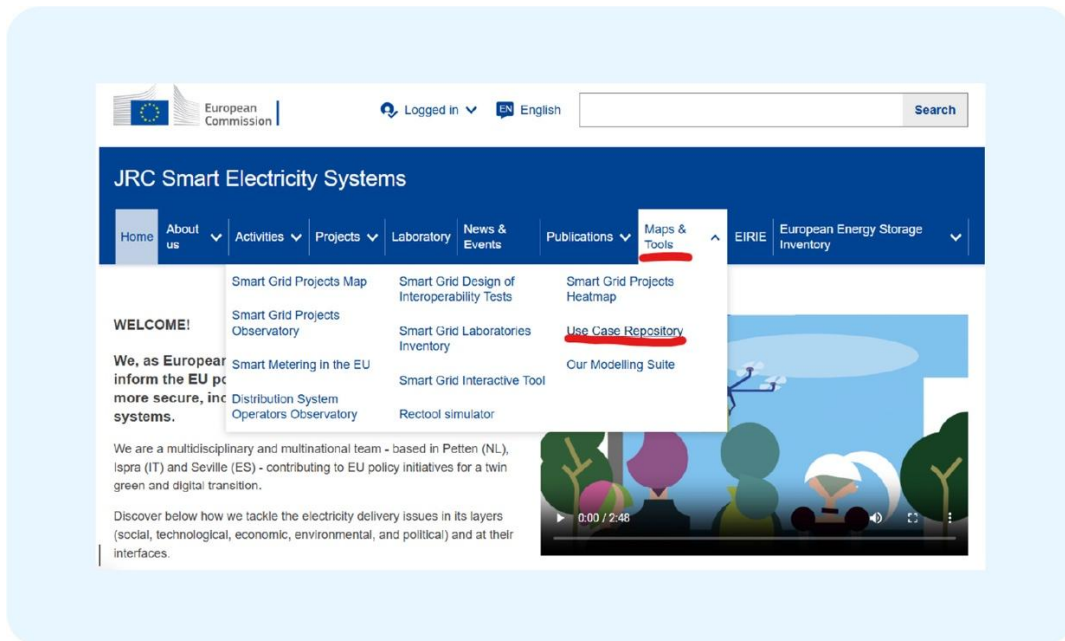


Figure 3 - Screenshot of SES-JRC home page



European Commission | Logged in | EN English | Search

## JRC Smart Electricity Systems

Home | About us | Activities | Projects | Laboratory | News & Events | Publications | Maps & Tools | EIRIE | European Energy Storage Inventory

European Commission > JRC SES > Maps & Tools > Use Case Repository

### Use cases

The BRIDGE use-case repository, based on IEC 62559, was created to simplify and homogenise the definition of use cases for BRIDGE members with different background and to provide an overall view of all the projects use cases in a simple format. Based on this, the European Commission recommended to integrate this repository with existing EC platforms, to make it fully operational, increase its use and visibility and facilitate the maintenance and security. After preliminary versions and updates the use case repository initially accessible under EIRIE platform is now available here.

The BRIDGE members, under the coordination of the Action#1 of [Data Management Working Group](#), are allowed to publish their use cases following an iterative process aimed at ensuring the completeness and quality of the contents.

**Navigate through the Use Cases available in the Repository**

[Go to UC Repository >](#)

**Manage your use cases**  
Do you need any of your use cases? you can manage them in your personal space.

Figure 4 - Use Case repository section on the JRC portal

Hence views and functions of the repository have been differentiated depending on whether the user is a Visitor, an Author or an Evaluator.

**Visitors.** General web users who are simply entering the SES-JRC webpage can click on the “Go to UC Repository” and have a look at the table with all the published UCs (**Errore. L'origine riferimento non è stata trovata.**). A visitor does not need to be logged in to access the repository table of the published UCs. Access shows the following columns: IDs, Names, Last available version, and the Horizon project the UC belongs to. By clicking on each one of the published UCs, it is possible to see the full UC description and download it (see Annexe 1 for example). On the left side of the page, a search tool is also available which allows the user to filter UCs per ID, name or Horizon project. A link for creating a new use case is available on the upper part of the page; if a visitor clicks it, they will be redirected to the login/sign-up page.



**Uses cases**

Here you will find all published Uses cases, you can create a [new use case here](#)

**Filter by**

Use case ID

Name of the use case

Horizon Project

**Apply**

**Uses cases (7)**

Use case ID	Name	Latest update	Horizon Project
<a href="#">UC-PALJAVI</a>	PALJAVI	24-02-2025 12:17:31	PROJECT DUMMY
<a href="#">UC-1</a>	UC JUAN 2	21-02-2025 14:34:17	test
<a href="#">UC Prueba</a>	UC prueba test	20-02-2025 17:35:31	R2D2
<a href="#">TEST JUAN 1</a>	UC Juan Sanchez	18-02-2025 16:05:27	SESI
<a href="#">UC8</a>	Outage_planning_optimization	10-02-2025 09:51:29	R2D2
	TEST UC Juan	23-01-2025 13:08:52	
	Test UC	02-12-2024 09:05:57	project 1

Figure 5 - Repository view for a Visitor

**Author.** A visitor who is logged in to the SES-JRC portal with their ECAS account is allowed to create a UC by clicking on the link visible in **Errore. L'origine riferimento non è stata trovata.**. As mentioned before, this section of the repository is only accessible to those users who are logged in with an ECAS account; it also means a user must log in to be an Author and create a UC. An Author can have access to the full list of UCs created by themselves through the "Manage your UCs" link corresponding to the URL: <https://ses.jrc.ec.europa.eu/my-uc>. A different page of the repository will be opened, showing a table with all UCs in draft, under review or published state from the Author, **Errore. L'origine riferimento non è stata trovata.** Authors have to stay coordinated with DMWG Action#1 to create a UC; this is to prevent any user with an ECAS account publishing content on the repository. In this regard, the possibility of introducing an additional level of authorisation in the future is not discarded.

**Results**

Use case ID	Name of the use case	Latest update	Published	Latest version status	Horizon Project	Author
<a href="#">UC8</a>	Outage_planning_optimization	10/02/2025 09:51	Yes	draft	R2D2	
<a href="#">UC12</a>	Emergency & Restoration - Over-frequency protection module	28/02/2025 13:32	No	under_review	R2D2	

Figure 6 - Repository view of "my use cases area" for an Author

**Evaluator.** A volunteer from DMWG group will review the status and quality of UC under review. By clicking the icon "Go to UC Repository" in **Errore. L'origine riferimento non è stata trovata.**, an Evaluator can view all UCs, whatever their status (**Errore. L'origine riferimento non è stata trovata.**). The role of the Evaluator is crucial to



ensure the content of UCs complies with standard quality (i.e. all fields are properly filled in, the scenarios and steps are clearly described, pictures are readable, etc.) and it is consistent with other UCs. Evaluators are coordinated by the DMWG Action#1 leader, who will communicate to the SES-JRC team the ECAS accounts of the Evaluators to enable them in the repository. An Evaluator can ask an Author to improve a UC (change its state from “Under Review” to “Draft”) or decide to publish it if it is of good quality (change it from “Under Review” to “Publish”). Only an Evaluator can publish a UC.

Use case ID	Name of the use case	Latest update	Published	Latest version status	Horizon Project	Author
<a href="#">UC8</a>	Outage_planning_optimization	10/02/2025 09:51	Yes	draft	R2D2	nmarquat
<a href="#">UC12</a>	Emergency & Restoration - Over-frequency protection module	28/02/2025 13:32	No	under_review	R2D2	nmarquat
<a href="#">UC08</a>	Outage planning optimization	20/02/2025 16:07	No	draft		n0076j2t
<a href="#">UC- PALJAVI</a>	PALJAVI	24/02/2025 12:17	Yes	published	PROJECT DUMMY	paljavi
<a href="#">UC- Flexibility</a>	Provision of flexibility services to the local flexibility market	24/02/2025 14:02	No	draft		n00e6khg
<a href="#">UC-1</a>	UC JUAN 2	21/02/2025 14:34	Yes	published	test	sancjan
<a href="#">UC Prueba</a>	UC prueba test	20/02/2025 17:35	Yes	under_review	R2D2	n0076j2t
<a href="#">test_02</a>	UC test 02	03/03/2025 15:27	No	draft		nmarquat
<a href="#">test juan 10</a>	asdasd	21/02/2025 10:50	No	draft		n0076j2t
<a href="#">TEST JUAN 1</a>	UC Juan Sanchez	18/02/2025 16:05	Yes	published	SESI	sancjan

Figure 7 - Repository view for an Evaluator

Apart from these three roles described above, the Repository is managed by IT personnel of JRC, as owner and responsible of the web portal, who has administrator privileges. They are in charge of any change in the Repository, administrating the back end and the front end. Action 1 leader is in contact with the JRC personnel acting as a connection link for the Bridge Community.

### 3.3.2 Use Case Drafting

A BRIDGE project contributing to the UC repository is allowed to create a UC. Such contributions are coordinated and managed by DMWG-Action#1.

Once an Author is logged in to the SES-JRC web portal it, they can create a new UC by clicking on the icon of **Errore. L'origine riferimento non è stata trovata.**, corresponding to the URL: [https://ses.jrc.ec.europa.eu/node/add/use\\_cases](https://ses.jrc.ec.europa.eu/node/add/use_cases). The Author is redirected to the page shown in **Errore. L'origine riferimento non è stata trovata.** where the UC forms are available to be filled in.



European Commission > Home > > Add Content > Create Use Cases

**Don't forget save your progress** Close

In order to persits your information provided about the uses case, please go to the latest step

## Add Use case Next

- 1 Description of the use case
- 2 Diagrams of use case
- 3 Technical details
- 4 Step by step analysis of use case
- 5 Information exchanged
- 6 Requirements
- 7 Common terms and definitions
- 8 Custom information
- 9 Save

### 1.1 Name of use case

ID \*

Area Domain(s)/ Zone(s) \*

Name of the use case\*

### 1.2 Version management

Figure 8 - Screenshot of the UC form

The form to upload a UC is organised into nine sections with the fields already listed in section 3.2.

The Author has to go through the different sections and fill in at least the mandatory fields indicated by \*.

The instructions on how to properly fill in the form are under review from DMWG Action#1 and they will be available on the UC repository webpage.

Users don't have to complete a UC in a single go; they can save the information by going to section 9. Only "ID" and "Name of the use case" are needed in order to save a draft.

Before saving a draft, users must accept a statement to ensure there are no confidential details nor privacy disclosed, **Error. L'origine riferimento non è stata trovata.**

Figure 9 - Screenshot of the “Save” icon with the privacy statement to check

Once an Author fills in some fields and saves the draft of a UC, this new draft becomes available on the system through the page represented in **Errore. L'origine riferimento non è stata trovata.**. In this screenshot, it is possible to see a horizontal bar menu with the following four tabs:

- Current Version: displays the current status of the draft, where the Contributor can check the content and the completion of the UC. It is a read-only window. At the top of the UC, there is a box with the following items:
  - Moderation State: indicates the status of the UC. The available states are: published, under review and drafted (see section 3.3.3).
  - Change to: allows the Contributor to change the status of a UC from “draft” to “under review”. Once a Contributor has completed filling in all the mandatory fields (\*) of a UC, it is possible to send it to Evaluators through the button “Apply” (see **Errore. L'origine riferimento non è stata trovata.**).
  - Log message: a box text where the Author can read/write comments from/to the Evaluator.
  - Apply: will apply the change of state of the UC from “draft” to “under review” and send the log message. This action basically completes the drafting phase by a Contributor and triggers the evaluation phase. If mandatory fields are missing, the system will not allow moving a UC to the evaluation phase, meaning it will remain in draft mode. An error message is displayed as in Figure 9 with the missing compulsory field.



The screenshot displays a web interface for managing use cases. At the top, an information message states: "Use cases *Emergency & Restoration - Over-frequency protection module* has been updated." Below this, a navigation bar includes "Current version", "Edit use case", "Delete", and "Comments & Revisions". The main title is "Emergency & Restoration - Over-frequency protection module".

The moderation section shows the current state as "Draft". A "Change to" dropdown menu is open, showing "Under review" as the selected option. A "Log message" text area is empty, and an "Apply" button is visible to the right.

Below the moderation section, the page content is structured as follows:

- PAGE CONTENTS**
  - Description of the use case
  - Diagrams of use case
  - Technical details
  - Step by step analysis of use
- 1. Description of the use case**
  - 1.1 Name of use case**
    - Name of the use case:** Emergency & Restoration - Over-frequency protection module
    - Area Domain(s)/ Zone(s):** Transmission / Operation

Figure 10 - Screenshot of the change of state functionality

- **Edit Use Case:** this re-opens the editing session (**Errore. L'origine riferimento non è stata trovata.**), and the Author is able to edit more fields again.

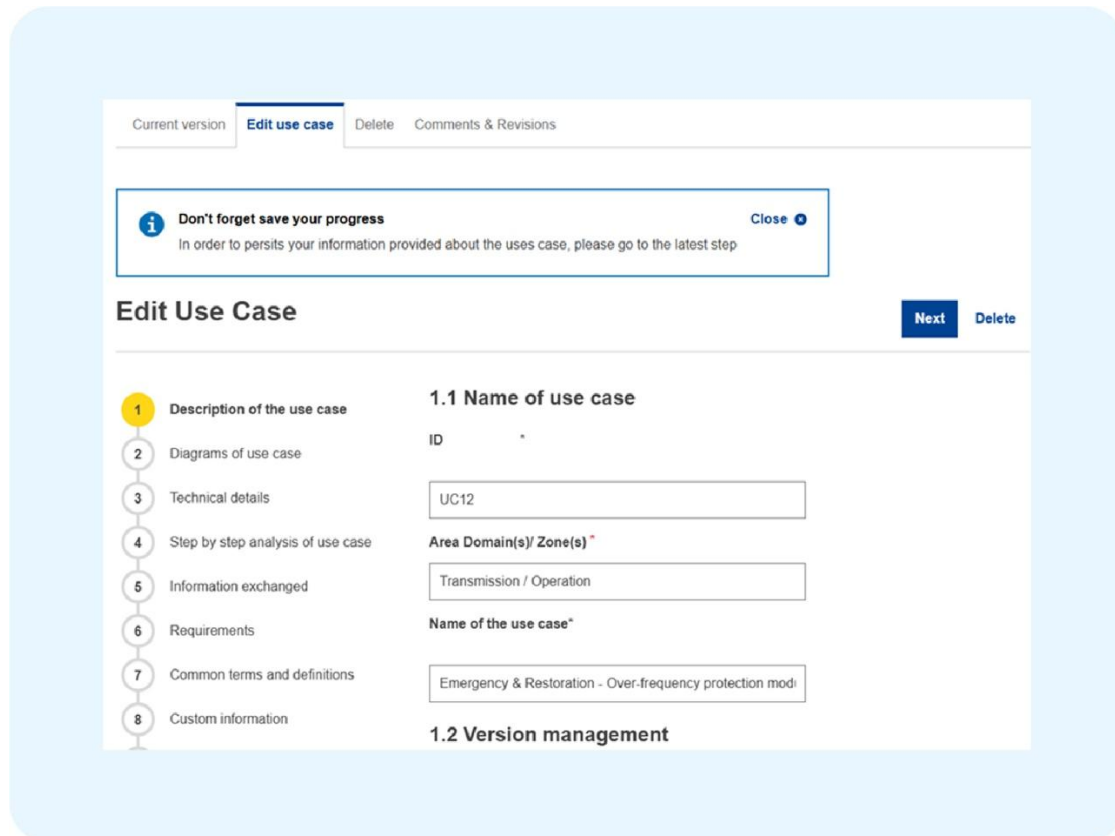


Figure 11 - Screenshot of the editing UC after the first save of draft

- **Delete:** option to delete a draft UC (Errore. L'origine riferimento non è stata trovata.)

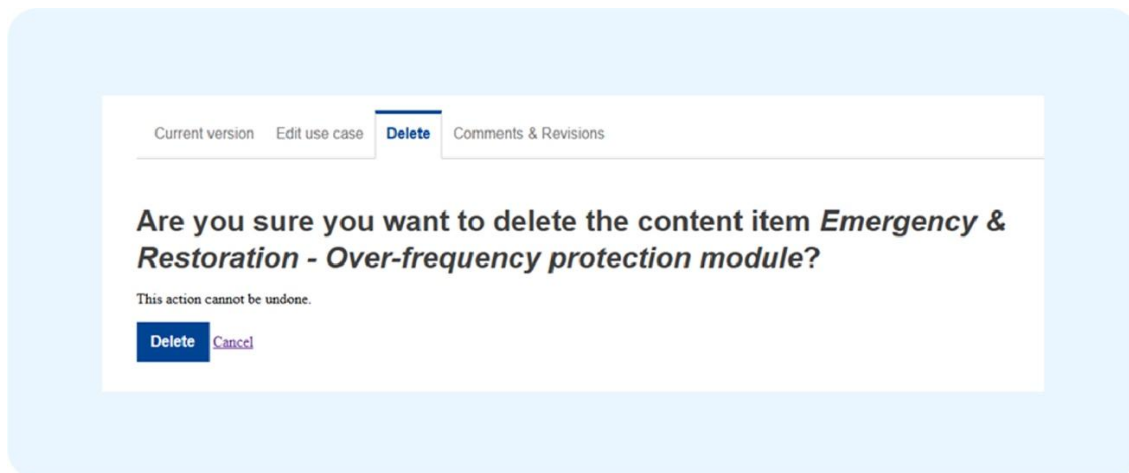


Figure 12 - Screenshot of the "delete" tab

- **Comment & Revisions:** this is the history of all versions drafted, reviewed and published, and of the comments exchanged between the Evaluator and the Contributor. The Contributor can also recover a previous version of a draft UC and keep editing it; if the changes are saved, this will convert it into the last current version of the draft.

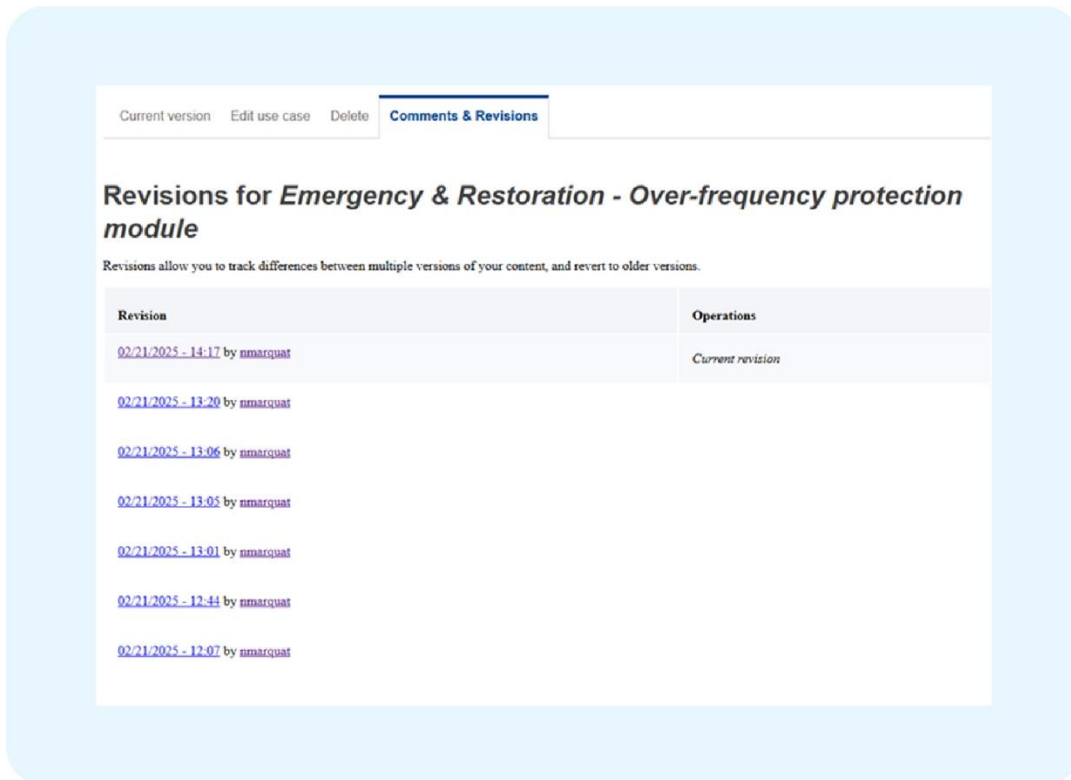


Figure 13 - Screenshot of the “comment &amp; revision” list

Once a UC form is completed or at least its mandatory fields, it is possible to send it for review to the Evaluators; if a mandatory field is missing a message error is displayed with the missing information, and the UC state remains in “Draft” (see **Errore. L'origine riferimento non è stata trovata.**).

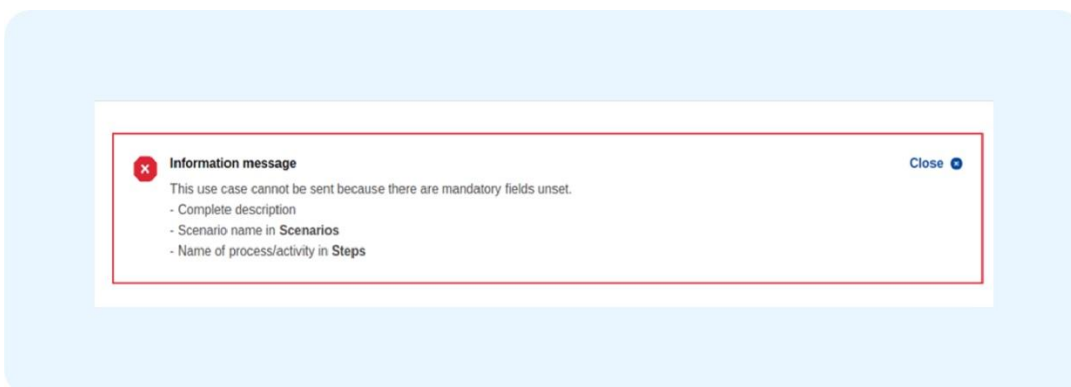


Figure 14 - Error message for missing mandatory fields

### 3.3.3 UC Review, Comments and Publish

Once a UC is submitted for review, the system sends a notification via email to the Author and the Action 1 leader about the change of state. The Author is no longer able to edit the UC form. Action 1 leader assigns an Evaluator for the UC review. The Evaluator checks the UC for completeness and quality.

If an Evaluator considers the UC needs improvements, they can change the state from “Under Review” to “Draft” and add in the comment box which field has to be improved. In this case, the session will be sent back to the



Author who is now able to edit the UC again. The system will send a notification about the change of state to both the Author and Evaluator. The Author also finds the comment from the Evaluator in the “Comments and Revisions” tab of the same UC (**Errore. L'origine riferimento non è stata trovata.**).

If all the mandatory fields are filled in properly, the Evaluator can decide to publish it. A notification is sent to both the Evaluator and Author about the change of state.

The full process is represented in **Errore. L'origine riferimento non è stata trovata.**, representing the whole workflow in more detail compared to **Errore. L'origine riferimento non è stata trovata.**. The Author's actions are depicted in grey boxes on the left side, while the steps of the Evaluator are on the right side in blue boxes. The notifications generated and sent by the system are in black boxes in italic font with dashed connectors.

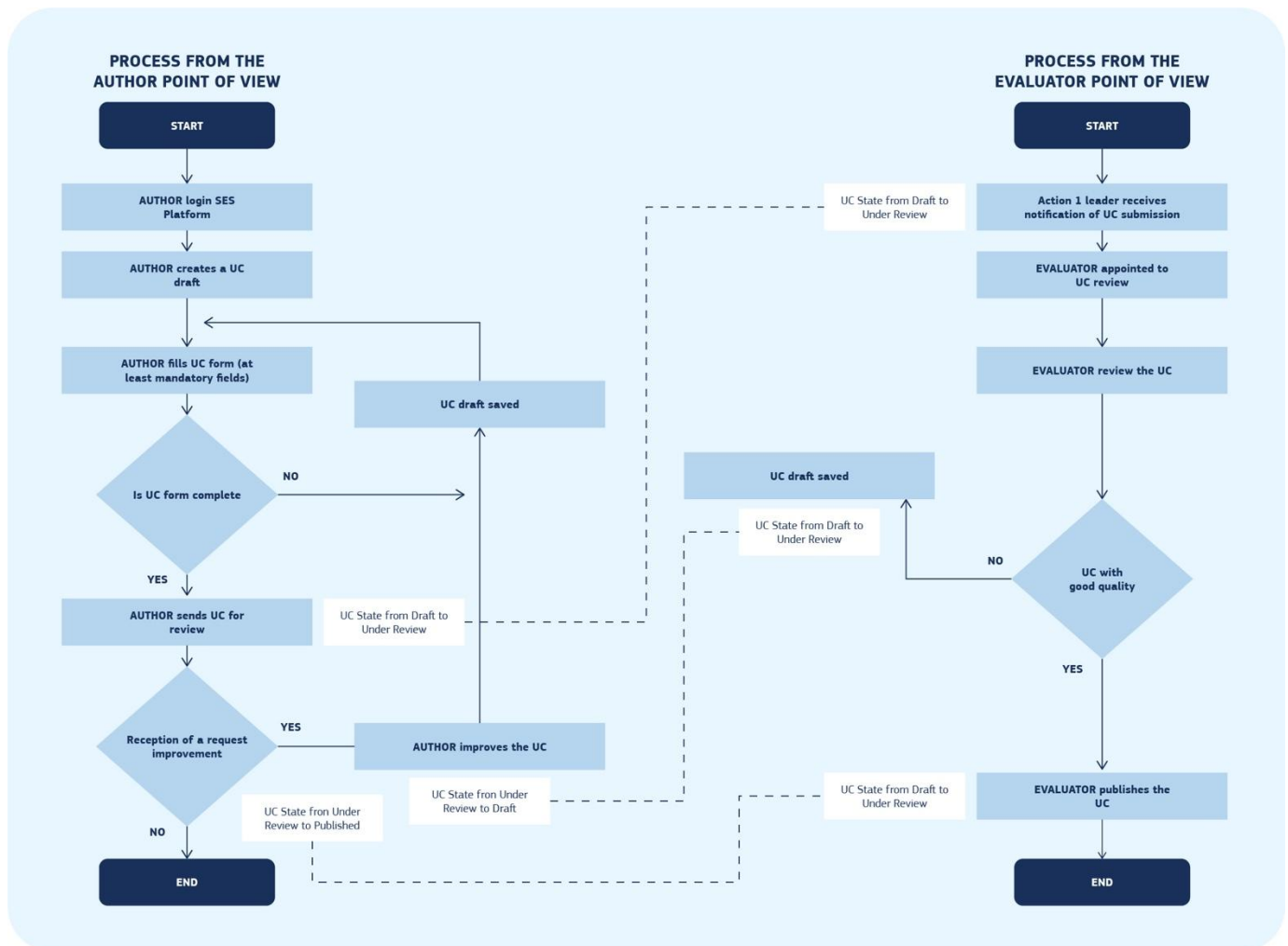


Figure 15 - Complete workflow for a UC publication from the Actor and Evaluator perspective

For the correct implementation of such a process, it is established that a UC can be in one of the following states:

- **Draft:** a UC is created and saved on the repository. With this status, it is only accessible by the User who created it and is able to complete it in different sessions and steps. Once all mandatory fields of a “Draft” are completed, the Author can change its status and submit it for review. This status is also activated once the Evaluator has reviewed the UC and has sent some comments for improvement to the User. In this case, the Evaluator is allowed to read the draft.
- **Under Review:** a UC draft completed in all the mandatory fields and submitted for evaluation. It is visible to its Author and the Evaluator, but it is no longer editable.



- **Published:** a UC under review, which has been positively evaluated by an Evaluator who decides to publish it. It is visible to any visitor of the webpage, and it is no longer editable. In fact, there is the possibility to edit a UC already published, but it will be saved as a new draft.

### Author's functionalities

Whether a UC is in one of the three possible statuses, an Author can have different functionalities activated depending on the status the UC is in. The mapping of the functionalities vs the UC status is represented in Table 1.

Table 1 - UCs states vs functionalities available for an Author

Available Functionality in the "my-uc" area	State of the UC		
	Draft	Under Review	Published
Published Version			✓
Current Version	✓	✓	
Edit UC	✓		✓
Latest unpublished Version & Workflow Actions			✓
Delete	✓	✓	✓
Comment & Revisions	✓	✓	✓

All of them have already been introduced in the previous section, but as "Published" and "Latest unpublished Version & Workflow Actions". The "Published" status not only means the UC is published on the public repository, but it also applies to a UC which is in "Draft" after being published (a published UC can be edited again, changes are saved in a new draft, which follows the normal approval procedure). "Latest unpublished version & workflow actions" allows for recovery of the last version changed after its publication, in case some changes are needed, or the Author wants to create a new UC from there **Errore. L'origine riferimento non è stata trovata.** The following example can explain both functionalities better. It may happen that an Author is changed due to a legal definition update after a UC is published. In this case, the Author or an Evaluator can edit the UC. The system will create a new draft, while the previous version remains available in the public repository. The new UC draft will undergo the normal review process between the Author and the Evaluator. Both users can have access to the previous approved and public version through the "Published Version" tab, and to the new updated and editable draft through the "Latest unpublished version & workflow actions" tab.



Published version Edit use case **Latest unpublished Version & Workflow Actions** Delete Comments & Revisions

### Outage\_planning\_optimization

Moderation state Change to Log message

Draft Under review

Apply

Figure 16 - Screenshot of the “Latest unpublished Version & Workflow Actions”

While it is in this status the UC will appear in the internal repository of the Author as it appears in **Errore. L'origine riferimento non è stata trovata.**, where the column Published is set to yes (meaning there is a version of this UC already published), and the column “Latest version status” is under review (meaning the latest available version of this UC is not published but is under review).

Use case ID	Name of the use case	Latest update	Published	Latest version status	Horizon Project	Author
<a href="#">UC12</a>	Emergency & Restoration - Over-frequency protection module	13/03/2025 12:13	Yes	under_review	R2D2	nmarquat

Figure 17 - Screenshot of my-uc area for a published UC being edited

Once the review process is complete, the Evaluator will publish the new version, and the changes will be overwritten on the published version in the public repository. The Author’s view of their UC on the repository will be as in **Errore. L'origine riferimento non è stata trovata.**, where the column “Latest version status” is now changed to Published.



**Results**

Use case ID	Name of the use case	Latest update	Published	Latest version status	Horizon Project	Author
<a href="#">UC12</a>	Emergency & Restoration - Over-frequency protection module	14/03/2025 09:01	Yes	published	R2D2	nmarquat

Figure 18 - Screenshot of my-uc area for an updated published UC

Finally, **Errore. L'origine riferimento non è stata trovata.** shows an example of a notification message sent by the system. The message notifies of the change of status of a UC with any comment from the Evaluator to the Author. Similar messages are exchanged in other cases too.

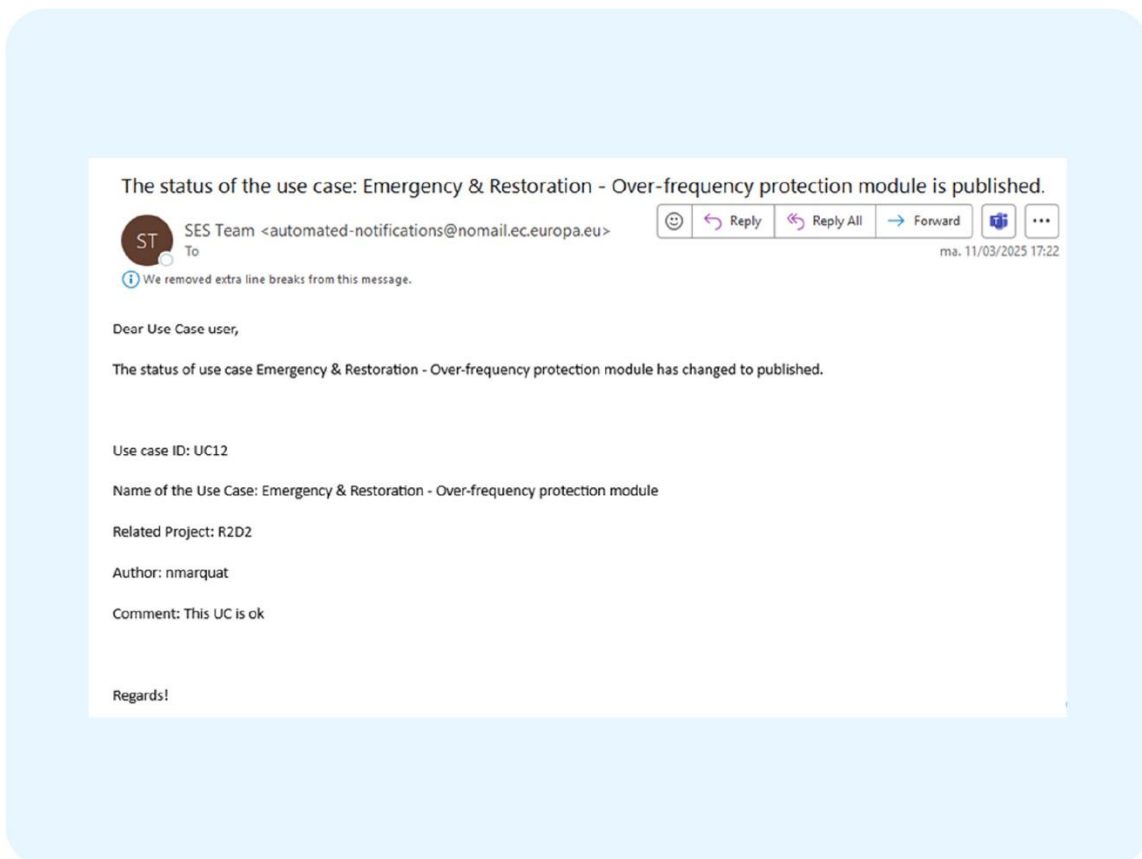


Figure 19 - Example of a notification email with the state changed from “Under Review” to “Publish”



## Evaluator's Functionalities

Apart from the different visualisation options of the repository already presented in **Errore. L'origine riferimento non è stata trovata.**, an Evaluator is allowed to:

- a) Change to "Published" a UC which was sent to "Under Review"
- b) Change to "Draft" a UC which was sent to "Under Review"
- c) Send comments to Author
- d) Edit a UC already "Published", it will be automatically changed to "Draft".
- e) Delete a UC in any state.

At the time of writing, the UC repository has just completed the minimum necessary tests, and it is publicly available. Thus, an Evaluator with all those functionalities activated has a role similar to an Administrator of the repository. There is the possibility to keep these functionalities to the Action#1 leader only while leaving only the functionalities for the Evaluators a), b) and c) from the previous bullet list.



## 4 Conclusions and Next Steps

At the time of writing, the UC repository had just been moved from pre-production to a production environment, which means all the links and URLs aforementioned are online and publicly available.

This is a completely new development compared to what was presented in previous reports of Action#1 [3], with new processes and functionalities implemented in it.

Nevertheless, additional steps are needed for the UC repository to operate at full capacity. The tasks planned in Action#1 for the next twelve months are set out in **Errore. L'origine riferimento non è stata trovata.**

During the BRIDGE General Assembly 2025 a tentative Gantt for 2024-20205 was presented, even though, in the case of UC repository maintenance or changes, any scheduling will depend on JRC availability at that time.

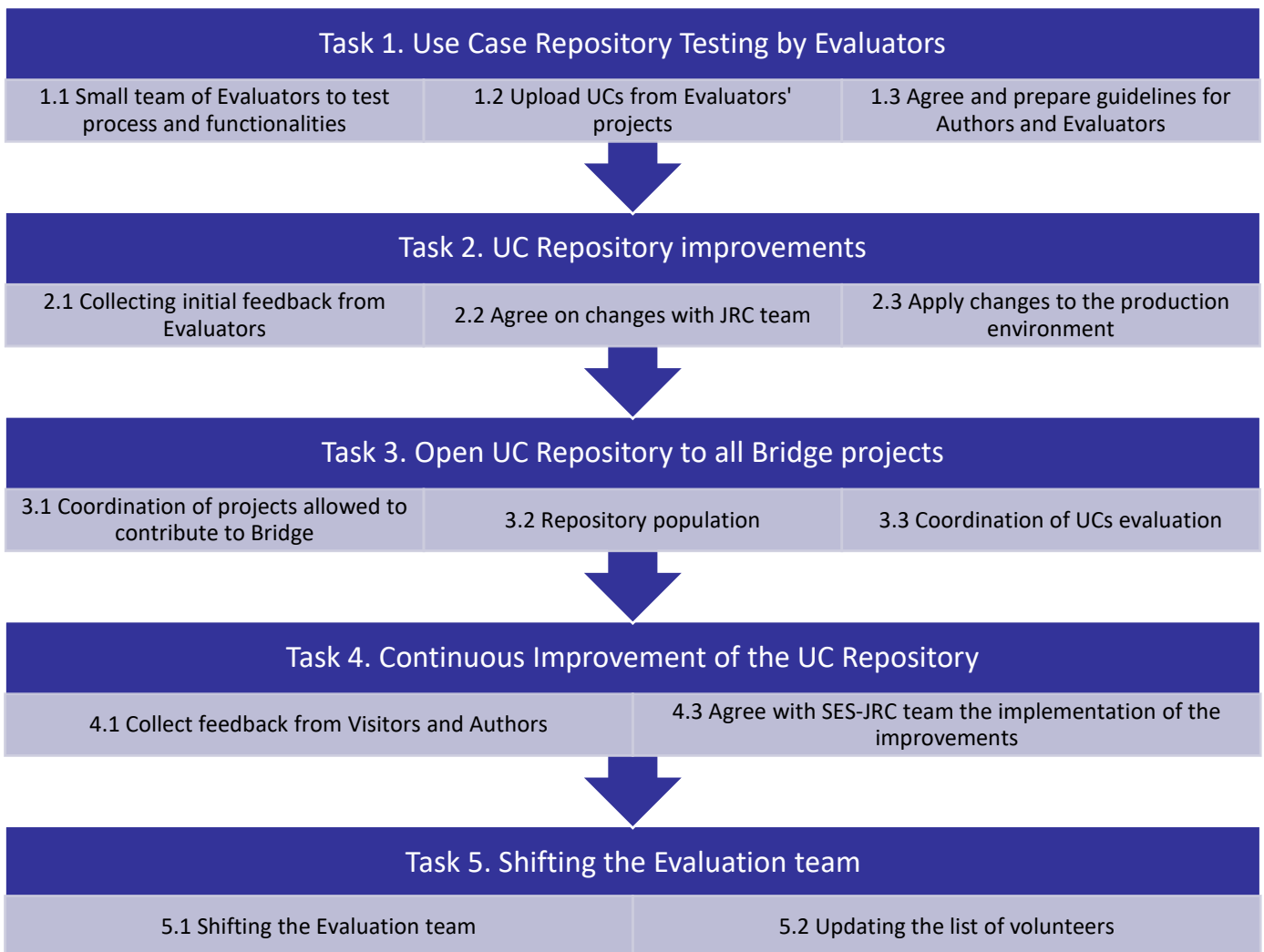


Figure 20 - Next steps in DMWG Action#1 for the next 12 months

### Task 1. Use Case Repository Testing by Evaluators

The goal of this task is twofold: check the functionalities and the operational process of the repository before opening it to the BRIDGE community, and Evaluators the training with the repository itself.

1.1 Small team of Evaluators to test processes and functionalities. During the preparation of this document, the UC repository was moved to production, hence it is now available and all the previous links are available. It is



good at this stage to organise a small group of Evaluators who can check the whole *draft-review-publish* process and

1.2 Upload UCs from Evaluators' Projects. This small group of Evaluators will start uploading the UCs and reviewing them before their publication. This is important in order to start populating the repository with some samples once the BRIDGE projects start uploading their contributions. Moreover, it is preparatory for the next sub-task.

1.3 Agree and prepare guidelines for Authors and Evaluators. Thanks to the previous 2 subtasks, the Evaluators will agree on common guidelines for Authors and Evaluators. Guidelines for Authors will advise on how to properly fill in the UC form. From past experiences on previous versions of the repository, the content of UCs was not always consistent for several reasons (i.e. projects used to fill in not all fields of the form, or they interpret the IEC62559-2:2015 fields according to the project scope, etc.). At the same time, Evaluator's guidelines will provide indications on what to check in a UC draft, to have a common level of quality of content for all UCs. ETRA as Action#1 leader has already prepared guidelines for Authors and Evaluators, which will be shared with other Action#1 participants. As stated in § 3.3.2, a link to the Author's guidelines will be available once ready in the UC Repository.

## Task 2. UC Repository Improvements

The goal of this second task is to improve the UC repository in case any criticalities are detected in subtasks 1.1 and 1.2.

2.1 Collecting initial feedback from Evaluators. After the first use of the UC repository, Evaluators will highlight what can be improved for the correct use of the repository for all BRIDGE community. Considering the priority is to open the repository to all projects, in this first stage, only critical changes (those changes considered serious or not deferrable) will be considered. In this regard, some improvements were already identified from the previous version of the repository, for example:

- implement a new authorisation system for UC Authors, so as to prevent visitors to the webpage with an account from creating a UC outside the coordination of DMWG Action1;
- possibility of uploading an XML file of a UC according to IEC 62559-3:2017 (from DMWG Action 4);
- updating the Actors' list (from DMWG Action #3) once the new definitions of Actors are ready;
- another possible upgrade of Repository functionalities, already discussed with SES-JRC It team, regards the privileges for Evaluators who can no longer be allowed to edit a UC from another Author (see functionalities d) and e) described in § 3.3.3). A new possibility is to ban such functions to Evaluators and to create another role as Administrator for Action#1 leader only, with these functions enabled.

At the moment, they do not seem to be critical for the repository usage, so they can be discussed in a later stage, since the priority is to have a public UC repository as soon as possible, considering the long stop of past months.

2.2 Agree on changes with the JRC team. Once the major changes have been identified, their application and scheduling will be agreed upon with SES-JRC technical team, since all maintenance activities of the UC repository depend on JRC. The technical implementation of the proposed changes will be evaluated by JRC as the website administrator.

2.3 Apply changes to the production environment. JRC will then implement the agreed changes useful for the UC repository to be ready for all BRIDGE projects.

## Task 3. Open UC Repository to All BRIDGE Projects

The UC repository is now ready to be opened to all Bridge projects, as it has been improved with the minimum and essential changes and it contains some UCs as samples.



3.1 Coordination of projects allowed for contribution to BRIDGE. The availability of the BRIDGE projects to contribute to the UC repository is ascertained at the BRIDGE General Assembly and periodic DMWG meetings; contributions from these projects are then scheduled.

3.2 Repository population. In this subtask, the normal creation of UCs will go according to the established process of draft-review-publication. This is the core of Action#1 supposed to run as long and smoothly as possible to publish most of the UCs.

3.3 Coordination of UC evaluation. Action#1 leader will coordinate the whole process of UC creation, assigning UCs to the Evaluators, coordinating with participant projects and with the JRC technical team when needed. Action#1 calls or periodic meetings will be organised as the need arises. This subtask will run in parallel with the previous 3.2.

#### **Task 4. Continuous Improvement of the UC Repository**

This task involves acquiring regular feedback to improve the repository and thus facilitate the exchange of information across BRIDGE projects.

4.1 Collect feedback from Visitors and Authors. Through the constant use of the UC repository by Authors and Evaluators, comments and feedback will be collected periodically, discussed and analysed in DMWG and Action#1 meetings.

4.2 Agree with the SES-JRC team on the implementation of the improvements. Additional changes and improvements have to be agreed upon in advance with the JRC technical team as the webpage administrator.

#### **Task 5. Rotation of the Evaluation Team**

As the activity to evaluate and review UCs can be highly time-consuming and is expected to have many projects participating in Action#1 from all BRIDGE projects, it was originally agreed to have 6-month shifts for the evaluation team.

5.1 Shifting the evaluation team. It is imagined to have at least one shift in the evaluation team in the next 12 months.

5.2 Updating the list of volunteers. Considering the turnover of BRIDGE projects and the changes in the availability of the participants, the list of volunteers for the evaluation team has to be updated periodically with the support of the BRIDGE secretariat, with a questionnaire to all BRIDGE WGs.



## 5 Annex 1: Use Case Example

In this chapter, a sample of a UC already uploaded to the repository is shown. From the UC repository, it is possible to download the pdf file of any published UCs. This annexe presents the screenshots of this pdf.

Pictures in section 2 of the UC can be enlarged in the online version of the UC and the pdf.

### 1. Description of the use case

#### 1.1 Name of use case

Name of the use case:

Emergency & Restoration - Over-frequency protection module

Area Domain(s)/ Zone(s):

Transmission / Operation

#### 1.2 Version management

Version No.	Date	Name of author(s)	Changes	Approval status
-------------	------	-------------------	---------	-----------------

1	-	EMSS		
---	---	------	--	--

#### 1.3 Scope and objectives of use case

Scope:

Transmission system operation during emergency and restoration

Objective(s):

Obj. 1: Create a centralized system that would simulate the lack of limited sensitive frequency mode-overfrequency (LFSM-O) on generating units in the power system

Related business case(s):

BC1 (Contribute to the improvement of the overall security and resiliency in the power system)

#### 1.4 Narrative of use case

Short description:

The Emergency & Restoration - Over-frequency protection module (OFFPM) is designed as a replacement for the missing or insufficient controllers on generating units in the power system which can operate in limited frequency sensitivity mode - over-frequency (LFSM-O).

Complete description:

In the CROSSBOW project, two conceptual solutions for over-frequency protection system were developed, as a replacement for the missing or insufficient LFSM-O controllers (as defined in EU Regulation 2016/631 - Network Code on requirements for grid connection of generators) on generators in Serbia and in the region of Southeast Europe. According to EU Regulation 2017/2196 (Network Code on Emergency and Restoration), such a system must properly disconnect the generators. The first solution implied that the over-frequency protection system calculates settings for each generator in a predetermined order provided by TSOs (which takes into account local

**Complete description:**

In the CROSSBOW project, two conceptual solutions for over-frequency protection system were developed, as a replacement for the missing or insufficient LFSM-O controllers (as defined in EU Regulation 2016/631 – Network Code on requirements for grid connection of generators) on generators in Serbia and in the region of Southeast Europe. According to EU Regulation 2017/2196 (Network Code on Emergency and Restoration), such a system must properly disconnect the generators. The first solution implied that the over-frequency protection system calculates settings for each generator in a predetermined order provided by TSOs (which takes into account local

congestions), starting with 50.2 Hz (and up to 52Hz). These calculations are performed every 5 – 15 min due to changes in production in real time. In the event of a critical frequency, the Over-frequency Protection (OFP) system sends a command for generator disconnection to selected generators. In the case of application at the regional level, this system takes care not to cause unacceptable flows on the interconnecting transmission lines when the generator is disconnected by the over-frequency protection. The second solution implies that the generators, based on real-time measurements and calculations based on the developed algorithm, are assigned one of the predefined levels of over-frequency protection in the frequency range 50.2 – 52 Hz. Local constraints are controlled by assigning different levels of OFP to the protection devices on generators in one power plant. The OFP algorithm fills the quotas for each level of the over-frequency protection so that the effect corresponds to the virtual activation of the LFSM-O on all generators in the system. This solution was simulated for both national and regional levels. Based on CROSSBOW results, the modified over-frequency protection system will be implemented within R2D2 project in the transmission system of the Serbian TSO. As not all generators are equipped to carry out above given technical solution for the Emergency & Restoration - Over-frequency protection module (OFPM), they will be divided into several groups as follows: 1. The first group of generators are generators that are equipped with LFSM-O and they do not participate in the OFPM. 2. The second group of generators will be assigned fixed over-frequency protection settings (where there are no technical possibilities for remote signal sending neither LFSM-O controllers are installed) – this is not the part of this use case 3. To the third group (where there are technical possibilities for sending signals remotely), the OFPM sends appropriate signals, which can be related to: a) Reduction of active power production on generators (group A) b) Disconnection of the generators from the transmission grid (group B) This type of over-frequency protection system will have the role of reducing the total production in the system as closely as possible when impermissibly high frequencies occur, as if each generator is equipped with an LFSM-O controller. In addition, this system will ensure that there are no local violations of the security criteria in the network. On the other hand, as it will be implemented at the national and not at the regional level, this OFPM will only be able to control to a lesser extent the change in active power flows on the interconnecting lines and the impacts on neighbouring systems (this can only be achieved if there is a regional implementation of the OFPM, which may be the subject of one of the future projects). Also, this system is not intended to control high frequencies in case of splitting the system into subsystems, as its main intention is to bring the Serbian TSO into compliance with the binding provisions of the EU network codes.

**1.5 Key performance indicators (KPI)**

<b>ID</b>	<b>Name</b>	<b>Description</b>	<b>Reference to mentioned use case objectives</b>
12	% of the installed capacity of generators that are included in the OFPM at the national level	$=100\% \cdot \text{DataID2} / \text{DataID1}$ ; - DataID1 - Sum of the installed capacity of generators lacking LFSM-O controllers; - DataID2 - Sum of the installed capacity of generators that are included in the OFPM at the national level	Objective 1



## 1.6 Use case conditions

### Assumptions

Generators that cannot receive command signals have fixed over-frequency protection settings harmonized with the OFPM. Protection devices operate autonomously in case of over-frequency. SCADA AGC runs autonomously after calculated set-points are received from OFPM. SCADA system transfers disconnection signal generated by OFPM to appropriate circuit breakers in the connection facility of a generator.

### Prerequisites

Generating units are capable of receiving a set point to reduce their active energy production, or generating units can be remotely - disconnected from the TSO control centre, or over-frequency protection of the generating units can be reset from the TSO control centre.

## 1.7 Further information to the use case for classification/mapping

### Relation to other use cases

none

### Level of depth:

High level of detail.

### Prioritisation:

Highest priority (5). The centralized over-frequency protection does not currently exist in the Serbian power system, and it is necessary for the application of NC ER requirements.

### Generic, regional or national relation:

Generic and national.

### Nature of the use case:

System functional requirements description.

### Further keywords for classification:

Over-frequency protection, Emergency operation.

## 1.8 General remarks

Remarks:

## 2. Diagrams of use case

### 2.1 Diagrams of use case



Diagram name

Diagram image

SGAM Business Layer



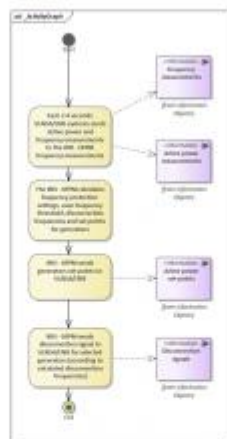
SGAM communication layer



SGAM component layer



functional layer



Information object mapping

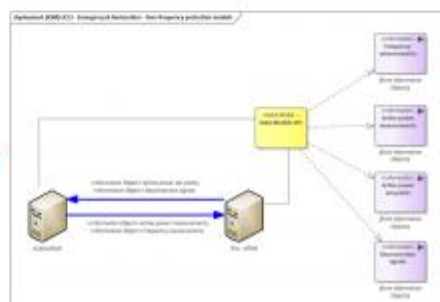




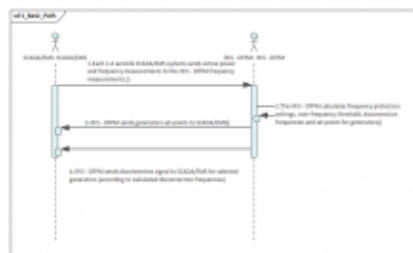
Diagram name

Diagram image

SGAM functional layer



sequence



### 3. Technical details

#### 3.1 Actors

Actor name	Actor type	Actor description
Over Frequency Protection Module	Control system	OFPM is a part of the control system designed to reduce active power production when an over-frequency threshold is reached.
SCADA	Control system	Supervisory control and data acquisition (SCADA) is a control system architecture comprising computers, networked data communications and graphical user interfaces for high-level supervision of machines and processes. It also covers sensors and other devices, such as programmable logic controllers, which interface with process plant or machinery.

#### 3.2 References

No.	References type	Reference	Status	Impact on use case	Originator/organisation	Link
1	Report Deliverable	D2.2 CROSSBOW Use cases, scenarios and KPIs identification 1.3	public		EMS	



No.	References type	Reference	Status	Impact on use case	Originator/organisation	Link
2	Regulations	Network Code on Emergency and Restoration (2017/2196)	in force	This regulation provides the legal foundation for establishing the OFP module as one of the potential solutions for implementing an automatic over-frequency protection scheme, in accordance with Article 16 of this regulation.	EU Commission	

## 4. Step by step analysis of use case

### 4.1 Over-frequency identification

No.

1

Scenario description

OFPM regularly receives SCADA measurements and calculates if OFPM should be activated and through which mechanism (Active power generation decrease or Generators disconnection) based on comparison of needed active power decrease and available downward reserve

Primary actor

OFPM

Triggering event

Regular repetition

Pre-condition

Frequency is monitored

Postcondition

Over-frequency is identified and OFPM is activated

### 4.1 Steps of Over-frequency identification



Step No.	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
1	Regular repetition	SCADA measurements download	Each 2-4 seconds SCADA systems sends to the OFPM frequency and generators active power measurements	Data download	SCADA	OFPM	1, 2	IRI_017, IRI_105, IRI_106
2	Over-frequency threshold is reached	Calculations of needed active power decrease and available downward reserve	OFPM calculates needed active power decrease and available downward reserve	Data processing	OFPM	OFPM	0	IRI_017, IRI_088, IRI_089, IRI_090, IRI_091, IRI_105, IRI_106, IRI_107, IRI_108
3	Calculations are completed	Triggering of active power generation decrease mechanism or generators disconnection mechanism	Based on comparison of needed active power decrease and available downward reserve OFPM triggers 1) active power generation decrease mechanism or 2) generators disconnection mechanism	Data processing	OFPM	OFPM	0	IRI_017, IRI_092, IRI_093, IRI_105, IRI_106, IRI_108

## 4.2 Active power generation decrease (generators of group A)

No.

2

Scenario description

Set-points are calculated and sent to the generating units of group A to decrease their active power output.

Primary actor

OFPM

Triggering event

OFPM triggered active power generation decrease

Pre-condition

Generating units of group A follow regular generation schedule

Postcondition

Generating units of group A decrease their active power output according to the set-point sent by the OFPM



## 4.2 Steps of Active power generation decrease (generators of group A)

Step No.	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
1	OFPM triggered active power generation decrease	Set-points calculation	OFPM calculates generators set-points	Data processing	OFPM	OFPM	0	IRI_017, IRI_094, IRI_095, IRI_096, IRI_097, IRI_098, IRI_099, IRI_105, IRI_106, IRI_108, IRI_109
2	Set-points are calculated	Set-points transfer	OFPM sends generators set-points to SCADA/AGC	Data transmission	OFPM	SCADA	3	IRI_017, IRI_100, IRI_105, IRI_106, IRI_108, IRI_109

## 4.3 Generators disconnection

No.

3

Scenario description

Disconnection frequencies are calculated for all generators of group B, and disconnection signals are sent to generators if measured frequency is higher than the disconnection frequency.

Primary actor

OFPM

Triggering event

OFPM triggered generators disconnection mechanism

Pre-condition

Generating units of group B follow regular generation schedule

Postcondition

Some generating units of group B are disconnected

## 4.3 Steps of Generators disconnection



Step No.	Event	Name of process/activity	Description of process/activity	Service	Information producer (actor)	Information receiver (actor)	Information exchanged (IDs)	Requirement, R-IDs
1	OFPM triggered generators disconnection mechanism	Frequency disconnection calculations	OFPM calculates generators disconnection frequency	Data processing	OFPM	OFPM	0	IRI_017, IRI_101, IRI_102, IRI_103, IRI_105, IRI_106, IRI_108, IRI_110
2	Disconnection frequency are calculated	Generators disconnection	OFPM sends disconnection signal for selected generators (according to calculated disconnection frequencies within scenario 1)	Data transmission	OFPM	SCADA	4	IRI_017, IRI_104, IRI_105, IRI_106, IRI_108, IRI_110

## 5 Information exchanged

### 5.1 Information exchanged

Requirement, R-IDs	Information exchanged, ID	Name of information	Description of Information Exchanged
IRI_111	1	Active power measurements	Active power measurements on generating units
IRI_111	2	Frequency measurements	Measured frequency in the power system
IRI_100	3	Active power set-points	Set-point for generators' active power controllers (controller leads generator's active power to the set-point value)
IRI_104	4	Disconnection signals	Signal which triggers selected circuit breaker opening.

## 6 Requirements

### 6.1 Functional requirements

Category ID

1

Category name for requirements

Functional requirements

Category description

Functional requirements define what a product must do, what its features and functions are.



Functional requirements of the system are captured by describing how the system should respond in each step of a scenario

Requirement R-ID	Requirement name	Requirement description
IRI_088	Frequency activation requirement	IRIS OFPM must be active if frequency exceeds 50.2 Hz
IRI_089	Active power decrease calculation requirement	IRIS OFPM must calculate total needed decrease of active power generation in case of over-frequency Pdec [MW] as follows (for LFSM-O droop of 5%): $P_{dec} = P_{total} \cdot (40 - f - 2008)$
IRI_090	Downward reserve calculation requirement	For each generator available for active power decrease, IRIS OFPM must calculate: $P_{dw} = P - P_{min}$ . In addition, the sum of Pdw for all generators shall be calculated - $SUM(P_{dw})$ .
IRI_091	Recalculation period setting requirement	IRIS OFPM must recalculate total active power decrease, available downward reserves and generators base (set) points in time interval set by OFPM operator.
IRI_092	Downward active power reserve threshold requirement	IRIS OFPM operator must be able to set available downward active power reserve threshold (Pthreshold) and frequency threshold (fthreshold).
IRI_093	Priority OFP mechanism requirement	IRIS OFPM will firstly activate reduction of active power on generators if $f > 50.2$ Hz and secondly disconnection of the generators if the following condition is met: $SUM(PH_{dw}) + SUM(PT_{dw}) + SUM(PW_{dw}) < P_{threshold}$ or $f > f_{threshold}$
IRI_094	Generation decrease priority requirement	IRIS OFPM will reduce generators active power according to the following priority: Hydro Power Plants, Thermal Power Plants, Wind Parks (according to the Serbian pilot site characteristics).
IRI_095	Downward capacity calculation per generation type requirement	Based on IRI_090 requirement, IRIS OFPM must calculate $SUM(PH_{dw})$ , $SUM(PT_{dw})$ and $SUM(PW_{dw})$ . In the event of an outage of a generator that is in this mechanism, $SUM(PH_{dw}) / SUM(PT_{dw}) / SUM(PW_{dw})$ is reduced by the Pdw of this generator
IRI_096	Base-point calculation requirement 1	If $P_{dec} + SUM(P_{var}) < SUM(PH_{dw})$ , for each hydro generator IRIS OFPM must calculate new base point Pb as follows: $P_b = P - [P_{dec} + SUM(P_{var})] \cdot P_{dw} / SUM(PH_{dw})$ . Thermal and wind generators get a base point equal to their active power when OFPM is activated.
IRI_097	Base-point calculation requirement 2	If $SUM(PH_{dw}) < P_{dec} + SUM(P_{var}) < SUM(PH_{dw}) + SUM(PT_{dw})$ , for each thermal generator IRIS OFPM must calculate new base point Pb as follows: $P_b = P - [P_{dec} + SUM(P_{var}) - SUM(PH_{dw})] \cdot P_{dw} / SUM(PT_{dw})$ . All hydro generators get Pb equal to their technical minimum.
IRI_098	Base-point calculation requirement 3	$SUM(PH_{dw}) + SUM(PT_{dw}) < P_{dec} + SUM(P_{var}) < SUM(PH_{dw}) + SUM(PT_{dw}) + SUM(PW_{dw})$ , for each wind generator IRIS OFPM must calculate new base point $P_b = P - [P_{dec} + SUM(PH_{dw}) - SUM(PT_{dw})] \cdot P_{dw} / SUM(PW_{dw})$
IRI_099	Base-point calculation requirement 4	If $SUM(PH_{dw}) + SUM(PT_{dw}) + SUM(PW_{dw}) < P_{dec} + SUM(P_{var})$ , IRIS OFPM must calculate for all generators new base point Pb equal to their technical minimum.
IRI_100	Base-point communication requirement	IRIS OFPM shall communicate generators base point signal through: 1) Thermal power plant and wind park gateway 2) TSO connection facility gateway and GRAS devices installed in hydro power plants
IRI_101	Disconnection criteria requirement	All generators in IRIS OFPM disconnection mechanism, will be sorted in array according to local security criteria and additional criteria set by generator owners according to the following priority: Hydro Power Plants, Thermal Power Plants, Wind Parks.
IRI_102	Disconnection frequency calculation requirement	IRIS OFPM must calculate disconnection frequency for all generators as follows: $f_{disci} [Hz] = (2008 + SUM(P_{var}) + 0,5 \cdot \pi + SUM(P_{1 \rightarrow i-1})) / 40$



Requirement R-ID	Requirement name	Requirement description
IRI_103	Disconnection frequency recalculation period requirement	IRIS OFPM must recalculate disconnection frequency for all generators in time interval set by OFPM operator.
IRI_104	Disconnection signal communication requirement	IRIS OFPM must communicate generators disconnection signal to circuit breaker of the generator's connection line in TSO connection substation
IRI_105	Observability requirement	IRIS OFPM must provide to operator observability of generators participating in active power generation decrease mechanism and generators disconnection mechanism.
IRI_106	OFF mechanism activation requirement	IRIS OFPM operator must be able to include/exclude generators for one or both mechanism (active power generation decrease mechanism / generators disconnection mechanism) before or during OFPM activation.
IRI_107	Sound alarm requirement	When over-frequency higher than 50.2 Hz is detected, IRIS OFPM must generate sound alarm that can be cancelled by operator.
IRI_108	Summary display requirement	When over-frequency is detected, OFPM must generate summary display presenting: 1) actual frequency 2) time elapsed from over-frequency detection 3) calculated total active power to be reduced 4) total reduced power after over-frequency detection
IRI_111	OFPM - SCADA communication requirement	IRIS OFPM and SCADA must communicate through IPC (inter-process communication).

## 6.2 non functional

Category ID

2

Category name for requirements  
non functional

Category description

Requirements that cannot be captured this way are non-functional requirements, such as business rules, the user interface and other requirements that are not suitable to be described within a scenario.

Requirement R-ID	Requirement name	Requirement description
IRI_109	Generation decrease display requirement	When OFPM active power generation decrease mechanism is activated, OFPM must generate a display presenting all data given in comments section.
IRI_110	Generation disconnection display requirement	If OFPM generators disconnection mechanism is active, OFPM must generate a display presenting: Generators' active power at the moment of over-frequency detection, identification if generator is disconnected by OFPM / Generators disconnection mechanism



## 7 Common terms and definitions

### 7.1 Common terms and definitions

Term Definition

## 8 Custom information

### 8.1 Refer to section

Refers to section Value Key

#### Publisher Organization

Organization name	Organization	Acronym	Country
EMS Service	EMSS		Serbia

Technologies for use cases:

High level Use Case:

HLUC 7: Enhance System Supervision and Control including Cyber Security

Related Project:

R2D2

Cordis Link:

<https://cordis.europa.eu/project/id/101075714/results>

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