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Use of open-source P2P energy sharing platforms for energy Democratization

Deliverable D 8.3 Data Management Plan

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Disclaimer

This document has been produced in the context of the U2Demo¹ project. Views and opinions expressed in this document are however those of the authors only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

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¹ <https://u2demo.eu/>

Executive Summary

The U2Demo Horizon Europe project is deeply committed to the principles outlined in the European Commission's Open Research Data Management guidelines, to enhance the accessibility and reusability of research data generated within European Commission-funded projects. In line with these principles, U2Demo consortium is dedicated to develop tools and platforms that are open-source and align with the principles of openness, technology neutrality, interoperability, replicability, reliability, security, trustworthiness and scalability, to make them reusable by the broader research community and stakeholders.

In this context, U2Demo will follow a comprehensive Data Management Strategy detailed in this deliverable – the Data Management Plan (DMP), D8.3. This initial plan – compliant with the FAIR (Findability, Accessibility, Interoperability, and Reusability) principles and the European Commission's guidelines on Open Science, has been prepared by Work Package (WP) 8 leader – INESC ID. This plan will be updated at M24 (D8.4) or whenever changes are applied.

This document serves as a key resource for outlining the types of data outputs generated within the project, specifying data formats, sources, storage (short- and long-term duration) mechanisms and documentation processes. The DMP will provide guidelines on how data will be managed, storage and preserved throughout the project lifecycle. This plan aligns with the European Commission's priorities on Open Science, including open access, data transparency, reproducibility, accessibility, security and reliability of the research outputs. Additionally, it ensures compliance with GDPR rules on data access, data sovereignty and data protection, safeguarding ethical and legal considerations.

Finally, to facilitate effective data management and monitoring, the deliverable will be complemented by a Data Definition Catalogue (DDC), a data management monitoring Excel file. The DDC will be continuously update by the Project Manager, with support from the WP and Task leaders. The DMP main goal is to provide clear guidance to all project partners and to foster responsible data management practices, to maximize the impact of the research outputs.

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Acronyms

| | |
|------|---|
| AI | Artificial Intelligence |
| CC | Creative Commons |
| D | Deliverable |
| DDC | Data Definition Catalogue |
| DMP | Data Management Plan |
| DOI | Digital Object Identifier |
| ECs | Energy Communities |
| FAIR | Findability, Accessibility, Interoperability, and Reusability |
| GDPR | General Data Protection Regulation |
| M | Month |
| PM | Project Manager |
| PV | Photovoltaic |
| WP | Work Package |

1 Introduction

1.1 Scope and Objectives

The goal of this first Data Management Plan (DMP), U2Demo Deliverable D8.3, is to give an overview on the data elements that are expected to be generated during this project. It describes how the elements are stored during and after the project, and which part of the data will be publicly available. The main aspects discussed about the published datasets are the measures undertaken by the U2Demo project partners to align with the FAIR (Findability, Accessibility, Interoperability, and Reusability) principles. These principles facilitate the reuse of the research outcomes of this project and are therefore important for the impact the results of this project can have.

A preliminary approach to the Research Data Management was developed during the project proposal phase (Figure 1). Now, six months after the beginning of the project, this deliverable D8.3 presents the first version of the DMP, which will be updated throughout the project (D8.4, due at M24, Figure 1). At this stage, the list of data elements is not yet complete but reflects the data elements expected to be generated within the project.

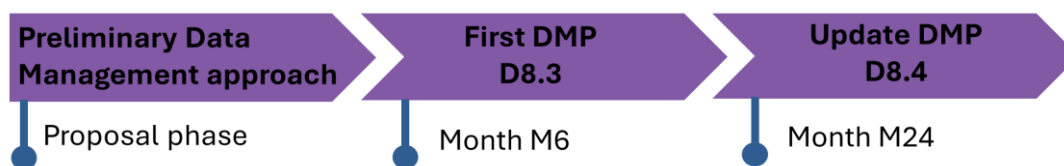


Figure 1 – U2Demo Data Management Plan timeline

The document follows the Horizon Europe DMP template [1] and the FAIR principles [2].

1.2 Structure

This document is structured in different sections: In Section 2, the different data elements that are expected to be generated during the U2Demo project are presented. It is shown where the data will be stored during the project and after its end, and the data utility inside and outside the project. As the data generated in the demo sites is crucial for this project, these data elements will be discussed in more detail. Section 3 is dedicated to the measures that the U2Demo project is taking to make the data sharing aligned with the FAIR principles. Following these principles is important to facilitate the data reuse and make the project research outcomes as widely accessible as possible. Section 4 provides workflows to ensure the quality of the data elements used in the U2Demo project and to facilitate the coordination between the project partners and introduce the data definition catalogue (DDC). Section 5 then discusses the resources allocated to making the data FAIR. Section 6 presents how data security is guaranteed. The ethical principles guiding the work in the U2Demo project, including measures to secure the privacy of the participants and the use of Artificial Intelligence (AI) tools, are described in Section 7. Finally, a conclusion is being drawn in Section 8.

1.3 Relationship with other deliverables

The U2Demo DMP, D8.3, is part of WP8 – Project Management. This deliverable is closely linked to all deliverables of WP8: Project Management Plan (D8.1) [3] and respective update (D8.2), and update of the DMP at M24 (D8.4). Moreover, this deliverable is closely related to

all activities and deliverables concerning data collection, namely the prototyping and demonstration activities (WP5), but also the activities concerning the preparation, design and conceptualization phase (WP1 & WP2), and development, testing and integration of tools (WP3 & WP4). The link between the U2Demo WPs is presented in Figure 2.

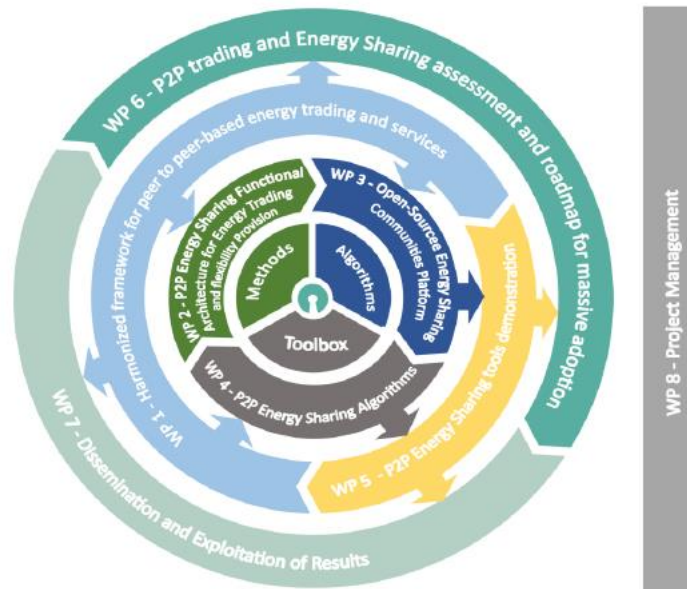


Figure 2 – Work package structure from U2Demo (from U2Demo Grant Agreement and Deliverable D8.1 [3])

2 U2Demo Data Summary

In this chapter, the data elements used in the U2Demo project are presented. It will be shown which elements are expected to be generated and used, where the data elements are stored, how they can be accessed by members of the project, and which part of the data can be made publicly available after the end of the project.

2.1 Types of data/research outputs

During the U2Demo project, several types of data are used and generated that can be grouped in two categories: *i)* Data elements and *ii)* Deliverables. The project internal collection and curation procedures for the different data elements are defined in Section 4.

***i)* Data elements, include:**

Mailing lists: Used internally to schedule meetings, discuss activities and outputs. The mailing lists are available in the project SharePoint and only accessible to the partners of the project. The mailing lists are of the format .xlsx, to be accessed through MS Excel.

Use cases repository: In WP1: Task 1.4, a Use Case repository will be developed including the definition of Business and System Use Cases related to P2P trading, Energy Sharing and the prosumers activities that will be demonstrated inside the U2Demo project. The development of Use Cases will result from discussions that will be conducted in dedicated workshops and meetings with participant partners. The Use Case repository will be developed using the commercial software Enterprise Architect with Modсарus plugin, an open licence tool developed by EDF R&D² for Sparx Enterprise Architecture, that allows to generate and transform the Use Cases into UML models. The repository will be an .eapx file with a size of approximately 200kB. The Use Case repository will be publicly available on U2Demo [GitHub](#) and [Zenodo](#) public communities. Afterwards, this repository will be merged with [EIRIE platform](#) under the coordination of BRIDGE initiative.

Software: Software elements which are developed during the U2Demo project will be stored, together with technical documentation files, in a source code repository, [U2Demo GitHub community](#), which supports version control and other software development tools, such as file hosting, bug tracking and issue tracking. The software code will be stored in repository under licences that establish a fair balance between Intellectual Property Rights (IPR) and business interests, while respecting the openness, transparency and reusability principles (more about the software licensing schemes on Section 3.4). Software planned to be produced in the project includes open algorithms for forecasting, decision support, data analytics, P2P matching and energy sharing and open-source platform based on blockchain technologies. An assessment of the existing tools is being conducted at an early stage of the project (M6) to identify tools which can be reused.

Datasets of the pilots: From each pilot, datasets of the energy communities will be collected. These datasets are numerical data (.csv or .xlsx) or text (.docx or .txt). The expected sizes of these datasets are variable and can change depending on the community, but is expectable to be around 1GB/year, for instance. Table 1 provides the current available information on

² <https://sparxsystems.com/products/3rdparty/frameworks.html>

expected datasets generated in the pilots, together with an indication if the data can be made publicly available after the end of the project. The datasets will be provided by the respective partner managing the energy community.

Table 1 – Datasets from the Pilot sites

| U2Demo Pilots | Description of expected datasets | Dissemination level |
|---------------|---|--|
| Netherlands | <p>Datasets collected from the energy community in the Netherlands consists of a measured part and a forecasting part:</p> <p><i>Measured part:</i> PV production data, consumption data of each entity of the community, data of the charging stations for the electric vehicles, battery data and knowledge of the general properties of the electric vehicles. Furthermore, the grid energy price is being stored.</p> <p><i>Forecasting part:</i> forecasts of the consumption and production profiles, which are generated based on historical data, and weather forecast data</p> | Discussions are being held with Demo leaders and stakeholders to identify which type of data can be publicly available |
| Belgium | <p>Data collected from the demo site in Belgium consists of PV production data and the consumption data of each household in the energy community (power, voltage and current information, which are accessible through the Fusion Solar platform of Huawei, the manufacturer of the solar panels).</p> <p>The consumption of each household is measured through smart meters in each house which can be accessed through the platform of the DSO.</p> | |
| Portugal | <p>Data regarding the energy consumption, the energy production and the users energy profile will be generated. This data is collected from partners and then stored in the SharePoint of the U2Demo project. All files are of the format .xlsx and can be accessed through Microsoft Excel.</p> | |
| Italy | <p>Data of the energy consumption and production, the users energy profile data and weather data are available. The data set will be collected from partners and stored in the SharePoint of the U2Demo project. All data files are of the format .xlsx, accessible through Excel.</p> | |

The datasets generated in the pilots will be discussed in more detailed in the DMP update, D8.4, at M24, including specific information for each dataset (name, description, security and privacy considerations) and information for each datatype in the dataset (e.g. datatype name, description, purpose, format, size, source, access, recipients, metadata).

Similar to Software, Datasets can be published in repositories under different licences (more about the licensing schemes on Section 3.4).

Questionnaires:

Questionnaires responses from key stakeholders and participants from all pilots in the

context of T1.2 – Activity consumer motivation mapping and social requirements and WP5 – P2P Energy Sharing tools demonstration.

Publications: During the project it is expected that outcomes are published. Possible forms include but are not limited to: books, book chapters, conference papers, journal articles, patents, preprints, reports, thesis, technical notes, working papers. Research papers are those submitted to conferences and journals, peer-reviewed scientific papers are those that underwent peer-review process by peers and pre-prints are research papers that are not yet submitted or accepted by journals or conferences but available in [arXiv](#) or [Zenodo](#). Possible scientific journals where work will be submitted are (non-exhaustive list), with preference to open access journals: such as [Renewable Energy Journal](#), [Journal of Modern Power, Systems and Clean Energy](#), [IEEE journals - IEEE Transaction on Green Communications and Networking](#), [IEEE Transactions on Smart Grids](#), [IEEE Transactions on Sustainable Energy](#), [IEEE Transactions on Power Systems](#), [IET Journals](#), [Frontiers in Sustainable Cities, Sustainable Cities and Society](#), [Distributed Ledger Technologies: Research and Practice](#), [Electric Power Systems Research](#) journals and [Open Research Europe](#). Scientific articles will be open access and accessible from the project website, together with datasets and open-source tools.

Others: other elements such as posters (pdf files) from the work developed, videos (.avi and .mp4 files) and images (.jpg and .tiff files) promoting the project and presentations may be produced and shared in the project website.

ii) Deliverables

During the project, several deliverables, which are reports corresponding to each task of the project, will be generated. Each report will undergo an internal review by two reviewers before being submitted to the European Commission portal by the PM, for formal approval by the European Commission Project Officer. Once approved, and when their dissemination level is public, these deliverables will then be made publicly available on the [U2Demo](#) and [CORDIS](#) websites. Additionally, for each deliverable, the authors will prepare a short version (about 3 pages) which will be published in [U2Demo Zenodo](#) after the full document receives approval by European Commission. The project will generate twenty-six (26) deliverables in report (R) format and four (4) in OTHER format. Important to note, even deliverables classified as “OTHER” should be accompanied by a short report describing the tool to be submitted in the European Commission portal. Table 2 presents the deliverables to be published throughout the project.

Table 2 – U2Demo list of deliverables

| Deliverable | Deliverable Name | WP | Lead | Type | Dissemination level | Due Date |
|-------------|---|----|------------|-------|---------------------|----------|
| D1.1 | Active consumers and ECs initiatives mapping | 1 | EUI | R | PU | M12 |
| D1.2 | Active consumers' needs and social parameters | 1 | TNO | R | PU | M12 |
| D1.3 | Open-source tools assessment | 1 | EIFER | R | PU | M09 |
| D1.4 | Use case repository | 1 | INESC ID | OTHER | PU | M12 |
| D2.1 | P2P Market and Energy Sharing Designs | 2 | TNO | R | PU | M08 |
| D2.2 | Decision support methods for active consumers and ECs | 2 | R&D NESTER | R | PU | M14 |

| | | | | | | |
|------|---|---|----------------|-------|-----|-----|
| D2.3 | P2P trading matching and Energy Sharing models | 2 | KU Leuven | R | PU | M16 |
| D2.4 | P2P trading matching and Energy Sharing models | 2 | VITO | R | PU | M18 |
| D3.1 | U2Demo architecture definition and guidelines | 3 | Energy Web AG | R | PU | M08 |
| D3.2 | U2Demo standardization, cybersecurity and data privacy | 3 | R&D NESTER | R | PU | M10 |
| D3.3 | U2Demo platform based on blockchain technologies | 3 | EXAION | OTHER | PU | M36 |
| D4.1 | P2P and Energy Sharing Design considering platform requirements | 4 | ARTELYS | R | PU | M10 |
| D4.2 | Decision support tools for active consumers and ECs | 4 | EIFER | OTHER | PU | M20 |
| D4.3 | P2P matching and energy sharing algorithms | 4 | ARTELYS | OTHER | PU | M36 |
| D5.1 | Detailed specification of the pilots | 5 | EDP NEW | R | PU | M18 |
| D5.2 | Pilots' installation & commissioning | 5 | KLIMAAN | R | SEN | M27 |
| D5.3 | Test of tools in external active consumers / ECs | 5 | INESC ID | R | PU | M36 |
| D5.4 | Lessons learned in the Pilots | 5 | EDP NEW | R | PU | M38 |
| D6.1 | Tools assessment report | 6 | R&D Nester | R | PU | M39 |
| D6.2 | Strategy for standardization and harmonization | 6 | EIFER | R | PU | M12 |
| D6.3 | Roadmap and guidelines to promote the user engagement in P2P energy sharing and ECs | 6 | TNO | R | PU | M41 |
| D6.4 | Policy recommendations and strategic positioning framework | 6 | EUI | R | PU | M42 |
| D7.1 | Dissemination and Communication Plan | 7 | RESCOOP VLAAND | R | PU | M06 |
| D7.2 | Dissemination and Communication Plan - Updated | 7 | RESCOOP VLAAND | R | PU | M24 |
| D7.3 | Scalability, replicability and business models for ECs | 7 | EIFER | R | PU | M41 |
| D7.4 | Open-Source Tools maintenance and evolution strategies | 7 | Energy Web AG | R | PU | M42 |
| D8.1 | Project Management Plan | 8 | INESC ID | R | PU | M02 |
| D8.2 | Project Management Plan - Updated | 8 | INESC ID | R | PU | M18 |
| D8.3 | Data Management Plan | 8 | INESC ID | R | PU | M06 |
| D8.4 | Data Management Plan- Updated | 8 | INESC ID | R | PU | M24 |

2.2 Data storage

Throughout the project duration, a private SharePoint repository will be used to store the data and make it accessible to the project partners. This SharePoint can only be accessed by authorized accounts, the partners of the U2Demo project. Newcomers to the project will have to request an invite to the U2Demo Coordinator team.

Furthermore, data will be stored in institutional clouds of partners of the project.

Publicly available data will be published through the following platforms:

- Website of the project: (<https://u2demo.eu/>)
- European Commission Site CORDIS (<https://cordis.europa.eu/project/id/101160684>)
- GitHub repository (<https://github.com/U2DemoProject>)
- Zenodo (<https://zenodo.org/communities/u2demo/>)
- REScoop toolbox repository (<https://www.rescoop.eu/toolbox>)
- EIRIE platform (<https://ses.jrc.ec.europa.eu/eirie/>)

In all cases, several safety measures are in place, which will be discussed further in Chapter 6.

2.3 Purpose of the data generation and relation to project scope

The mailing lists are used for the internal communication.

The Use Case repository developed in Task 1.4 is an integral basis for the WP2, WP4 and WP5.

The data gathered from the demo sites is key to demonstrate the performance of the methodologies and tools developed inside the U2Demo project. The different locations of the Demo sites allow to test the developed tools under different operating conditions and in different environments.

Before applying the tools, real data gathered from the demo sites will be used to test the tools in the development phase.

Forecasting algorithms are used to support the data set generated in the demo sites.

The deliverables and publications generated during this project document the research outcomes in the tasks and help in identifying future research questions. Additionally, they help in drawing attention to the research and the topic.

2.4 Data Source

The data for the U2Demo project is gathered from different sources. Whenever possible, the consortium aims at re-using existing data and using publicly available datasets.

- Data and software re-used from other sources:
As the partners of the consortium are involved in several other research projects and innovation actions, namely: [BRIGHT](#), [Tandems](#), [POCITYF](#), [ALAMO](#), FlexUnity, [EV4EU](#), [OneNet](#), [InterConnect](#), [TwinEU](#). Results from these projects will feed into the U2Demo project and it may be possible to re-use data/software from these projects.
- Publicly available data sets:
It is expected to use publicly available data elements, such as, weather and energy price data, among others. In Task 1.3, a review on existing tools is conducted to assess if existing tools can be re-used inside the U2Demo project.
- Data collected inside the project:
The datasets from the demo sites will be collected by the partners who manage the demo sites. These data elements will be generated in WP5.
Data elements about the consortium for the internal communication will be collected manually by the consortium partners.

2.5 Data utility outside the project

The data generated in the U2Demo project can be of interest to several target groups that have been identified in WP7, in the Deliverable: Communication and Dissemination Plan (D7.1) [4].

In brief, the data elements of the U2Demo project may be used by:

- **General Public & Civil Society:** consumers, prosumers, customers, Energy Cooperatives, media may be interested in the influence of the research outcomes of the U2Demo project on the energy management of ECs.
- **Research and academia:** Universities, researchers, R&D organizations and others may use the data elements for research and academic purposes.
- **Energy Industry:** energy producers, system operators, ECs, retailers and aggregators, and others may be interested in the Use Case repository and in the code and the platforms developed during the project. These data elements are supported by the deliverables and the publications, which help document the findings of this project and are therefore an integral part in making the research outcomes more understandable.
- **Policy makers, Public authorities at European, National, and Regional levels,** including governments, governmental agencies, parliaments, EU commission may use the research conducted during the U2Demo project in order to identify structures inside the communities which may increase the energy sharing between the participants. The results of this project can directly influence the development of new laws and regulations for energy sharing.
- **Standardization Bodies** such as IEC, IEEE, ISO, UNE, CEN, who can use the project results to develop new standards and regulations to ensure interoperability, efficiency and regulatory compliance in Energy Communities.
- **Technology Providers** such as PV manufacturers, energy management platform providers, among others, who can benefit from the results of the project to develop new products and innovations and identify new business models.

3 FAIR data

The FAIR principles are guidelines which aim at improving the Findability, Accessibility, Interoperability and Reuse of published data ³.

The U2Demo consortium adopts an Open Science strategy, which includes providing open access, open data, collaborative participation, transparency, reproducibility, accessibility, security and reliability of the research outputs. It is aimed at maximizing access and reuse of data obtained through the U2Demo project. The U2Demo consortium will follow the FAIR data principles to make open data Findable, including provisions for metadata (Section 3.1), Accessible (Section 3.2), Interoperable (Section 3.3) and Re-usable (Section 3.4), as early as possible in the research process. These principles apply not only for datasets but also for software developed in the project.

3.1 Making data findable, including provisions for metadata

The data published from the U2Demo project can be found through:

- Website of the project: (<https://u2demo.eu/>) – customized WordPress website.
- EC Site CORDIS (<https://cordis.europa.eu/project/id/101160684>) - The Community Research and Development Information Service (CORDIS) is the European Commission's primary source of results from the projects funded by the EU's framework programmes for research and innovation, from FP1 to Horizon Europe.
- GitHub repository (<https://github.com/U2DemoProject>) - the recommended code repository to manage the software that will be shared internally with the project's participants and also to share the software publicly.
- Zenodo (<https://zenodo.org/communities/u2demo/>) - This is the recommended system to manage and share the final versions of public data elements such as datasets, videos, images, and presentations, publications and software repositories.
- REScoop toolbox repository (<https://www.rescoop.eu/toolbox>) - repository of tools, reports and papers to support energy communities in Europe.
- EIRIE platform (<https://ses.jrc.ec.europa.eu/eirie/>) – is a multi-functional platform that contains information on potential funding and consortium building, projects data collection, references to standards and regulations, engaging all actors active in the field of energy research and innovation.
- [Linux Energy Foundation](#) platform – the largest open-source foundation. The integration in this repository should be curated by platform owners.
- [Energy Web Foundation](#) platform

The private data elements will be stored in the U2Demo project repository hosted by Microsoft Teams/SharePoint. The general structure of the U2Demo repository contains WP folders (one folder for each WP, in total 8 WPs folders) and one additional Dataset folder, where all datasets of the project and respective metadata will be stored. Each WP folder contains a folder for each task, containing all the material generated and developed within the task, and a folder for the WP meetings, containing all the relevant material (presentations, MoMs, attendance lists).

To make the data findable for humans and machines, the U2Demo project will adopt the following measures:

³ <https://www.go-fair.org/fair-principles/>

- Data uploaded to the U2Demo community in [Zenodo](#) will be linked to the European Commission Funded Research ([OpenAIRE](#)) community
- All public data will be associated with a persistent identifier, such as for example digital object identifiers (DOI) for scientific publications or handles for internet resources
- Metadata: Data uploaded in Zenodo and code uploaded to GitHub will be enriched with metadata to facilitate discovery. This metadata will include for example the Grant Number, Project Acronym, WP number, Task number, Task leader, file name, version, date, file type, DOI, description, access and licensing info, associated publications, keywords. Datasets stored internally in private SharePoint will also be associated with metadata files.
- All files will have a consistent name:
<ProjectAcronym>_<FileType>_WP<WPId>_T<TaskId>_LastUpdateDate>_V.<version>
e.g., U2Demo_D1.1_WP1_T1.1_xx.xx.xx_v0.1

<FileType>: = “DB” (Database), “D” (Deliverable), “SP” (Scientific publication), “R” (Report), “I” (Images), “ MoM “ (Minutes of Meeting), “ AL ” (Attendance List), “ Ag ” (Agenda),

<WPId>:= « 1 » to « 8 »

For multiple files, to add numerical order at the beginning:
e.g., 01_U2Demo_SC_meeting_ppt_WP8_05_12_24_v0.1
02_U2Demo_SC_meeting_ppt_WP8_05_12_24_v0.1

3.2 Making data accessible

Making data accessible relates to facilitating the access to the data by ensuring that no additional specific software or payments are needed to access the data.

For this scope, the U2Demo project will publish data elements in the public repositories, mentioned in Section 3.1. Additionally, the consortium will prefer publishing data in file types which can be accessed using standard software such as MS Office and LaTeX⁴. Furthermore, U2Demo will preferentially opt for the open peer-review process and for sharing the scientific publications even before the peer-review process, through pre-prints (e.g. arXiv.org), following an “early and open sharing” approach. The U2Demo project will also provide immediate open access to published scientific articles through the project website.

Datasets will be shared through Zenodo. The access to Zenodo is in general open for all, and more information can be found in the Terms of Use (<https://about.zenodo.org/terms/>) and the general conditions (<https://about.zenodo.org/>).

Code will be shared through GitHub, either by private mode, for sharing and/or developing code between project partners, or public mode, to share code outside the project. More information on GitHub accessibility can be found in the Terms of Use: <https://docs.github.com/en/site-policy/github-terms/github-terms-of-service>.

For semi-private datasets, snapshots of these data will be published via Zenodo or similar sources, allowing other researchers who wish to query and explore more data, to contact the data owner and request additional data for their research under a defined licence.

⁴ <https://www.latex-project.org/lppl/>

3.3 Making data interoperable

Whenever possible, open data formats and standardized metadata will be used. To facilitate interoperability, partners will be suggested to use CSV and JSON formats data, when possible. Regarding software, the design process of the open-source platform developed in the U2Demo project will include measures to increase interoperability and usability of the platform. The platform will include APIs allowing the interaction with data spaces, mainly with Simpl Middleware and Gaia-X. The applications and software tools developed within the U2Demo project will be designed in a user-friendly, efficient and feature-rich way, through clear navigation features, user-friendly menus and interactive elements. Furthermore, options for personalization and preferences will be available. Further information on how data elements will be interoperable will be identified in subsequent versions of the DMP (D8.4).

3.4 Making data re-usable

All public data elements will be published in public repositories of the project and also advertised on social media of the project, to increase the visibility of the research outputs.

To make the data and the research outputs re-usable, the open datasets, metadata and publications will have clear usage licences to inform type of reuse, allowing that any interested 3rd party re-use the data under specific terms of conditions. The Creative Commons (CC) licences are the most commonly and widely used licences for these data elements. Important to note that those licences are irrevocable, which means that when one receives material under that CC licence, will have the right to use it under the licence terms, even if the licensor stops distributing the material under the CC licence terms.

In U2Demo project, the expected types of licences to be used under the CC scheme, following the Horizon Europe policies⁵, are identified in Table 3. For the open-source software to be developed under The U2Demo project, licences to be used can be based on permissive (e.g., Berkeley Software Distribution (BSD), Massachusetts Institute of Technology (MIT), Apache) or copyleft (e.g., GNU General Public License (GPL), GNU Lesser General Public License (LGPL), Mozilla) models. Software licences allow third parties to use software for free with their own data, setting up restrictions about what end-users can and cannot do, depending on the different type of licences. Table 3 presents options for software licensing. Besides GPL v3.0, commonly used by U2Demo partners in their solutions, resourceful links are provided to help partners to choose the most appropriate licence for the U2Demo open software solutions. The identification of the U2Demo software licences will be provided in the update DMP version, at M24 (D8.4).

⁵https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/aga_en.pdf

Table 3 – Different types of Licences

| Licence | Permissions and attributions | Data elements |
|--|---|--|
| Attribution CC BY (or equivalent) – now the CC BY 4.0 | Allows re-users to share and adapt, even commercially, if appropriate credit is given, providing the link to the licence and indicating if changes were made ⁶ | Scientific peer-reviewed publications, book chapters and long text formats |
| Attribution NonCommercial (CC BY-NC, or equivalent), now the CC BY-NC 4.0 | Allows re-users to share and adapt, but not use for commercial purposes, if appropriate credit is given, providing a link to the licence and indicating if changes were made ⁷ | Long text formats |
| Attribution NoDerivatives (CC BY-ND, or equivalent), now CC BY-ND 4.0 | Allow re-users to share – copy and redistribute the material in any medium or format for any purpose, even commercially, as long as it is given appropriate credit, provide a link to the licence and indicate if changes were made. If it is remix, transform or build upon, the modified material cannot be distributed ⁸ . | Long text formats |
| Attribution NonCommercial-NoDerivatives (CC BY-NC-ND, or equivalent), now the CC BY-NC-ND4.0 | Allow reusers to share – copy and redistribute the material in any medium or format for any purpose, but not be used for commercial purpose, as long as it is given appropriate credit, provide a link to the licence and indicate if changes were made. If it is remix, transform or build upon, the modified material can not be distributed ⁹ . | Long text formats |
| Attribution CC 0 or equivalent, now CCO 1.0 | Allow reusers to copy, distribute, and perform the work, even for commercial purposes, all without asking permission ¹⁰ . | Metadata |
| Attribution GPL – GPL 3.0 | Copyleft licence that required derivative works to be licensed under GLP 3.0, ensuring source code availability, ensuring retaining copyright notices although not explicitly requiring attribution – type of licence commonly used by some partners in their solutions | Software |
| Licences – Open Source Initiative | List of open-source licences, including GPL, MIT, Apache, BSD, MPL, and AGPL, among others, ensuring compliance with open-source principles like free distribution and access to source code. | Software |
| Find and compare software licences Interoperable Europe Portal | List of licences such as the European Union Public Licence (EUPL), AFL, GPL, MIT, Apache, BSL, BSD, covering both permissive and copyleft open-source models. | software |

⁶ <https://creativecommons.org/licenses/by/4.0/>

⁷ <https://creativecommons.org/licenses/by-nc/4.0/>

⁸ <https://creativecommons.org/licenses/by-nd/4.0/>

⁹ <https://creativecommons.org/licenses/by-nc-nd/4.0/>

¹⁰ <https://creativecommons.org/publicdomain/zero/1.0/>

4 Workflow inside the project

To ensure the quality of the data elements used in the U2Demo project and to facilitate the coordination between the project partners, workflows for the curation of the data elements are created. In the following, they are shown for the types of data discussed in Section 2.1. The workflows will comply with the guidelines provided in Section 3 to ensure that the data complies with the FAIR principles. Thus, to help identifying and monitoring if data elements generated within the project are FAIR, we will periodically (every 6 months), request partners to fill in the template table in Appendix 1.

Mailing lists:

Table 4 – U2Demo Mailing lists Workflow

| U2Demo Mailing lists Workflow | |
|-------------------------------|---|
| 1 | When a member joins the consortium, he/she should enquire the Coordination Team to give him/her access" to the project repository and U2Demo consortium mailing list |
| 2 | Once access is granted, the member identifies, in the Contact list Excel file, which WPs he/she will participate |
| 3 | The Project Manager, PM, will then add the member email contact to the respective WP mailing lists. |
| 4 | Partners are requested to leave changes in the Contact list Excel file, in bold, and inform the PM to update the mailing list, otherwise it will be updated on a monthly bases. |

Software:

Table 5 – U2Demo Software Workflow

| U2Demo software Workflow | |
|--------------------------|--|
| 1 | Partners will request access to the code repository |
| 2 | Partners will produce a software tool or application, define the software licence that would be most suitable and stored it in code repository. |
| 3 | Partners will also produce technical documentation to accompanied the software and add to the code repository |
| 4 | Task leader will inform the PM who will then register the element in the Data Definition Catalogue and if Public, will request the Communication Officer to add it to the U2Demo website and advertise on social media/website |

Data sets from the Demo sites:

Table 6 – U2Demo Datasets Workflow

| U2Demo Datasets Workflow | |
|--------------------------|---|
| 1 | Partners will produce datasets with metadata information. Those datasets will be stored in private repository (SharePoint). |
| 2 | Partners will decide on the licence that will be most suitable and add that information to metadata files |

| | |
|---|---|
| 3 | Task leader and Work package leaders will check GDPR compliance and if needed, ask and manage users consents. This will be performed with support from the PM, if necessary. |
| 4 | Task leader or Work package leader will submit the dataset in the public repository with additional metadata information, stating the access right and licence schema. |
| 5 | Task leader and/or Work Package leader will inform the PM who will then register the element in the Data Definition Catalogue and if Public, will request the Communication Officer to add it to the U2Demo website and advertise on social media/website |

Deliverables:

The procedure workflow for development, internal revision and submission of deliverables has been outlined in Deliverable D8.1 [3]. A brief description is given in Table 7.

Table 7 – U2Demo Deliverable workflow

| U2Demo Deliverables Workflow | |
|------------------------------|---|
| 1 | The deliverable leader drafts an initial Table of Contents at least 3 months before the deadline. This ToC shall be discussed during the Kickoff meeting of the task. |
| 2 | The progress is updated during regular meetings (WP meetings and task meetings, if applicable). In case of any delays or issues arising, the WP leader and the coordination team are to be informed by the task leader. |
| 3 | If deviations apply (either technical or temporal), the coordination team informs the Project Officer and requests the change. |
| 4 | A final draft must be completed ideally 1 month before the deadline, with all sections included. This draft shall be submitted for internal review via email, cc'ing the WP leader and the coordination team. |
| 5 | The deliverable reviewers have about 10 working days to complete their review. |
| 6 | All suggestions/changes/ feedback shall be incorporated in the final version of the deliverable by the task leader. The final version is then sent to the Coordination team. |
| 7 | The Coordination revises the document and if necessary, may request additional quality improvements. |
| 8 | The coordination submits the deliverable in the Sygma portal, writing a paragraph about technical and temporal deviations in the submission page, if applicable |

A Data Definition Catalogue (DDC) has been developed and now being implemented in the U2Demo project to facilitate effective data management and monitoring. This is an Excel file that will be continuously update by the U2Demo Project manager, with support from the WP and Task leaders and contains information on: partner institutions and respective members, scope of work packages, deliverables (name, deadlines, reviewers, dissemination levels, type of deliverable), list of scientific articles being published under the U2Demo project (name, authors, journal, DOI, year, repository, licence), list of the communication news of the U2Demo project (news title, date, media name, support, country, link), repositories, list of U2Demo events and future participation in events. The DDC is available under WP 8- Management.

5 Allocation of resources

5.1 Costs for making the data and research outputs FAIR

As mentioned before, the [U2Demo](#) website will serve as a public repository of the project. The costs associated with the website (development and maintenance) have been already considered in the budget, already in proposal phase. Other public repositories mentioned above are free of charge. For example, Zenodo, an open-source tool, will allow for long term preservation of the project data elements. In other hand, our private repository (SharePoint) is also under our institutional framework, being free of charge and allowing long term preservation of the data elements. Data elements will also be stored in institutional repositories of the consortium

For scientific publications, the consortium will opt by open-source scientific journals, with costs related to these expenses already been foreseen in the project budget, already at proposal phase. Furthermore, we will encourage the consortium to opt for the free of charge [Open Research Europe](#) platform.

5.2 Person responsible for the data management in the project

Each U2Demo partner task/WP leader is responsible for data management and quality assurance of data produced in each task, overviewed by the U2Demo Project Manager.

6 Data security

All public data produced in the U2Demo project will be stored in trusted repositories according to the Horizon Europe programme. The data will be protected to ensure that no data is lost or accessed without authorization.

6.1 Measures for data security

As show in Chapter 2.2, the data elements are stored on the SharePoint, institutional Clouds, GitHub, the U2Demo website, ZENODO, CORDIS, the REScoop toolbox repository and the EIRIE platform.

The security of data stored in institutional clouds or personal computers is the responsibility of each partner. Some advised measures for data security are:

- Do regular backups, preferably and use different media for it
- Keep the antimalware up-to-date and activate the firewall
- Keep the access to the data user specific
- Cloud-based storage systems maybe useful for backups

The above mentioned repositories have several safety measures in place in order to guarantee data security. In particular, SharePoint and Zenodo provide data security through:

- SharePoint: The project SharePoint is used to share the data between the partners of the project. The SharePoint can only be accessed by authorized users, which are the partners of the U2Demo project. Information on the security of the data in the SharePoint can be found through: <https://learn.microsoft.com/en-gb/sharepoint/safeguarding-your-data>. Newcomers to the project will have to request access to the SharePoint from the U2Demo Coordinator Team.
- Zenodo: The data protection measures of Zenodo can be found at: <https://about.zenodo.org/infrastructure/#security>. It shall be noted that data can be stored with the attribute “closed access”. However, this is not suitable for storing sensitive data as the files are stored unencrypted and may, in specific conditions, be viewed by Zenodo personnel operational staff.

6.1.1 Data security measures in the developed tools

One main result of the U2Demo project is the development of an open-source platform for energy sharing inside energy communities. This platform will fetch data from different sources such as the demo sites. One main security feature of this platform is to design a platform based in Blockchain/DLT ensuring data integrity, transparency and immutability. Requirements in terms of cyber security and data privacy will be analyzed to protect the U2Demo platform from potential cyber threats, vulnerabilities and breaches. This ensures that the U2Demo platform follows standards such as IEC62443 and ISO/IEC 27000.

6.2 Long term preservation and curation

The longevity of the data elements is ensured by uploading the data to:

- Zenodo: The minimal lifetime of the data on Zenodo is currently given by the lifetime of CERN. More information can be found in the policies of Zenodo (<https://about.zenodo.org/policies/>).
- GitHub: Information on the persistence of public repositories on GitHub can be found at: <https://docs.github.com/en/repositories/archiving-a-github-repository/about-archiving-content-and-data-on-github> . Public repositories are available unless removed by the owner of the repository or unless they violate the Community Guidelines or Terms of Service or GitHub receives a DMCA Takedown Notice.
- SharePoint: Public and private data will be stored on the project internal SharePoint and on institutional clouds for long term curation.

The longevity of the data uploaded to the other platforms, such as: EC Site CORDIS, REScoop toolbox repository, the EIRIE platform, the Linux Energy Foundation platform and the Energy Web Foundation platform, is according to the terms of each of the individual platforms. The project website will be active for 5 years after the end of the project.

7 Ethics

All activities carried out within the U2Demo project will comply with ethical principles and relevant national, EU and international law, including the EU Charter of Fundamental Rights and the European Convention for the Protection of Human Rights and Fundamental Freedoms and its Supplementary Protocols. The work will fully comply with the General Data Protection Regulation (GDPR).

At all times, anonymity of the participants is mandatory and no sensitive personal information is shared. All user data collected from EU citizens will reside in EU servers and comply with GDPR rules on data access, data sovereignty and data protection. When data is published, the person publishing the data confirms that the data is anonymized, and that the data was collected and is being published with consent.

To observe and understand the perspective of end users regarding P2P markets and energy sharing, and ethnographic approach is followed. The sampling of the participants will take into consideration gender, nationality and other factors relevant within the aim of the project with the aim of being as inclusive and diverse as possible.

Any project with an ethics dimension in which INESC ID and/or INESC ID researchers participate follow the Code of Conduct developed under the INESC holding. The R&D project will be followed by an Ethics Commission set up by the INESC holding.

7.1 Use of AI

Artificial Intelligence (AI) will be used in the U2Demo project. AI algorithms will be mainly used in WP2 to develop forecasting, decision support, data analytics tools and software that provide dynamic information of grid conditions and consumers and are taken in account by the P2P trading and flexibility provision mechanisms. Not only in WP2 but also in WP4, learning algorithms will be used to evaluate the performance of several optimization algorithms. The implementation and integration of the AI-based algorithms into the platform will be done in WP3 and WP4.

The use of AI will comply with the INESC ID, U2Demo coordinator, Code of Conduct. The generic good practices referred to usage of AI are the follow:

- Ensuring that AI is human-centered, that is, developed, applied and used with respect for their fundamental rights and ethical principles of beneficence (doing good), non-maleficence (do not harm anyone), preservation of their autonomy and justice.
- Based on the same values and principles, seek to prospectively assess the possible effects of AI on human beings, their interactions and the common good.
- Incorporate the requirements for a trustworthy AI from the first design stage: accountability, good data management and control, design for the common good, nondiscrimination, respect for human autonomy, respect for privacy, technical soundness, security and transparency.
- Consider technical and non-technical methods to ensure the application of these requirements in AI systems
- Take into account the same requirements when building the system itself, the test environment and potential applications of the system.
- Strive to create conditions for the traceability and auditability of AI systems, particularly in critical contexts or situations. As far as possible, design the system so as to allow

the tracking of all its constituent elements, namely data, pre-trained models, etc. Also, define the AI system explanation methods.

- Ensure the participation and inclusion of interested parties in the design and development of the AI system, always and clearly informing them about the capabilities and limitations of the system.
- Integrate the development of credible AI into the organization's culture and provide information to stakeholders on how that concern should be translated into the design and use of AI systems.
- Promote opportunities for reflection and discussion of ethical issues and emerging challenges arising from AI systems, as well as anticipating future scenarios arising from the evolution of the configuration of AI systems, ensuring the adequate training of all agents involved in their creation and development.
- Ensure the assessment of the reliability of the developed AI systems, namely through: adoption of a set of procedures to ensure that reliability in the development, dissemination and use phases, adaptable to the specific case in which it is being used; to conduct a dynamic and permanent process of identifying requirements, evaluating solutions and ensuring better results throughout the lifecycle of the AI system.

8 Conclusions

This deliverable presents an initial DMP for the U2Demo project. Complying with the Horizon Europe policies, this DMP will be key to making U2Demo data elements open and FAIR, providing guidance and workflows for these principles to be guaranteed. This plan will be updated on M24 (D8.3), or whenever relevant changes occur. This DMP also presents the Data Definition Catalogue which consists of a record of the EV4EU data elements that will be filled during the project execution.

9 References

- [1] HORIZON EUROPE (2021), Data-Management-Plan-Template, v 1.0, European Commission. https://www.openaire.eu/images/Guides/HORIZON_EUROPE_Data-Management-Plan-Template.pdf
- [2] Horizon Europe (HORIZON) (2024). HE Programme Guide, v 4.1, European Commission. https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_en.pdf
- [3] Nunes, A.R., Marques, J., & Morais, H. Deliverable D8.1 - Project Management Plan, Ref. Ares (2024)7752608 - 31/10/2024, Use of open-source P2P energy sharing platforms for energy Democratization (U2Demo) Horizon Europe project, GA no. 101160684
- [4] Vanhoutte, I., Carmo, M., Gerits, A., & Nunes, A.R., Deliverable D7.1 - Dissemination and Communication Plan, Use of open-source P2P energy sharing platforms for energy Democratization (U2Demo) Horizon Europe project, GA no. 101160684, *in submission*

APPENDIX A: Data Monitorization

Table for monitorization if data elements comply with FAIR

Table 8 – Data Monitorization

| Type of data element ¹¹ | |
|---|--|
| Consistent name | |
| Data utility | |
| Purpose and relevance of data element in relation to objectives | |
| Methodology to produce the data element | |
| Source and ownership | |
| GDPR complaint | |
| Data formats, vocabularies | |
| Storage | |
| Security and Privacy considerations | |
| Dissemination level, limitations | |
| Licences | |
| Metadata | |

¹¹ Dataset, software, publication, questionnaire