



EUROPEAN COMMISSION

HORIZON EUROPE PROGRAMME – TOPIC: HORIZON-CL5-2022-D2-01

FASTEST

**Fast-track hybrid testing platform for the development of
battery systems**

Deliverable D8.1: Data Management Plan

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Date: [18.06.2024]

Doc. Version: [V1.1]



Co-funded by
the European Union



UK Research
and Innovation

Co-funded by the European Union under grant agreement N° 101103755 and by UKRI under grant agreement No. 10078013, respectively. Views and opinions expressed are however those of the author(s) 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 CINEA can be held responsible for them.

Document Control Information	
Settings	Value
Work package:	8 - Coordination & Management
Deliverable:	8.1
Deliverable Type:	R – Document, report
Dissemination Level:	PU - Public
Due Date:	31.11.2023 (Month 6)
Actual Submission Date:	27.11.2023
Pages:	< 17 >
Doc. Version:	V1.0
GA Number:	101103755
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Formal Reviewers		
Name	Organization	Date
Foad Gandoman	RSTER	23/11/2023
Miguel Gallardo	SIE	24/11/2023

Document History			
Version	Date	Description	Author
V1.0	27.11.2023	First version	Alvaro Sanchez (ABEE)
V1.1	18.06.2024	Disclaimer updated	Alvaro Sanchez (ABEE)

Project Abstract

Current methods to evaluate Li-ion batteries safety, performance, reliability and lifetime represent a remarkable resource consumption for the overall battery R&D process. The time or number of tests required, the expensive equipment and a generalised trial-error approach are determining factors, together with a lack of understanding of the complex multiscale and multi-physics phenomena in the battery system. Besides, testing facilities are operated locally, meaning that data management is handled directly in the facility, and that experimentation is done on one test bench.

The FASTEST project aims develop and validate a fast-track testing platform able to deliver a strategy based on Design of Experiments (DoE) and robust testing results, combining multi-scale and multi-physics virtual and physical testing. This will enable an accelerated battery system R&D and more reliable, safer and long-lasting battery system designs. The project's prototype of a fast-track hybrid testing platform aims for a new holistic and interconnected approach. From a global test facility perspective, additional services like smart DoE algorithms, virtualised benches, and Digital Twin (DT) data are incorporated into the daily facility operation to reach a new level of efficiency.

During the project, FASTEST consortium aims to develop up to TRL 6 the platform and its components: the optimal DoE strategies according to three different use cases (automotive, stationary, and off-road); two different cell chemistries, 3b and 4 solid-state (oxide polymer electrolyte); the development of a complete set of physic-based and data-driven models able to substitute physical characterisation experiments; and the overarching DT architecture managing the information flows, and the TRL6 proven and integrated prototype of the hybrid testing platform.

LIST OF ABBREVIATIONS, ACRONYMS AND DEFINITIONS

Acronym	Name
EC	European Commission
WP	Work Package
FAIR	Findable, accessible, interoperable and reusable
DOI	Digital Object Identifier
IP Data	Intellectual-Property Data
DMP	Data Management Plan
BOM	Bill of materials
NDA	Non-Disclosure Agreement
DoE	Design of Experiments
DT	Digital Twin

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1. EXECUTIVE SUMMARY

This report details the foundational Data Management Plan (DMP) for the FASTEST project, supported by the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement number 101103755. The DMP's primary function is to offer a comprehensive summary of all the datasets that are collected, created, and disseminated throughout the project.

Additionally, it outlines the data management strategies adopted by the FASTEST consortium for these datasets. The DMP in its initial form sets out the data's status whether collected, processed, or generated, along with the methodologies and standards employed. It also addresses the potential for data sharing and openness, as well as the strategies for data curation and preservation by the Consortium.

The preliminary version of the DMP establishes a broad framework and methodology for managing data within FASTEST, covering both administrative and technical aspects of data management. This encompasses policies on managing data according to FAIR principles (Findable, Accessible, Interoperable and Reusable). As the project progresses, the DMP will undergo periodic revisions. These updates will not only refine the policy components but also provide augmented details regarding the datasets that are being gathered and generated within the FASTEST project.

2. OBJECTIVES

The aim of this document is to outline a broad strategy for managing research data throughout the FASTEST project and beyond its completion. It will detail the type of data to be gathered, processed, and produced, determine the public accessibility of this data, and explain the methods for data care and conservation, even post-project. While this document offers the initial Data Management Plan, it will undergo regular updates during the project, culminating in a finalized version by the project's conclusion.

3. INTRODUCTION

The FASTEST Data Management Plan provides internal guidelines aimed at enhancing and optimizing access to the large volume of data anticipated from all project segments and tasks. As a result, D8.1 is an outcome of “Task 8.5 Data Management”. It will be revised in D8.2 “Data Management Plan Update 1” (M18) and in D8.3 “Data Management Plan Update 2” to ensure all research data is easily findable, accessible, interoperable and reusable.

4. DATA MANAGEMENT PLAN

This section outlines the Data Management Register Tool used in FASTEST, highlighting its role in the collection, documentation, and maintenance of data. It features a dynamic register for ongoing updates, guidelines for new Intellectual Property Data, and a classification of anticipated data types. The plan also includes a metadata management framework addressing data reference, ownership, contributors, and confidentiality, ensuring efficient and secure data management adaptable to the project's changing needs.

4.1 Data Management Plan on FASTEST

This section details the approach implemented in FASTEST to obtain a complete overview of the data generated during the project's duration. For clarity, based on the content of this section, the current status of all data identified in the Data Management Register is presented under "RESULTS" in Table 1, labelled "FASTEST Data Management Register Tool."

4.1.1 Data Management Methodology

To ensure organized management of data sets produced during the project, all generated data will be recorded and documented in the "Data Management Register tool" of FASTEST, located on the project's SharePoint.

- a) This register functions as a dynamic record. It will be continuously updated and filled in by project partners. Access to this register is available via the FASTEST SharePoint web platform. On the subsequent page, a visual representation of the Data Management Register Tool is provided.
- b) Prior to logging a new Intellectual Property Data Item, communication must be made to the administrative coordinator (SIE), the technical coordinator (ABEE), and any partners implicated in its creation (if any).
- c) Subsequently, the data proprietor may enter the new IP-Data into the Data Management Register Tool. Upcoming sections detail the necessary metadata for inputting a new IP Data item.

4.1.1.1 Data type and how to reference

Within FASTEST, a diverse array of data types is anticipated to be produced, and these will be collected using Data Management Register Tool. Below is a list of currently recognized data types and their respective shorthand notations. As the project evolves, additional data types might emerge, necessitating the creation of new acronyms.

Recognized Data Types (with their shorthand notations) as of now:

- **Experimental data (ED):** Arising from any lab experiment. The format and magnitude of this data will vary based on the individual data recording tools of each lab and the specifics of the test.
- **Models (M):** This includes algorithms, simulations, scripts, or coding, contingent upon the developmental platforms employed.
- **Data associated with design**, such as:
 - **Electronic designs (S):** Schematic representations, diagrammatic blocks, BOM (bill of materials), and the like.
 - **Mechanical designs (C):** 3D renderings, CAD drafts, etc.
- **Hardware prototypes (DEM):** Their digital representation will be maintained through the provision of relevant descriptive metadata and documentation, accessible in the project website's results segment.
- **Software outputs (SW):** Programs developed under the project's framework.
- **Contact lists (CL):** External contact lists used for dissemination and external communication with stakeholders.
- **Marketing and exploitation data (ME):** Data collected and processed for marketing and exploitation purposes.

Other document categories like deliverables or academic articles aren't encompassed by the above data classifications. The former possess unique references and identifiers as stipulated in the project Grant Agreement, while the latter are assigned their own Digital Owner Identifier (DOI) and are considered under Dissemination efforts.

4.1.1.2 Metadata in Data Management Register Tool

1. Reference: Every dataset will be designated a specific reference based on its Data Category, WP & Task, Data Sequence, and Sub-data Sequence.

Data Number and Sub number

Data Type:

- WP, Task (and any subtask, when applicable): each kind of data will be associated with a specific WP, task (and subtask when relevant) where it originates.
- Data Number: this is given in a consecutive manner, pointing to the count of datasets of a certain data type produced within a particular WP and specific Task. All datasets of identical type within a distinct Task should share the same Data Number, with differences marked only by the Sub-data Number (elaborated further below).
- Data Sub number: This differentiates datasets within the same category that share the same Data Number, originating from a specific WP and Task. Its identification only takes place post-data creation.

Examples of References:

DataType_WP.Task(.Subtask)_DataNumber_DataSubnumber.

- ED_8.1_1_1 (Experimental Data, generated in WP 8, Task 1, from capacity test, pertaining to the cell 1).
- ED_5.2_1_8 (Experimental Data, generated in WP 5, Task 2, from capacity test, pertaining to the cell 8).
- ED_2.2_2_21 (Experimental Data, generated in WP 2, Task 2, from degradation test, pertaining to cell 21).

2. Title: The name given to each IP Data Entry.

3. Data proprietor: The primary holder of the IP Data Entry. Joint ownership is only permissible when properly clarified in Column 6 (Dataset Origin) and Column 9 (Data Application). Shared ownership IP Data requires an NDA (Non-Disclosure Agreement) by the end of the project.

4. Contributing Partner: All those who played a role in crafting the IP Data Item.

5. Creation Date: The project month when the data is anticipated to be produced.

6. Dataset Origin: Pertains to the Partner(s) supplying the data essential for the IP Data Item and/or the WP where it originates.

7. Purpose: Reason for the IP Data item.

8. Format: Physical for DEM items. For digital entries, it varies based on the software utilized.

9. Data Application: Relevant only during the project's duration.

10. Confidentiality: CONFIDENTIAL/SENSITIVE (SEN data treats by FAIR data principles).

4.1.2 Data collection

The process of gathering data in a project varies based on the nature of the data produced, the informational needs contributed by partners for effective project execution, and the approaches for securing, storing, and accessing the data. Consequently, it is essential to meticulously collect the relevant metadata for each dataset in Table 1 of the Data Management Register Tool for the FASTEST project. This task will be executed manually. Data acquisition will occur through this Excel file, as outlined in Deliverable D8.1, "Data Management Plan" of the FASTEST project.

4.2 FAIR DATA

This segment outlines the application of FAIR data principles within the FASTEST project. FAIR is an acronym for Findable, Accessible, Interoperable, and Reusable, adhering to the [GO-FAIR guidelines](#).

The primary objective of these principles is to improve the utilization of SENSITIVE (NON-CONFIDENTIAL) data globally, fostering more efficient and extensive use of technical and scientific accomplishments. This approach is designed to optimize the use of resources, thereby preventing the redundancy of economic expenditures.

4.2.1 Making Data Findable, including Provisions for Metadata

The foundation of achieving FAIR data within FASTEST lies in the development of comprehensive metadata, which enhances the findability and discoverability of data. Consequently, additional fields might be introduced in the Data Management Register Tool throughout the project. Data identification is facilitated using the "Reference" field. The purpose of the reference is to ensure each data piece's uniqueness.

Within the SharePoint of the project, various data types are already categorized into specific fields like deliverables and publications. The data register tool will be situated in SharePoint, in a section akin to those designated for project deliverables and publications. This arrangement allows it to be a dynamic resource, accessible for consultation and updates by project partners.

Furthermore, as the volume of data generated in FASTEST expands, there is a provision for adding more fields in the tool. This approach ensures scalability and adaptability in data management.

4.2.2 Making Data Openly Accessible

Within the FASTEST project, all participating entities are encouraged to engage in dissemination efforts using data that is neither sensitive nor confidential. Data intended for public access will be showcased on the [FASTEST website](#). Despite this, a significant portion of the data utilized in the project is sensitive and will be carefully evaluated for potential public release.

As stipulated in the Grant Agreement regarding "Open access to scientific publications," every participant is obligated to provide open access to scientific publications connected to their project results.

The project dictates that all dissemination materials must feature specific acknowledgements. These include recognition of funding from the European Union's Horizon Europe Green Research and Innovation program (under grant agreement No 101103755), display of the EU emblem, and a disclaimer absolving the European Climate, Infrastructure and Environment Executive Agency (CINEA) of responsibility for the document's content.

Finally, details of all dissemination activities undertaken in the project will be meticulously documented in the "Dissemination Activities" database located on SharePoint. This ensures a comprehensive record of outreach and communication efforts associated with the project.

4.2.3 Making Data Interoperable

Achieving interoperability in the FASTEST project hinges on the effective utilization of metadata. Enhanced interoperability is attainable through the adoption of appropriate metadata standards, methodologies, and naming conventions.

To facilitate and augment inter-disciplinary interoperability of (meta)data sets, the project will employ widely recognized ontologies and a universally applicable language, such as English.

Recognizing that this is an evolving process, any improvements identified during the course of the project may be incorporated into the Data Management Plan (DMP) as necessary. This approach allows for continuous refinement and adaptation of the project's data management strategies.

4.2.4 Increase Data Re-Use

In the context of the FASTEST project, each dataset's potential for re-use is systematically evaluated in the Data Management Register Tool, specifically within Table 1 FASTEST Data Management Register Tool structure. This assessment hinges on the dataset's "Confidentiality" classification:

- Datasets labeled as "Confidential" are considered not suitable for re-use.
- Those marked as "Public" are identified as reusable.

It's important to note that, as per the Consortium Agreement binding all FASTEST participants, data generated and shared in the project is initially presumed to be confidential. However, reflecting the project's collaborative ethos and the academic orientation of certain partners, specific datasets intended for dissemination will be created as re-usable. The designation within the "Confidentiality" field in the Data Management Register Tool is instrumental in pinpointing which data, generated over the course of the project, can be reused.

4.3 Allocation of Resources

Activities encompassing data generation and handling in the FASTEST project are included in the direct personnel costs, aligning with the person-month allocations for each partner.

For long-term data preservation, SharePoint will serve as the storage medium for up to two years after the project concludes. Beyond this period, the data will remain accessible to all partners via alternative arrangements, consistent with the terms outlined in the Consortium Agreement.

4.4 Data Security

The FASTEST project is committed to diligently safeguarding its data, products, and services from unauthorized access or usage. This includes implementing comprehensive protection measures.

The responsibility for ensuring data security primarily rests with the individual partners. They are responsible for securely housing all shared, processed, and operational data within their premises. Access to this data will be strictly limited to authorized personnel within the project consortium. In instances where data needs to be transmitted between partners, it must be done through secure means. This could include encrypted data channels, secure digital transfer methods, or, in some cases, physical transportation of data. The use of SharePoint for such purposes is highly recommended.

Regarding data stored on the project's web-based repository, SharePoint, security measures are inherently provided by the platform. These include robust protection against unauthorized access, consistent with current industry standards. Security features such as firewalls and authentication protocols are in place.

4.5 Ethical and Legal Aspects

In terms of ethical considerations, the FASTEST project does not anticipate any ethical issues stemming from its research activities.

From a legal standpoint, the management and sharing of data within FASTEST are governed by the stipulations of Article 4.4 of the FASTEST Consortium Agreement, agreed upon by all participating entities. This necessitates a thorough review of data before sharing or making it accessible, ensuring that no confidentiality issues arise as per the communication and dissemination plans devised for each dataset.

It is also crucial to recognize that the approach to ethical and legal matters in FASTEST will be subject to adjustments in response to any alterations in the project's scope and context.

5. RESULTS

In this section, the tool's structure is outlined in the provided Table 1, which is based on the anticipated outcomes from the various tasks undertaken in the project. It's important to highlight that this Register does not include all document types; specifically, deliverables and scientific publications are not covered within the data types listed and are thus excluded from the Data Management Register Tool. As the project progresses, Table 1 will be subject to regular updates and revisions to ensure it accurately reflects the ongoing developments and changes. Moreover, with each update of this deliverable, Table 1 will be included, now expanded to contain all the information that has been collected, providing a comprehensive and updated overview of the data management in the FASTEST project.

Table 1 FASTEST Data Management Register Tool structure

Reference	Title	Data Proprietor	Contributing partner	Creation Date	Dataset Origin	Purpose	Format	Data Application	Confidentiality

6. CONCLUSION

This initial Data Management Plan, as outlined in the deliverable, presents a preliminary strategy for managing data generated in the FASTEST project. The plan details the types of data to be collected, processed, and/or generated, the extent of public accessibility of this data, and the methods for its curation and preservation beyond the project's lifespan.

Additionally, the document aligns with guidelines from the European Commission (EC), aiming to make FASTEST data adhere to the FAIR principles - ensuring data is Findable, Accessible, Interoperable, and Reusable.

It is important to note that this document is dynamic and will undergo periodic updates and enhancements. This process will incorporate new ideas and documents emerging from ongoing discussions. Two updates of this Data Management Plan are foreseen during the life of the project, in months 18 and 36.

7. REFERENCES

[1] Grant Agreement No. 101103755 – FASTEST

[2] FASTEST Consortium Agreement