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GA No. 101091572

Graphene, MXene and ionic liquid-based sustainable supercapacitor

GREENCAP - Deliverable report

D7.3 – Quality Assurance Report

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Summary

The Horizon Europe GREENCAP project aims to unlock the full potential of supercapacitors (SCs) as electrochemical energy storage systems, supporting the transition towards the climate-neutrality set by the EU's international commitments under the Paris Agreement, while ensuring the targets of EU's Action Plan on Critical Raw Materials (CRMs). By exploiting layered 2D materials, including graphene and MXenes as electrode materials, and ionic liquids (ILs) as high-voltage electrolyte, GREENCAP will develop a CRM-free SC technology exhibiting a battery-like energy density (>20 Wh/kg, >16 Wh/L), together with the distinctive superior power densities and high cycle life of traditional electrochemical double layer capacitors.

To support the achievement of the GREENCAP objectives and reach the set targets for key performance indicators thereof in terms of resources, quality, and impact of GREENCAP, it is essential to have management tools and procedures to ensure smooth and structured collaboration. The highest quality of the GREENCAP project results is ensured by the introduction of internal quality assessment and risk management procedures. This deliverable deals with the quality assurance procedures (that have been discussed at the project kick-off meeting) and it is complementary to the risk management plan, already identified at the beginning of the project (M3) and reported in D7.1.

Contents

List of Figures and Tables

1 Introduction

This deliverable is related to the Coordination and Management Work Package (WP7) and specifically to tasks 7.3 which aims to ensure the achievement of the overall GREENCAP objectives and its targets for the Key Performance Indicators and provide these within the required time and budget as efficiently and effectively as possible. With that in mind, this deliverable D7.3 - Quality Assurance Report - describes the review criteria for each deliverable and milestone.

The quality of the overall outcome of the project is primarily dependent upon the quality of the execution of the performed activities. The quality of the work is monitored throughout the project by the General Assembly (GA), the Executive Board (EB), the Project Coordination (PC) team, and the work package leaders (WPLs). Additionally, each project team member, including the Project Coordinator (PC), has the responsibility to critically consider the quality of the work and strive for the best work possible. Potential deviations from the project plan must be anticipated and identified in a timely manner. As detailed in Annex I of the Grant Agreement, the Quality Assurance Report serves as the basis to ensure high quality in all developments of the GREENCAP project, from demonstrator to deliverables and milestones. All GREENCAP consortium members will participate in the peer review of deliverables and the evaluation of the milestone achievement. There are no deviations from the description of this deliverable as given in Annex I of the Grant Agreement.

2 Quality Assurance

This document reports on the agreement and procedures related to the Quality Assurance aspects of the GREENCAP project. The consortium applies internal quality control mechanisms to validate outputs and deliverables. While the PC and the WPLs ensure the delivery of high-quality project outputs complying with the necessary standards in the field, other project partners are entitled to provide an additional expert perspective in the case of particularly high-profile outputs. The list of deliverables and respective internal reviewers is provided below in Table 3. All consortium members will participate in the peer review of deliverables.

2.1 Quality Assurance Procedure

All deliverables will undergo a quality assessment before submission to the Grant Authority. In short, there are specified authors for a deliverable who write the report and are responsible for the technical content. The lead participant is responsible for the technical quality and format as well as on-time delivery. The WPL is responsible for the quality check and the consistency in relation to the work package objectives, while an expert reviewer within the consortium (a member working in that WP and is not one of the deliverable authors) assesses the compliance with the Description of Action/project objectives and if the deliverable fulfils the expectations. Before approval and submission of the report, a technical and formal (compliance with expectations and EC rules) check will be performed. The final quality check and approval are done by the PC team (Coordinator BED, with the support of UNR). Figure 1 below shows the deliverable preparation and approval procedure.

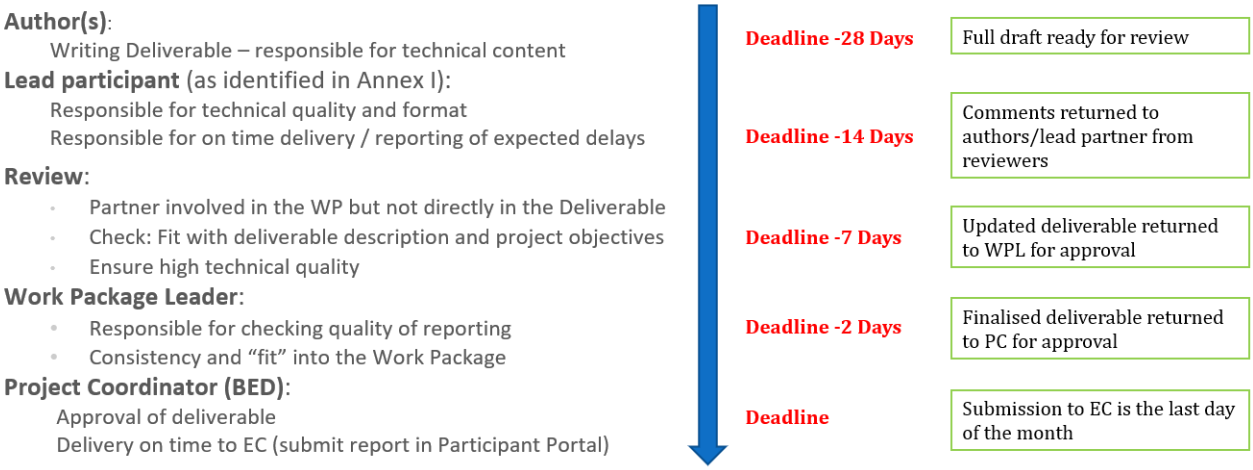

Figure 1. Deliverable preparation and approval procedure

2.2 Review process for project deliverables

The term “Deliverables” refers to the formal GREENCAP project deliverables, which are listed in the Grant Agreement No. 101091572. The term “Reports” refers to both the compulsory reports for the Grant Authority as well as other publications and exposures of GREENCAP activities to third parties. Also, content on the project website and social media can be considered a report, with the notion that all information presented on the website and social media has to be PUBLIC. The website host is responsible for the quality checks of information that is to be published on the GREENCAP website and social media accounts.

For confidential deliverables, a short Publishable summary (potentially modified from the Public Summary version in deliverables) can be published on the website.

To ensure the quality of the deliverables, all deliverables will be subject to internal review before submission. The review will be done on different levels: 1) technical level, 2) WP level, and 3) project level. Having a review process on the three different levels will ensure a high quality of the technical content of the deliverable, a good alignment within the WP of the respective deliverable and an assessment if the task description has been followed correctly, also consistent formatting and overall fit with the project objectives. For each technical deliverable, at least one project partner who is not directly involved in the preparation of the report will be appointed as a peer reviewer. The review of the deliverable on a WP level will be conducted by the respective WPL. In some cases, the WPL is also the lead beneficiary of the deliverable. In this situation, this step will be ‘skipped’ and an extra expert will review the deliverable to ensure enough scrutiny of the content. The (technical) expert(s) who will review the deliverable will be selected by the WPL on the following criteria: 1) they are from the consortium, 2) they are not directly involved in the writing of the deliverable, and 3) they either have expert knowledge of the content and/or they will be using the output from the deliverable in their own task(s). Lastly, the project coordination team (BED, UNR) fulfils the role of overall Quality Manager and will review the deliverable on an overall project level.

In the table below, the role of each actor in the deliverable review process is described, with their tasks and responsibilities, in chronological order.

Table 1. GREENCAP deliverables responsibility matrix

	Task/Responsibility
Author(s)	• Writing deliverable – responsible for technical content
Lead Beneficiary	• Gather the text/input from all partners who are writing the deliverable • Responsible for the (technical) quality and format • Responsible for on-time delivery/reporting of expected delays • Send a consolidated draft deliverable to the WPL for review
Work Package Leader	• Ensure a good fit of the deliverable within the WP • Assess if the task descriptions and WP objectives as described in the DoA have been sufficiently met • Check the organization/structure of the document

	• Send the draft deliverable, including changes made by the lead beneficiary (if any), to the (technical) expert reviewer(s)
(Technical) Expert Review	• Review the technical content
Quality Review by Coordinator	• Assess the fit with DoA and project objectives • Assess if the deliverable meets the EC quality criteria
Submission by Coordinator	• Approve the deliverable • Submit the deliverable on time to EC via the SyGMa portal

Each reviewer will use the standard review form (see Appendix A - Quality Assurance Review Form of this document) to document their review findings. After reviewing, the reviewer sends their comments to the deliverable author(s). The author(s) revises the deliverable according to the quality assurance review form within a maximum of seven days after receiving the feedback from the review . The WPL ensures that the requested updates/improvements are implemented by the author(s). The PC performs the final review.

Once the deliverable is approved by the PC, the PC/Management Team submits the deliverable to the EC in electronic form (.pdf) via the SyGMa portal. The project coordination team will store the submitted deliverables (as all project-related documents) on the consortium-only sharing and archive project platform: Mett.

A template for deliverables will be provided by UNR. This template includes the following sections which are mandatory for all technical deliverables:

- Public executive summary
- Core content: core technical development of Deliverable with clear descriptions of the work carried out, results, and discussions (based on the provided technical information)
- Risk table: overview and description of encountered risks (if any) and mitigation actions
- Conclusions and recommendations for future work including foreseen risks, challenges, and/or opportunities

2.2.1 Timing

The review and approval of Deliverables is composed of the following timeline and steps to ensure that all Deliverables are of high quality and submitted on time:

Table 2. GREENCAP deliverables submission planning ("D" stands for "Due date")

Submission Date	Action	Action by
D- XX	Check on timely planning and prepare for supporting actions as necessary	WP Leader with Author(s)
D-28	Present full draft of Deliverable for quality review to Reviewer(s)	Author(s)
D-14	Comments returned to Author(s) (In case of major modifications following the first round of reviews, revisit review procedure and take measures as necessary)	Reviewer(s)
D-7	Updated Deliverable to WP Leader for approval	Author(s)
D-2	Finalised Deliverable to Project Coordinator for approval	WP Leader

D	Submit Deliverable to EC	Project Coordinator

2.2.2 Project deliverables and assigned reviewers

Table 3. GREENCAP List of Deliverables and appointed reviewers

Del. no.	Deliverable name	WP no.	Lead	Due Date	Peer reviewer 1	Peer reviewer 2
D1.1	Quality control for CRM-free SC materials	WP1	BED	M6	TCD	FSU
D1.2	Novel CRM-free EMs and IL-based electrolytes for SCs	WP1	TCD	M24	UCAM	BED
D1.3	Multiscale characterization of EMs and electrolytes	WP1	UCAM	M24	TUD	UNISTRA
D1.4	Updated quality control for CRM-free SC materials	WP1	BED	M36	TCD	FSU
D2.1	Functionalization of SC materials	WP2	UNISTRA	M19	TUD	BED
D2.2	Hybrids and functionalized EMs characterization	WP2	UNISTRA	M30	UCAM	BED
D2.3	Electrochemical characterization of electrode/electrolyte interfaces	WP2	FSU	M30	TCD	SOLV
D3.1	Slurry formulations for high-energy SCs	WP3	BED	M30	TUD	UNISTRA
D3.2	Electrodes for high-energy density SCs	WP3	TUD	M30	TCD	SKL
D3.3	Pouch cells	WP3	TUD	M33	SKL	BED
D4.1	Upscaling processes and standardization	WP4	BED	M30	TUD	SKL
D4.2	Industrial chain manufacturing	WP4	BED	M30	SKL	SOLV
D4.3	Cylindrical prototype cells	WP4	SKL	M30	SOLV	BED
D4.4	Preliminary Supercapacitor Management System	WP4	SKL	M30	TUD	TCD
D4.5	Updated Upscaling processes and standardization	WP4	BED	M36	TCD	TUD
D4.6	Updated Industrial chain manufacturing	WP4	BED	M36	SKL	SOLV
D4.7	Updated Cylindrical prototype cells	WP4	SKL	M36	SOLV	BED
D4.8	Supercapacitor Management System	WP4	SKL	M36	TUD	TCD
D5.1	Ex-ante environmental and socio-economic impact assessment	WP5	TUD	M9	UNR	BED
D5.2	Ex-post environmental and socio-economic impact assessment	WP5	TUD	M34	TCD	SKL
D5.3	Final benchmarking report	WP5	TUD	M36	UNR	BED
D6.1	Communication toolbox	WP6	UNR	M3	BED	All
D6.2	Dissemination, communication, and exploitation plan	WP6	UNR	M6	BED	SKL
D6.3	Exploitation strategy including the list of results' owners	WP6	UNR	M24	SKL	BED
D6.4	Updated dissemination, communication, and exploitation plan	WP6	UNR	M34	BED	SKL
D6.5	Updated exploitation strategy including the list of results' owners	WP6	UNR	M34	SKL	BED

D7.1	Risk Management Plan	WP7	BED	M3	UNR	All
D7.2	Data Management Plan	WP7	BED	M6	UNR	All
D7.3	Quality Assurance Report	WP7	BED	M6	UNR	All

The list of the planned project deliverables and appointed reviewers is internally available on the internal document-sharing platform Mett for all GREENCAP project partners.

2.3 Approval Process of Milestones

At the first responsibility level, WPLs are responsible for the achievement of WP-related milestones. WPLs report to the Executive Board if they find that a milestone has been achieved and the means of verification as reported in Sygma are indeed met. It will then be discussed among all WP leaders. Once an agreement exists within the Executive Board, the Management team will report the achievement of the milestone to the European Commission (EC). In addition, the GA will have to be informed during the recurring GA meeting and will monitor/check the achievement of the milestones.

2.4 Review process for project reports (monitoring procedures)

For the Official Project Reporting and for internal reporting (every 6 months) as indicated in DoA (WP7, T7.2), each partner is expected to contribute to the writing of technical and financial reporting. Review of the financial and technical reporting will be done mutually by the administrative and coordination team, including the administrative project coordinator (APM) and PC, with the support of UNR.

3 Conclusion

The GREENCAP consortium applies internal quality control mechanisms to validate outputs and deliverables, ensuring their high-quality standards.

This document contains the Quality Assurance Report of GREENCAP project and describes the approval procedure for project deliverables, milestones, and reports to ensure a high quality of the scientific/technical/administrative work carried out in GREENCAP. By following these Quality Assurance procedures, quality will be objectively evaluated and will subsequently be maintained by taking suitable corrective actions.

The list of reviewers per deliverable is uploaded on the internal document-sharing platform Mett, used by the consortium partners to exchange, and archive documents relevant to the project.

4 Risks and deviations from Annex 1

No risks have arisen related to this deliverable. There are no deviations from the description of this deliverable as given in Annex I of the Grant Agreement.

5 Acknowledgement

The author(s) would like to thank the partners in the project for their valuable comments on previous drafts and for performing the review.

Project partners:

#	Partner short name	Partner Full Name
1	BED	BEDIMENSIONAL SPA
2	SOLV	SOLVIONIC
3	FSU	FRIEDRICH-SCHILLER-UNIVERSITAT JENA
4	SKL	SKELETON TECHNOLOGIES OU
5	TCD	THE PROVOST, FELLOWS, FOUNDATION SCHOLARS & THE OTHER MEMBERS OF BOARD, OF THE COLLEGE OF THE HOLY & UNDIVIDED TRINITY OF QUEEN ELIZABETH NEAR DUBLIN
6	TUD	TECHNISCHE UNIVERSITAET DRESDEN
7	UNISTRA	UNIVERSITE DE STRASBOURG
8	SM	SKELETON MATERIALS GMBH
9	UNR	UNIRESEARCH BV
10	CNR	CONSIGLIO NAZIONALE DELLE RICERCHE
11	UCAM	THE CHANCELLOR MASTERS AND SCHOLARS OF THE UNIVERSITY OF CAMBRIDGE

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