BATTERY2LIFE

D9.6 Standardisation landscape

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LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviation	Meaning
BESS	Battery Energy Storage System
BMS	Battery Management System
BS	Battery Storage
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
CWA	CEN/CENELEC Workshop Agreement
DPP	Digital Product Passport
EC	European Commission
EFTA	European Free Trade Association
EMC	Electromagnetic Compatibility
EN	European Standard
EPS	Electric Power System
ESS	Electrical Storage System
ETSI	European Telecommunications Standards Institute
EV	Electrical Vehicle
EU	European Union
IEC	International Electrotechnical Commission
ISO	International Standardisation Organisation
ITU	International Telecommunication Union
LCA	Life Cycle Analysis
LCCA	Life Cycle Cost Analysis
NDA	Non-Disclosure Agreement
NSO	National Standardisation Organisation
SC	Subcommittee
SLI	Starting, Lightning, Ignition
TC	Technical Committee
TR	Technical Report
TS	Technical Specification
WG	Working Group
WP	Work Package
WTO	World Trade Organisation

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EXECUTIVE SUMMARY

The objective of this document is to report on the activities carried out during task T9.5 'Standardisation landscape analysis and preparation of the contribution to standardisation', the standards used to date in the development of the project and to prepare the project's contribution to the standardisation system in order to meet KPI 12: *'Based on the project findings, at least two contributions to new standardisation will be prepared and presented to relevant standardisation technical committees'*.

Chapter 2 describes the functioning of the standardisation system, chapter 3 summarises the main standards identified, chapter 4 identifies some applicable regulations and chapter 5 describes the standardisation strategy to meet KPI 12.

1 INTRODUCTION

BATTERY2LIFE is a project funded under the Horizon Europe framework programme that will facilitate the smooth transition of batteries to 2nd life use and boost the innovation of the European Battery Industry by providing enablers to implement open, adaptable smart Battery Management Systems (BMS) and improved system designs towards reliable reconfiguration of used batteries.

Two demonstrations that represent promising and sustainable business cases, serving the two most common stationary applications have been carefully selected: The domestic and the industrial (grid-scale) storage, with respect to their operational specificities and requirements.

Standards play an important role in global trade, as they set the technical requirements that ensure safety and quality in all industrial sectors. Therefore, when developing products in research projects, it is important to consider the standards applicable to the intended market in order to ensure that the product can be introduced in the market with the necessary guarantees. In the specific case of the European Union, standards are used to demonstrate compliance with numerous European regulations and are the basis for the technical harmonisation of the EU internal market.

1.1 Purpose of the deliverable

The objective of this deliverable is to report on the activities carried out during task T9.5 'Standardisation landscape analysis and preparation of the contribution to standardisation', the standards used to date in the development of the project and to prepare the project's contribution to the standardisation system in order to meet KPI 12: 'Based on the project findings, at least two contributions to new standardisation will be prepared and presented to relevant standardisation technical committees'.

1.2 Intended audience

This deliverable is mainly intended to provide the experts from the technical work packages (WP 1 to WP 8) with the necessary standards to develop the project according to the requirements of the market and the European regulations and to prepare the contribution from these work packages to the standardisation system.

This deliverable is public and contains useful information for other research projects working in the same field of activity.

1.3 Structure of the deliverable/correlation with other WPs

First, a brief description of the functioning of the international standardisation system is presented, which is important to understand the environment in which standards are developed (chapter 2).

In chapter 3, the most relevant standards for the project and the technical committees where they are developed have been selected, which are the basis for launching new standardisation proposals from the project. To select this list, an iterative process of selection/discarding has been carried out, and drafts of documents that are important but were under development have also been shared, as is the case of the standards that are being developed for Regulation (EU) 2023/1542 concerning batteries and waste batteries [1].

Chapter 4 summarises the European legislation applicable to the project. European standards are often used within the EU to harmonise technical requirements when required by European regulations, so several of them have been identified. In the case of Regulation (EU) 2023/1542 concerning batteries and waste batteries, the standardisation work requested by the EC started in parallel with the Battery2Life project and the drafts of standards linked to this regulation have been shared with the partners as soon a stable drafts have been available.

In chapter 5, the standardisation strategy necessary to meet KPI 12 has been developed, including a previous communication with selected technical committees and the topics on which to make proposals, considering the restrictions and rules imposed by the standardisation system and the timeframe of the project. This standardisation strategy will be implemented within task T10.5 *'Contribution to standardisation'*.

Most of the standards listed in chapter 4 are linked to the corresponding WP listed in each of the tables.

2 OVERVIEW OF THE INTERNATIONAL STANDARDISATION SYSTEM

Standards are voluntary technical documents that set out requirements for a specific item, material, component, system or service, or describe in detail a particular method, procedure or best practice. Standards provide people and organisations with a basis for mutual understanding and are used as tools to facilitate communication, measurement, commerce and manufacturing. The initiative to develop a standard is taken by interested stakeholders who consider that a particular standard could address specific needs. Standards are developed and defined through a process of sharing knowledge and building consensus among technical experts nominated by interested parties and other stakeholders, including businesses, consumers and environmental groups, among others. These experts are organised in Technical Committees (TCs), which are subdivided into Subcommittees (SCs) or Working Groups (WGs). These TCs are included in the structure of the Standardisation Organisations (National, European and International level, with the respective mirror committees) and work following their internal regulations.

2.1 International Standardisation Organisations

International Standardisation Organisations develop worldwide applicable, market-driven standards in a multi-stakeholder environment which ensures that a wide range of technical views are represented, including those relating to social and economic interests. While not subject to a specific jurisdiction, international standards make an important contribution to facilitating international trade. This contribution has been recognised by the World Trade Organisation (WTO) and the organisations cited below follow the Code of Good Practice for the Preparation, Adoption and Application of Standards of the WTO Agreement on Technical Barriers to Trade[2].

Organisation name	Description
International Standardisation Organisation	ISO is an independent, non-governmental international organisation with a membership of 163 national standards bodies. ISO develops standards mainly in fields not related to electrotechnology nor telecommunications.
International Electrotechnical Commission	IEC is a not-for-profit, non-governmental organisation with a membership of 84 national standards bodies. IEC develops standards in fields related to electrotechnology.

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International Telecommunication Union	ITU is the United Nations specialised agency for information and communication technologies. It is based on public-private partnership and currently has a membership of 193 countries and almost 800 private-sector entities and academic institutions.

Table 1: International Standardisation Organisations

2.2 European Standardisation Organisations

The European Standardisation system plays a major role in the EU Single Market, enabling the free circulation of goods among 28 countries. The European standardisation system relies on a single standard model. European standards are identically adopted by all their National Members and any national conflicting standard is withdrawn. European standards facilitate compliance with EU harmonisation legislation, hence the entry and free circulation of goods in the EU Single Market, based on a set of requirements equally applicable in all Member States of the European Union. European Standardisation Organisations work closely with their international level counterparts, in order to avoid duplication of efforts and promote global relevance of standards. As a result of this, 31% of CEN standards are identical to ISO standards and 72% of CENELEC standards are identical to IEC standards. CEN, CENELEC and ETSI have been officially recognised by the European Union and by the European Free Trade Association (EFTA) as being responsible for developing standards at European level.

Organisation name	Description
European Committee for Standardisation	CEN is a non-profit association whose members are the national standards bodies of 33 European countries. It develops standards in fields not related to electrotechnology nor telecommunications. It is the counterpart at European level of ISO.
European Committee for Electrotechnical Standardisation	CENELEC is a non-profit association whose members are the national standards bodies of 33 European countries. It develops standards in fields related to electrotechnology. It is the counterpart at European level of IEC.
European Telecommunications Standards Institute	ETSI is a non-profit organisation with more than 800 member organisations worldwide. It develops standards for Information and Communications Technologies (ICT).

Table 2: European Standardisation Organisations

2.3 National Standardisation Organisations

The national standardisation organisations (NSO) are the organisations officially recognised at the national level as being able to represent all standardisation interests in their country. They are responsible for developing national standards in their countries and they are the members of ISO, IEC, CEN and CENELEC (note that ITU and ETSI have a different membership policy). National stakeholders interested in standardisation activities are able to take part in the process at the European or International level through their national standardisation organisation.

The legal status of national standardisation organisations varies from one country to another. The most typical status is a private non-profit organisation whose members are national business associations and companies, but sometimes the NSO is a part of the Public Administration.

As stated in subclause 2.2, at the European level the European Standardisation System guarantees that European Standards are identically adopted by all the national standardisation organisations and any national conflicting standard is withdrawn [3]. This means the national catalogues of standards have a high level of coherence across Europe.

The following table summarises the national standardisation organisations of the countries of the Battery2Life project partners. Note that there may be more than one organisation in a country.

Organisation name	Country
NQIS/ELOT **National Quality Infrastructure System**	Greece
UNE **Asociación Española de Normalización**	Spain
ASI **Austrian Standards International - Standardization and Innovation**	Austria
OVE **Austrian Electrotechnical Association**	Austria
EVS **Non-profit Association Estonian Centre for Standardisation and Accreditation**	Estonia
Electrosuisse **Association for Electrical Engineering, Power and Information Technologies**	Switzerland
SNV **Schweizerische Normen-Vereinigung**	Switzerland

Table 3: National Standardisation Organisations

2.4 Standardisation documents

Standardisation organisations develop different types of documents, which have different level of consensus and drafting timeframes. The most widespread document is the “Standard”, a normative document developed and approved by the members of the organisation according to

strict consensus procedures. Other types of documents are Technical Specifications (TS), Technical Reports (TR) and Workshop Agreements (WA), which have lower level of consensus and a faster drafting timeframe [4]. These last kinds of documents can be further processed to become an International Standard if the market has reached a suitable level of consensus.

Table 4 shows the different kinds of documents developed by international, European and national standardisation organisations and the main characteristics of them.

Type	International code	European code	National code	Main characteristics
Standard	ISO IEC	EN	UNE, NF, BS, DIN, etc. When adopting: UNE-EN, NF-EN, UNE-ISO, NF-ISO, etc.	Elaboration: 3 years 2 steps of member approval European: compulsory national adoption Revision: every 5 years
Technical Specification	ISO/TS IEC/TS	CEN/TS CLC/TS	When adopting: UNE-CEN/TS, NF-CEN/TS, UNE-ISO/TS, NF-ISO/TS, etc.	Elaboration: 21 months 1 step of member approval or internal approval in TC European: optional national adoption Revision: at 3 years (upgrading to EN or deletion)
Technical Report	ISO/TR IEC/TR	CEN/TR CLC/TR	When adopting: UNE-CEN/TR, NF-CEN/TR, UNE-ISO/TR, NF-ISO/TR, etc.	Elaboration: free timeframe Internal approval in TC European: optional national adoption No revision required
Workshop Agreement	IWA	CWA	Variable	Elaboration: free timeframe (usually few months) Internal approval in the Workshop European: optional national adoption Revision: at 3 years (upgrading to EN or deletion)

Table 4: Characteristics of different standardisation documents

3 STANDARDS AND TECHNICAL STANDARDISATION COMMITTEES RELEVANT TO THE PROJECT

3.1 IEC TC 21 Secondary cells and batteries - CLC/TC 21X Secondary cells and batteries

These technical committees develop standards for all types of secondary (rechargeable cells and batteries) as related to their chemistry, product dimensions, marking and performances, the intrinsic safety of the design, the qualification tests for selected applications and the safety rules for installation, operation, maintenance and disposal.

The main areas of application of such batteries are:

- Automotive for SLI (Starting, Lightning, Ignition) and Start/Stop duty in cars, trucks, motorcycles and similar equipment;
- Industrial for traction power supply to forklift trucks and similar vehicles;
- Industrial for emergency power supply duty to telecom and data networks as also for emergency lighting and power backup for vital civil, industrial and military infrastructure;
- Propulsion power supply to personal transport means such as Electrical Vehicles (EV), hybrid vehicles, golf carts, electric bikes and similar;
- Portable power supply to handheld equipment and devices;
- Propulsion, backup power supply and engine starting to railways, ships, aircraft and similar;
- Storage of energy from renewable sources both in islanded and grid-connected installations (Battery Energy Storage Systems or BESS).

In case of large grid integrated Electrical Storage System (EES) covered by IEC TC 120, the scope of TC 21 ends at the interface between the electrical energy storage device (the battery or electrochemical accumulation subsystem) and the rest of the energy storage system.

All commercially maturing or matured electrochemical energy storage technologies and batteries made thereof, such as Lead-acid, Nickel-Cadmium, Nickel-Metal hydride, Lithium-ion as also specialised ones such as Na-S (Sodium-Sulphur), Na-NiCl (Sodium-nickel chloride) High temperature couples and assorted Flow-Batteries are included in the scope of the technical committee and subcommittee.

Standards	Title	Additional info
IEC 63056:2020 EN IEC 63056:2020	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries for use in electrical energy storage systems	See Deliverable D2.1 BMS functional safety design

Standards	Title	Additional info
IEC 62619:2022 EN IEC 62619:2022	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications	See Deliverable D2.1 BMS functional safety design
IEC 62620:2014 IEC 62620:2014/AMD1:2023 EN 62620:2015 EN 62620:2015/A1:2023	Secondary cells and batteries containing alkaline or other non-acid electrolytes - Secondary lithium cells and batteries for use in industrial applications	See Deliverable D2.1 BMS functional safety design
IEC 62660-1:2018 EN IEC 62660-1:2019	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 1: Performance testing	See Deliverable D2.1 BMS functional safety design
IEC 62660-2:2018 EN IEC 62660-2:2019	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 2: Reliability and abuse testing	See Deliverable D2.1 BMS functional safety design
IEC 62660-3:2022 EN IEC 62660-3:2022	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 3: Safety requirements	See Deliverable D2.1 BMS functional safety design
IEC TR 62660-4:2017	Secondary lithium-ion cells for the propulsion of electric road vehicles - Part 4: Candidate alternative test methods for the internal short circuit test of IEC 62660-3	See Deliverable D2.1 BMS functional safety design
IEC 61427-2:2015	Secondary cells and batteries for renewable energy storage - General requirements and methods of test - Part 2: On-grid applications	See Deliverable D2.1 BMS functional safety design

Table 5: Useful standards from IEC TC 21 - CLC/TC 21X

3.2 ISO/TC 22/SC 32 Electrical and electronic components and general system aspects

This technical committee develops standards for electrical and electronic (E/E) components and cross-sectional specifications for E/E systems and components for road vehicles.

This includes:

- Wiring harness (e.g. cables, connectors, interconnections);
- Dedicated connectors (e.g. trailer connectors, OBD-connector);

- Dedicated E/E components and parts (e.g. alternators, fuses, ignition equipment);
- EMC;
- Environmental conditions;
- Functional safety;
- Cybersecurity;
- Dedicated optical components;
- Software update

Standards	Title	Additional info
ISO 26262-1:2018	Road vehicles — Functional safety — Part 1: Vocabulary	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-2:2018	Road vehicles — Functional safety — Part 2: Management of functional safety	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-3:2018	Road vehicles — Functional safety — Part 3: Concept phase	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-4:2018	Road vehicles — Functional safety — Part 4: Product development at the system level	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-5:2018	Road vehicles — Functional safety — Part 5: Product development at the hardware level	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-6:2018	Road vehicles — Functional safety — Part 6: Product development at the software level	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-7:2018	Road vehicles — Functional safety — Part 7: Production, operation, service and decommissioning	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-8:2018	Road vehicles — Functional safety — Part 8: Supporting processes	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-9:2018	Road vehicles — Functional safety — Part 9: Automotive safety integrity level (ASIL)-oriented and safety-oriented analyses	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-10:2018	Road vehicles — Functional safety — Part 10: Guidelines on ISO 26262	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-11:2018	Road vehicles — Functional safety — Part 11: Guidelines on application of ISO 26262 to semiconductors	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 26262-12:2018	Road vehicles — Functional safety — Part 12: Adaptation of ISO 26262 for motorcycles	See deliverable D1.2 Open-source and interoperable BMS principles

Table 6: Useful standards from ISO/TC 22/SC 32

IEC TC 65 Industrial-process measurement, control and automation - CLC/TC 65X Industrial-process measurement, control and automation

These technical committees develop standards for systems and elements used for industrial process measurement, control and automation, to coordinate standardisation activities which affect integration of components and functions into such systems including safety and security aspects.

Standards	Title	Additional info
IEC TR 61508-0:2005	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 0: Functional safety and IEC 61508 (see Functional Safety and IEC 61508)	See deliverables D1.2/D2.1
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 1: General requirements (see Functional Safety and IEC 61508)	See deliverables D1.2/D2.1
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems (see Functional Safety and IEC 61508)	See deliverables D1.2/D2.1
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3: Software requirements (see Functional Safety and IEC 61508)	See deliverables D1.2/D2.1
IEC TS 61508-3-1:2016	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3-1: Software requirements - Reuse of pre-existing software elements to implement all or part of a safety function	See deliverables D1.2/D2.1
IEC TS 61508-3-2:2024	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 3-2: Requirements and guidance in the use of mathematical and logical techniques for establishing exact properties of software and its documentation	See deliverables D1.2/D2.1
IEC 61508-4:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 4: Definitions and abbreviations (see Functional Safety and IEC 61508)	See deliverables D1.2/D2.1

Standards	Title	Additional info
IEC 61508-5:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 5: Examples of methods for the determination of safety integrity levels (see Functional Safety and IEC 61508)	See deliverables D1.2/D2.1
IEC 61508-6:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3 (see Functional Safety and IEC 61508)	See deliverables D1.2/D2.1
IEC 61508-7:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 7: Overview of techniques and measures (see Functional Safety and IEC 61508)	See deliverables D1.2/D2.1

Table 7: Useful standards from IEC TC 65 - CLC/TC 65X

3.3 IEC TC 120 Electrical Energy Storage (EES) systems - CLC/SR 120 Electrical Energy Storage (EES) Systems

These technical committees develop standards in the field of grid integrated EES systems in order to support grid requirements.

- focuses on system aspects on EES systems rather than energy storage devices;
- focuses on system aspects on EES systems rather than energy storage devices;
- investigates system aspects and the need for new standards for EES systems;
- also focuses on the interaction between EES systems and Electric Power Systems (EPS).

Standards	Title	Additional info
IEC 62933-5-2:2020 EN IEC 62933-5-2:2020	Electrical energy storage (EES) systems - Part 5-2: Safety requirements for grid-integrated EES systems - Electrochemical-based systems	See deliverable D2.1 BMS functional safety design

Table 8: Useful standards from IEC TC 120 - CLC/SR 120

3.4 ISO/TC 199 Safety of machinery - CEN/TC 114 Safety of machinery

These technical committees develop standards for basic concepts and general principles for safety of machinery incorporating terminology, methodology, guards and safety devices within the framework of ISO / IEC Guide 51 and in cooperation with other ISO and IEC technical committees.

Standards	Title	Additional info
ISO 13849-1:2023 EN ISO 13849-1:2023	Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design	See deliverable D1.2 Open-source and interoperable BMS principles
ISO 13849-2:2012 EN ISO 13849-2:2012	Safety of machinery — Safety-related parts of control systems — Part 2: Validation	See deliverable D1.2 Open-source and interoperable BMS principles

Table 9: Useful standards from ISO/TC 199 - CEN/TC 114

3.5 IEC TC 72 Automatic electrical controls - CLC/TC 72 Automatic electrical controls

These technical committees develop standards related to the inherent and functional safety of the product and to the operating characteristics where such are associated with application safety. The scope covers the evaluation of automatic electrical control devices used in homes, buildings, appliances and other apparatus, electrical and non-electrical. The scope also covers products for industrial purposes when no dedicated product standards exist, such as that for central heating, air conditioning, process heating building automation, etc. Additionally, the following products are also included under the scope:

- Automatic electrical control devices, mechanically, electromechanically, electrically or electronically operated. These devices are responsive to or controlling parameters such as temperature, pressure, chemical, passage of time, humidity, light, electrostatic effect, flow or liquid level;
- Automatic electrical control devices serving the starting of small motors that are used principally in appliances and apparatus for household and similar purposes. Such control devices may be built into, or are separate from, the motor;
- Non-automatic control devices when such are associated with automatic control devices;
- Automatic electrical controls used in application functions such as building automation for comfort living, energy management, photo-voltaic applications, battery management systems, alternate fuel applications, etc. Energy efficiency of the overall installation is not included within the scope. This is covered under the scope of TC23/SC23K;
- Automatic electrical controls that use cloud-based technology to perform control functions;
- Automatic electrical control devices that may be part of the gas train/path for alternate fuels such as hydrogen;
- Sensors and sensing technology used on or in association with automatic electrical controls.

Standards	Title	Additional info
IEC 60730 (Series) EN 60730 (Series)	Automatic electrical controls	See deliverable D1.2 Open-source and interoperable BMS principles

Table 10: Useful standards from IEC TC 72 - CLC/TC 72

3.6 ISO/TC 46 Information and documentation

This technical committee develops standards for practices relating to libraries, documentation and information centres, publishing, archives, records management, museum documentation, indexing and abstracting services, and information science.

Standards	Title	Additional info
ISO 15836-1:2017	Information and documentation — The Dublin Core metadata element set — Part 1: Core elements	See deliverable D9.2 Data Management Plan
ISO 15836-2:2019	Information and documentation — The Dublin Core metadata element set — Part 2: DCMI Properties and classes	See deliverable D9.2 Data Management Plan

Table 11: Useful standards from ISO/TC 46

3.7 CEN/TC 301 Road vehicles

This technical committee develops European Standards for road vehicles answering essentially to European standardisation requests. Since the automotive industry is acting globally, the international level (ISO/TC 22 Road vehicles) shall have top priority for any other standardisation projects.

Although, as the scope of the technical committee indicates, priority is given to standards at the international level, the European committee is currently developing standards under Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC.

Standards	Title	Additional info
EN 18061:2025	Road vehicles - Rechargeable batteries with internal energy storage - Steps, conditions and protocols for the safe repair and re-use and preparation for repurposing of modules and batteries designed for EV applications	Candidate harmonised standard for Regulation (EU) 2023/1542.

Table 12: Useful standards from CEN/TC 301

3.8 CEN/CLC/JTC 24 Digital Product Passport - Framework and System

This technical committee develops standards for the Digital Product Passport (DPP) framework and system, based on but not limited to standards on:

- unique identifiers;
- data carriers and links between physical product and digital representation;
- access rights management, information, system security, and business confidentiality;
- interoperability (technical, semantic, organisation);
- data processing, data exchange protocols and data formats;
- data storage, archiving, and data persistence;
- data authentication, reliability, integrity;
- Application Programming Interfaces (APIs) for the product passport lifecycle
- management and searchability;

and the data delivering system, data specification method while ensuring cross-sectoral and cross-system interoperability.

This technical committee develops the common standards for the management platform of the different DPPs included in several European Regulations. These standards were initially requested by the EC to develop the digital product passport platform of Regulation (EU) 2023/1542 concerning batteries and waste batteries but following the publication of Regulation (EU) 2024/1781 establishing a framework for the setting of ecodesign requirements for sustainable products, they are being developed under the latter. In any case, the product digital passport management platform will be developed according to these standards, regardless of the type of product, including batteries.

This technical committee does not develop standards on the specific content of the DPP for specific type of products.

Standards	Title	Additional info
prEN 18216	Digital product passport - Data exchange protocols	Under development.
prEN 18219	Digital product passport - Unique identifiers	Under development.
prEN 18220	Digital product passport - Data Carriers	Under development.
prEN 18221	Digital product passport - data storage, archiving, and data persistence	Under development.
prEN 18222	Digital Product Passport - Application Programming Interfaces (APIs) for the product passport lifecycle management and searchability	Under development.
prEN 18223	Digital Product Passport - System interoperability	Under development.

prEN XXX	Digital Product Passport - access rights management, information system security, and business confidentiality	Under development.
prEN XXX	Digital Product Passport – Data authentication, reliability and integrity	Under development.

Table 13: Useful standards from CEN/CLC/JTC 24

4 APPLICABLE REGULATIONS

Standards are commonly used to specify technical requirements for accessing a market, but they are also used to specify technical requirements required by regulation. This is especially important in the EU, where standards are used to demonstrate compliance with European regulations [5]. The following table contains a list of European and international regulations applicable to the Battery2Life project.

Regulation	Objective
Regulation (EU) 2023/1542 concerning batteries and waste batteries	The objectives of this Regulation are to contribute to the efficient functioning of the internal market, while preventing and reducing the adverse impacts of batteries on the environment, and to protect the environment and human health by preventing and reducing the adverse impacts of the generation and management of waste batteries.
United Nations Manual of Tests and Criteria (section 38.3), 2023	The Manual of Tests and Criteria contains criteria, test methods and procedures to be used for the classification of dangerous goods according to the provisions of the United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations, as well as of chemicals presenting physical hazards according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). It therefore also supplements national or international regulations which are derived from the Model Regulations or the GHS.
Directive 2014/35/EU on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits	The purpose of this Directive is to ensure that electrical equipment on the market fulfils the requirements providing for a high level of protection of health and safety of persons, and of domestic animals and property, while guaranteeing the functioning of the internal market.
Directive 2014/30/EU on the harmonisation of the laws of the Member States relating to electromagnetic compatibility	This Directive regulates the electromagnetic compatibility of equipment. It aims to ensure the functioning of the internal market by requiring equipment to comply with an adequate level of electromagnetic compatibility.
Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment	This Directive establishes a regulatory framework for the making available on the market and putting into service in the Union of radio equipment.
Directive 2011/65/EU on the restriction of the use of certain hazardous substances	This Directive lays down rules on the restriction of the use of hazardous substances in electrical and electronic equipment (EEE) with a view to contributing to the protection of human health and

Regulation	Objective
in electrical and electronic equipment	the environment, including the environmentally sound recovery and disposal of waste EEE.
Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)	This Directive lays down measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste from electrical and electronic equipment (WEEE) and by reducing overall impacts of resource use and improving the efficiency of such use in accordance with Articles 1 and 4 of Directive 2008/98/EC, thereby contributing to sustainable development.
Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)	The purpose of this Regulation is to ensure a high level of protection of human health and the environment, including the promotion of alternative methods for assessment of hazards of substances, as well as the free circulation of substances on the internal market while enhancing competitiveness and innovation.

Table 14: Applicable regulations

5 STANDARDISATION STRATEGY

5.1 Objectives of a strategy for an effective contribution to standardisation

The aim of the strategy for an effective contribution to standardisation is to prepare Task 10.5 Contribution to standardisation to be developed in the second part of the project (M19-M36), in which two new contributions to the standardisation system are to be submitted (according to KPI 12 of the Battery2Life Grant Agreement) and to cooperate with the technical standardisation committees most relevant for the project objectives (Objective 6 of the Battery2Life Grant Agreement).

This strategy has been designed in such a way that these objectives can be met in an effective way, while complying with the strict rules of the standardisation system and without overloading the main work of the project.

5.2 Objectives of interaction with the technical standardisation committees

The objectives of the interaction with the most relevant technical standardisation committees for the Battery2Life project are twofold. Firstly, in the European and international standardisation committees, the relevant entities of a product's value chain are represented, companies, administrations, research centres, certification bodies, etc. This makes the standardisation committees a forum of entities potentially interested in the project results, if they are properly selected. To make this selection, it is most effective to select from among the committees that develop the standards identified during the Standardisation landscape analysis of Task 9.5. Among these committees, in the following selection, the committees of origin (batteries for electric vehicles) and of final application have been prioritised. The second objective is to prepare the development of new standardisation proposals based on the project results by making the Battery2Life project known to the experts of these committees in order to facilitate the further development of standardisation proposals.

5.3 Relevant standardisation technical committees and levels of interaction

5.3.1 First selection of standardisation technical committees

The following table summarises the technical standardisation committees that should be contacted in the first instance.

Standardisation technical committees to be contacted
CEN/TC 301 Road vehicles
CENELEC/TC 21X Secondary cells and batteries
IEC TC 120 Electrical Energy Storage (EES) systems

Table 15: First selection of standardisation technical committees to be contacted

At this stage, it is proposed to contact these standardisation committees. At a later stage, depending on the availability of time, it may be proposed to contact additional standardisation committees.

5.3.2 Level of interaction with standardisation committees

The levels of interaction with the standardisation committees:

1) **Presenting the project at committee meetings;**
   This is the option with the least additional workload for the project and for the standardisation committee. It should be noted that participation in the standardisation committees is done through the member countries being part of the respective national committees, the Battery2Life project would be an invitee to the committee meetings. UNE would request an invitation to participate and present the project at one of the committee meetings, which would be done by a technical partner of the Battery2Life project. This work would be preparatory to task T10.5 Contribution to standardisation.

2) **Make contributions from the project to the standards under development;**
   For this option, it would be necessary to find a standard in a suitable state of development that allows contributions from the project, and to be able to make the standard development times compatible with the development of the project, and one or more project partners would have to join their national standardisation body in order to be able to participate in European or international standardisation work. This option would mean a very significant additional workload for the project, and also does not guarantee that the contributions coming from the project would be accepted in the standardisation committee, so the effectiveness would be doubtful and not compatible with KPI 12 which obliges us to make two new contributions to standardisation projects based on the results of the project.

3) **Propose the development of new standards.**
   This option is compatible with KPI 12, but the development of two new standards itself has the following drawbacks:

   - The development of new standards requires minimum participation by countries, which is difficult to achieve;
   - The process of developing new standards is slow due to the consensus-building and voting processes of the standardisation system and often makes it incompatible with a time-limited research project. The finalisation of new standards may take longer than the project completion period.

   The same results can be achieved by developing two CEN/CENELEC Workshop Agreement (CWA) documents, a type of CEN/CENELEC document more suitable for the development of standardisation documents based on research project results.

In a first step, an attempt will be made to follow option 3 and propose the development of two normative documents. If this route proves unfeasible, proposals will be made through the development of CWAs as explained in the following subclauses.

5.4 Development of CEN/CENELEC Workshop Agreements (CWA)

A CEN/CENELEC Workshop Agreement (CWA) is a CEN/CENELEC deliverable, developed by a Workshop open to the participation of any interested parties, which reflects an agreement between identified individuals and organisations responsible for its contents.

For research projects related to innovative technologies, which have not yet achieved a sufficient degree of stability, a European Standard may not be the best way of meeting this need, because of the nature of the standardisation process and the requirement that all CEN/CENELEC national members shall adopt the resulting standard. For this kind of projects, a CWA is the best way to transfer the knowledge generated in the project to the standardisation ecosystem.

The process for developing a CWA is specified in detail in the document CEN-CENELEC GUIDE 29 “CEN/CENELEC Workshop Agreements – A rapid way to standardisation” [6].

The administrative part of the process including the workshop secretariat will be developed by UNE, as a member of CEN/CENELEC. Battery2Life project partners have to join the CEN/CENELEC workshop together with external stakeholders who want to participate in the elaboration of the CWA documents. The resulting CWAs will not be a deliverable of the Battery2Life project, but a CEN/CENELEC document based on a deliverable of the project.

5.5 CWA development process

For the development of a CWA, first step is the selection of the topic on which it will be developed. Although the areas on which to develop a CWA are quite open as they are aimed at emerging topics, there are a number of restrictions to be taken into account, because it is important to ensure the coherence of all the different CEN/CENELEC deliverables in order to protect the credibility of European standardisation.

The restrictions applicable to the development of a CWA are the following:

1) It shall not conflict with a European Standard;
2) Safety matters are excluded from being the subject of a CWA. “Safety” refers to the avoidance of unacceptable risks that can lead to harm or injuries caused by accident, foreseeable misuse, defective design or manufacturing, etc. Examples: safety of machinery, safety of products, safety of personal protective equipment, safety against fire, safety devices in vehicles, etc;
3) A CWA is a public document, so confidential or sensitive project content or content protected by NDA agreements should be avoided;

4) The time required to develop a CWA, including CEN/CENELEC processing periods, is between 1 year and 9 months, so it is not possible to use deliverables that are planned for the end of the Battery2Life project as the basis of the document;
5) A CWA should be a technical document, so only deliverables with technical content will be selected.

In addition to these restrictions of the CWA development process, the topic on which to develop the document must come from a deliverable of the project, since the intention is to promote the acquired knowledge and, on the other hand, it is necessary to avoid having to develop additional content in order not to overload the work of the WPs.

During the process, it should also be taken into account that the Workshop in which the CWAs will be developed will be open to entities external to the Battery2Life project, so although the starting document will be the one we propose, it is possible that it may undergo changes with the contributions of these other parties.

5.6 Appropriate deliverables as a basis for developing CWAs

From the list of deliverables of the project, selecting the deliverables marked as public, document type (demonstrator type have also been selected if it contains a report) and excluding project management deliverables that do not have technical content suitable for the development of a CWA, the possible candidate documents are the included in the following table. Deliverables marked in red have been excluded for the reason indicated in the remarks column and those marked in yellow should be considered with caution.

Deliverable No	Deliverable Name	Due Date (month)	Remarks
D1.1	Demo sites requirements and specifications	3	Descriptive document, not suitable for developing a CWA
D1.2	Open-source and interoperable BMS principles	6	Safety related?
D1.3	BMS specifications and advanced algorithms for 2nd life	6	Safety related?
D2.3	BMS cloud platform	12	Safety related?
D3.1	BMS E/E topologies	10	Safety related?
D5.2	BMS prototyping, integration and validation of BMS solution for SLG	25	Safety related?

Deliverable No	Deliverable Name	Due Date (month)	Remarks
D5.3	BMS prototyping, integration and validation of BMS solution for MIBA	25	Safety related?
D6.1	Disassembly of modules for 2nd life BS	15	Safety related?
D6.3	BS assembly and testing methodology for 2nd life	25	Safety related?
D7.2	BS tests before shipment	30	Document available too late to develop a CWA
D8.1	On-site BS validation	36	Document available too late to develop a CWA
D8.2	Life Cycle Analysis (LCA) and Life Cycle Cost Analysis (LCCA) of the BS	36	Document available too late to develop a CWA

Table 16: Candidate deliverables for development of a CWA

Of the remaining deliverables, namely D1.2, D1.3, D2.3, D3.1, D5.2, D5.3, D6.1 and D6.3, all of them are related to the BMS or BS, and may contain safety-related aspects and would not be suitable for proposing a CWA. From these deliverables, it is necessary to select two deliverables that do not contain these safety aspects.

6 CONCLUSION

A comprehensive set of safety standards applicable to batteries, EV batteries and end products developed by the Battery2Life project have been identified and used. In most cases, these standards are established in the market and widely used.

In the case of the standards for Regulation (EU) 2023/1542 concerning batteries and waste batteries, during the first part of the project they were not yet available as they were under development, they have been shared as soon as a stable draft became available. In the case of the standards for the digital product passport, only a set of draft standards for the management platform are available at the moment.

In terms of contribution to standardisation, the project is developing material that is highly relevant to the standardisation system. However, this content is safety-related, which makes it a complicated process to transfer it to the standardisation system. A two-path route has been proposed to make this contribution.

7 REFERENCES

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