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Battery Passport Content Guidance – Executive Summary –

Achieving compliance with the EU Battery Regulation
and increasing sustainability and circularity

Version 1.0 / April 2023



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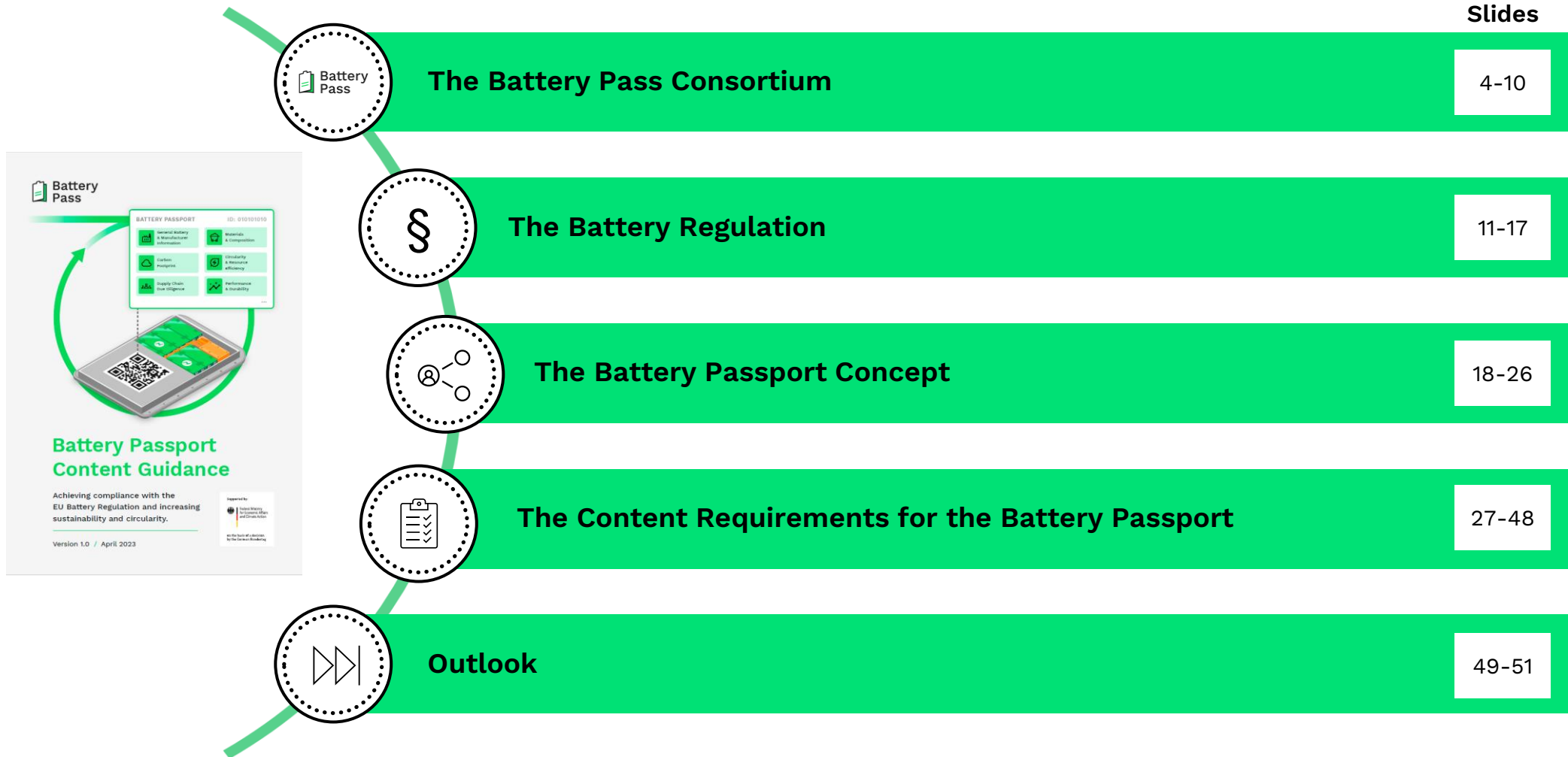
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This Executive Summary document summarises the key insights and recommendations of the Battery Passport Content Guidance report





The Battery Pass Consortium

The Battery Pass is a consortium of 11 partners from industry, science, technology and beyond, co-funded by BMWK aiming to advance the EU battery passport

Key facts on the Battery Pass Consortium

- Evolved from the Circular Economy Initiative Germany (CEID)
- Led by system change company Systemiq
- 11 consortium partners from industry, science, technology and beyond
- Co-funded by the German Federal Ministry for Economic Affairs and Climate Action (BMWK) with EUR 8.2 mn
- Aiming to advance the implementation of the EU battery passport mandated by the EU Battery Regulation
- Five work packages incl. coordination and communication, content and technical standards, demonstrator, and value assessment
- 3-year timeframe from April 2022 to April 2025

CONSORTIUM LEAD

SYSTEMIQ

CONSORTIUM PARTNERS








*under subcontract



Kick-off event of the Battery Pass Consortium in Berlin in April 2022

The Battery Pass develops a perspective on battery passport content and technical requirements, builds a demonstrator, and assesses the value of the passport

Work packages			Sub-topics
WP1	Project Coordination and Stakeholder Engagement		a) Consortium coordination b) Content governance for quality and coherence c) EU alignment and global compatibility d) External communication for results dissemination e) Scaling up and making results permanent
WP2	Content Standards		a) Carbon footprint b) Supply chain due diligence c) Circularity and resource efficiency d) Performance and durability e) Liability and ownership f) Auditability
WP3	Technical Standards		a) Reference models for data collection along battery life cycle b) Contextualization regarding EU and global data spaces c) Process and access logics based on the reference models
WP4	Demonstrator		a) Data infrastructure b) Data storage & process execution c) Integration with Catena-X/ EES/ Gaia-X d) Demonstration
WP5	Value assessment		a) Benefit modelling of individual use cases b) Benefit modelling of the battery passport overall

*Focus
of this
document*

The Battery Pass consortium draws upon a network of associated and supporting partners and guidance of the Battery Pass Advisory Council

The Battery Pass partner network

Associated Partners



Supporting Partners

Still growing...



Advisory Council



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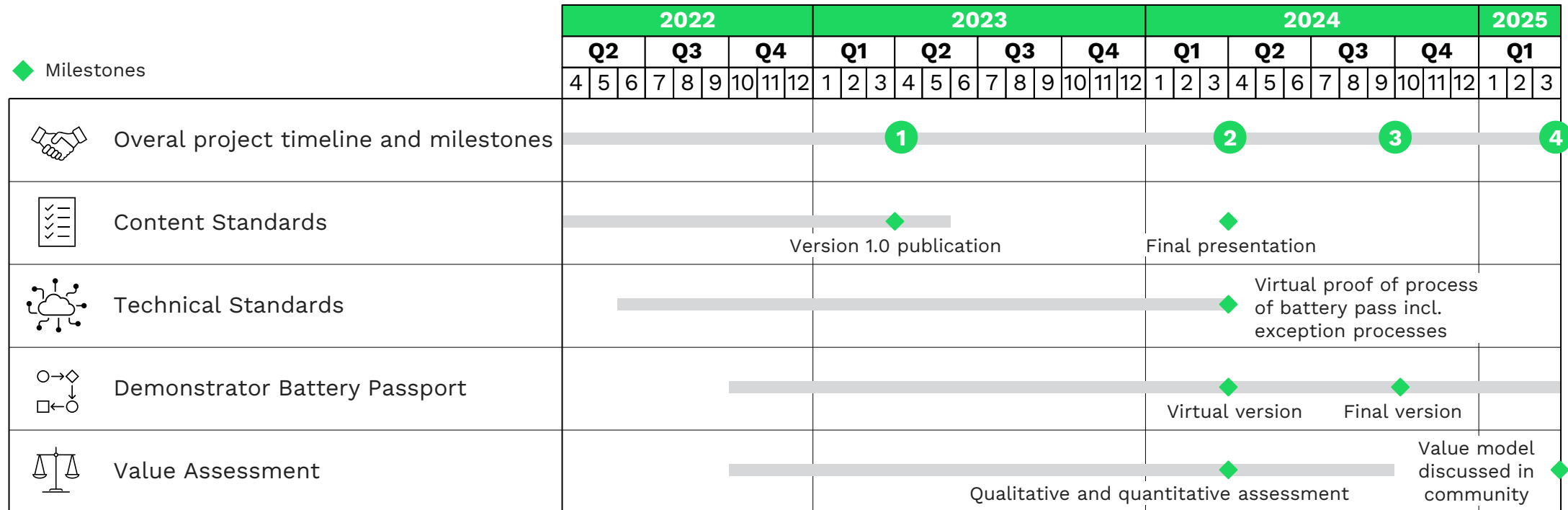
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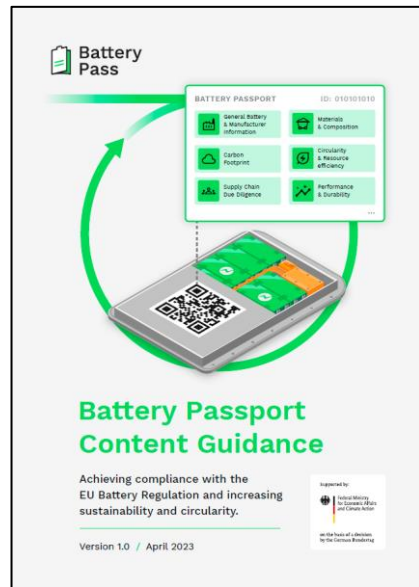
The publication of the Battery Passport Content Guidance (version 1.0) represents the first major milestone of the three-year project



- 1 Concept model for data and auditing
 2 Technical system model
 3 Demonstrator in use
 4 Use case model and follow-up for implementation

Overall, the Battery Pass has published five documents that help organisations to understand battery passport related content requirements

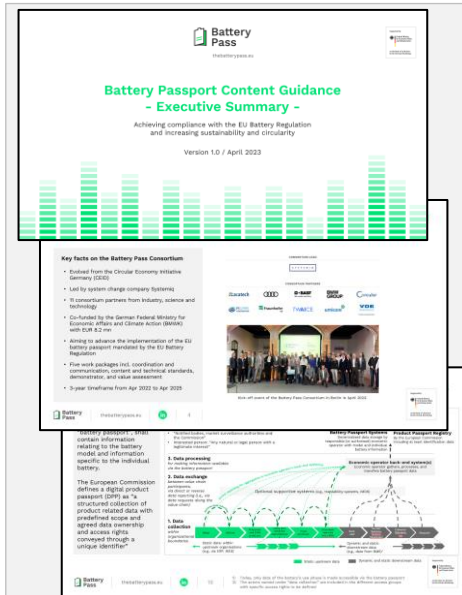
Battery Passport Content Guidance



Comprehensive report

PDF (200 pages)

Aggregates and interprets the content requirements for the battery passport as mandated by the EU Battery regulation and beyond enabling economic operators and other battery value chain players to prepare for the implementation.



Executive Summary

Slide deck

Summarises the key insights and recommendations of the main Battery Passport Content Guidance report for industry and battery passport ecosystem representatives with only little time.

This document

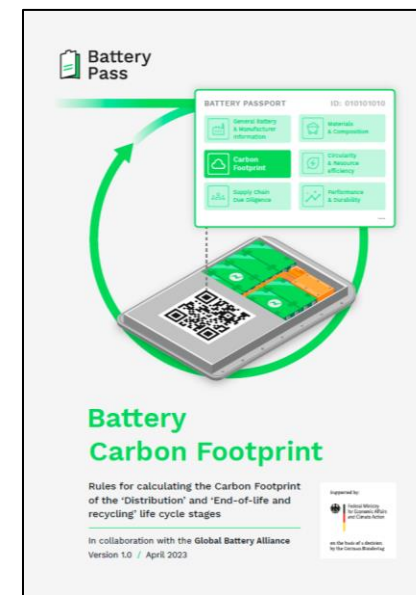


Data attribute longlist

Excel file

Includes all data attributes required (and suggested) for the battery passport alongside definitions as well as further relevant data dimensions. Can serve as a first basis for the technical demonstration and implementation of the passport within the own organisation.

Carbon Footprint specific documents



Carbon Footprint Rules

Report

Specifies accounting rules to calculate company-specific carbon footprints of the battery 'Distribution' and 'End-of-life and recycling' life cycle stages, complementing the GBA GHG Rulebook. Mainly of relevance for LCA practitioners.










Carbon Footprint EOL Analysis

Report

Comparatively assesses the three main EOL allocation approaches and their implications on the carbon footprint. Mainly of relevance for LCA practitioners and policy-makers.

The Battery Pass Content Guidance is directed at several stakeholder groups aiming to advance the implementation of the EU battery passport

Stakeholder groups	Objectives
 Responsible economic operators	<ul style="list-style-type: none">• One-stop-shop aggregating and interpreting all content requirements mandated by the EU Battery Regulation• Highlighting harmonisation potential with further regulatory frameworks• Indicating additional value-adding aspects enabling increased sustainability and circularity
 Battery value chain participants	<ul style="list-style-type: none">• Educate and guide on reporting duties of and access rights to battery passport information• Provide additional background information, e.g., complementing definitions, links to other regulations etc.
 Other industry participants	<ul style="list-style-type: none">• Serve as a blueprint for other upcoming digital product passports
 Standardisation organisations	<ul style="list-style-type: none">• Foundation for translating regulatory requirements into standards and unveil further standardization needs
 European Commission	<ul style="list-style-type: none">• Highlight ambiguities and inconsistencies in the legal text and requirements for further elaboration• Ensure a balancing of sustainability objectives and industry feasibility• Contribute to the public consultation phase of the upcoming delegated and implementing acts
 The Public	<ul style="list-style-type: none">• Inform and educate the public through information on the battery passport and its contribution to increased sustainability for batteries and knowledge for informed purchase decisions
 Battery Pass work packages	<ul style="list-style-type: none">• Leverage as foundation for the further specification of technical approaches incl. a formal reference model for data collection, an initial framework to cover technical specifications and the development of a demonstrator• Direct requirement and input for the identification and specification of use cases / value assessment



The Battery Regulation

The Battery Regulation is part of the EU Green Deal and complements the Strategic Action Plan on Batteries

Key elements of the EU's climate and sustainability efforts

EU Green Deal	Comprehensive plan to make the EU climate-neutral by 2050, safeguard biodiversity, establish a circular economy and eliminate pollution, while boosting the competitiveness of the European industry and ensuring a just transition for the regions and workers affected.
New Industrial Strategy	Framework guiding the development of the industrial sector, aiming to support the EU's broader goals of climate neutrality, digital transformation, and economic growth.
Circular Economy Action Plan	Initiative promoting the sustainable use of resources, especially in resource-intensive sectors with high environmental impact, such as textiles and construction.
Strategic Action Plan on Batteries	Initiative introduced in 2018 as part of the Clean Mobility Package and updated in the context of the EU Green Deal aiming at developing a sustainable and competitive battery value chain in Europe with the objective to ensure a reliable and sustainable supply of batteries.
Battery Regulation	Proposed in 2020, replacing the EU Battery Directive, and likely entering into force in August 2023, it is part of the EU Green Deal and complements the Strategic Action Plan for Batteries by providing a legal framework aiming to make batteries sustainable throughout their entire life cycle.

The Battery Regulation aims to promote sustainability, encourage circularity, ensure safety, and improve transparency



Promoting sustainability in the production of batteries and reducing the environmental impact throughout their lifecycle



Encouraging circularity by making data available to enable second life usage and to improve recycling in terms of both quality and quantity



















































Ensuring safety through the protection of human health as well as the environment



Improving transparency and consumer information on the environmental and safety performance of batteries

The Battery Regulation is a ground-breaking reform on the EU internal market as it covers the entire life cycle and mandates the first digital product passport

Regulation categories	Exemplary requirements	Lifecycle stages
 Restriction of substances	Mercury, cadmium, lead restrictions – delegated acts potentially extending this list	  
 Recycled content	Min. levels of recovered cobalt (16%), lead (85%), lithium (6%), and nickel (6%) , increasing over time	  
 Due diligence policies	Implementation of a due diligence policy , incl. traceability or chain of custody system	  
 Green public procurement	Criteria for sustainable procurement procedures for batterie to be established	  
 Labelling and marking	List of general information on battery labels determined; QR Code required	  
 Safety parameters	Stationary energy storage systems requiring technical documentation on safety	  
 Removability, replaceability	Portable batteries must be easily removable and replaceable by consumers	  
 Performance, durability	Minimum performance & durability requirements for batteries will be determined	  
 SoH, expected lifetime	Up-to-date data in the BMS to determine SoH and expected lifetime	  
 Carbon footprint	Carbon footprint reporting required for the first time and for each model per manufacturing plant	  
 Waste battery management	Collection targets as well as min. recycling efficiencies and levels of recovered Co, Cu, Pb, Li, Ni	  
 Improved data availability	An electronic record of a battery (battery passport) with key static and dynamic data	  

Material sourcing & production Use phase End of life

The Battery Regulation was generally welcomed by different stakeholders, yet the need to solve remaining challenges was addressed

Kamila Slupek
Sustainability Director
Eurometaux

“ We congratulate EU legislators for reaching today’s landmark agreement. The Battery Regulation’s new recycling and sustainability rules are **an important step to differentiating Europe’s batteries market on the global stage.** ”

Lauren Pagel
Policy Director
Earthworks

“ The European Union is **seizing the opportunity** presented by the transition to EVs and low-carbon transportation **to break away from irresponsible mining**, which has disproportionately impacted frontline and Indigenous communities in the Global South and marginalized communities. ”

Barbara Metz
Executive Director
Deutsche Umwelthilfe

“ With this **overdue agreement**, groundbreaking specifications for more sustainable batteries can finally come into force [...] ‘Unfortunately, **some problems remain unresolved.** If there is a pure switch from cars with combustion engines to electric cars, the environmental impact will increase significantly due to the rise in battery production. We need a fundamental shift away from private transport to buses, trains and bikes. In addition, the Commission must now exploit the circular economy potential for recycling batteries and their raw materials as quickly as possible through supplementary legal acts. ”

Rene Schroeder
Executive-Director
EUROBAT

“ The Commission’s proposal has the **potential to be a real gamechanger** with its 360° policy approach. Sustainability and decarbonisation must go hand-in-hand with an ambitious industrial policy for batteries, as well as a comprehensive and technology-inclusive research and innovation framework. ”

The battery passport will be the first digital product passport (DPP) implemented in the EU, which are seen as a key tool to advance the European Twin Transition



DPPs – a tool to advance the Twin Transition

- The **European Twin Transition** is a policy framework that aims to simultaneously address two major challenges: the **green transition** to a sustainable and low-carbon economy and the **digital transformation** of society.
- **Digital product passports** (DPPs) are a concept that involves creating a digital record of a product's environmental and social impact throughout its lifecycle. They are seen as a **key tool** for advancing the European Twin Transition by promoting a more sustainable, circular and digital economy.
- The **Battery Passport** is the **first DPP introduced in Europe** with further product categories to follow: textiles, construction, consumer electronics, plastics, chemicals and automotive sector.



Initiatives in other regions



China's Ministry of Industry and Information Technology is carrying out information collection and traceability management on the whole process of traction battery production, sales, utilization, scrap, recycling and utilization through the “National NEV Monitoring and Management – **Traction Battery Recycling And Traceability platform**”.



The **Inflation Reduction Act** (IRA) in the **US** introduces a significant tax credit for EVs assembled in North America. Battery passports present a solution to help automakers track and trace their battery supply chains to ensure compliance with the requirements of the IRA.

After European institutions reached a preliminary agreement in December 2022, the Battery Regulation is expected to enter into force in Q3 2023

Timeline of the EU Battery Regulation





The Battery Passport Concept

The purpose of the battery passport is to provide transparency and awareness, enable the shift to a circular economy, and create a level playing field

Purpose of the battery passport



Provide transparency to impact decisions

- Enable informed decisions based on comprehensive data being provided digitally
- Gain knowledge about the history / story of a product
- Shift from intuitive to conscious decision-making about batteries' design, use and fate



Enable the shift from linear to circular economies

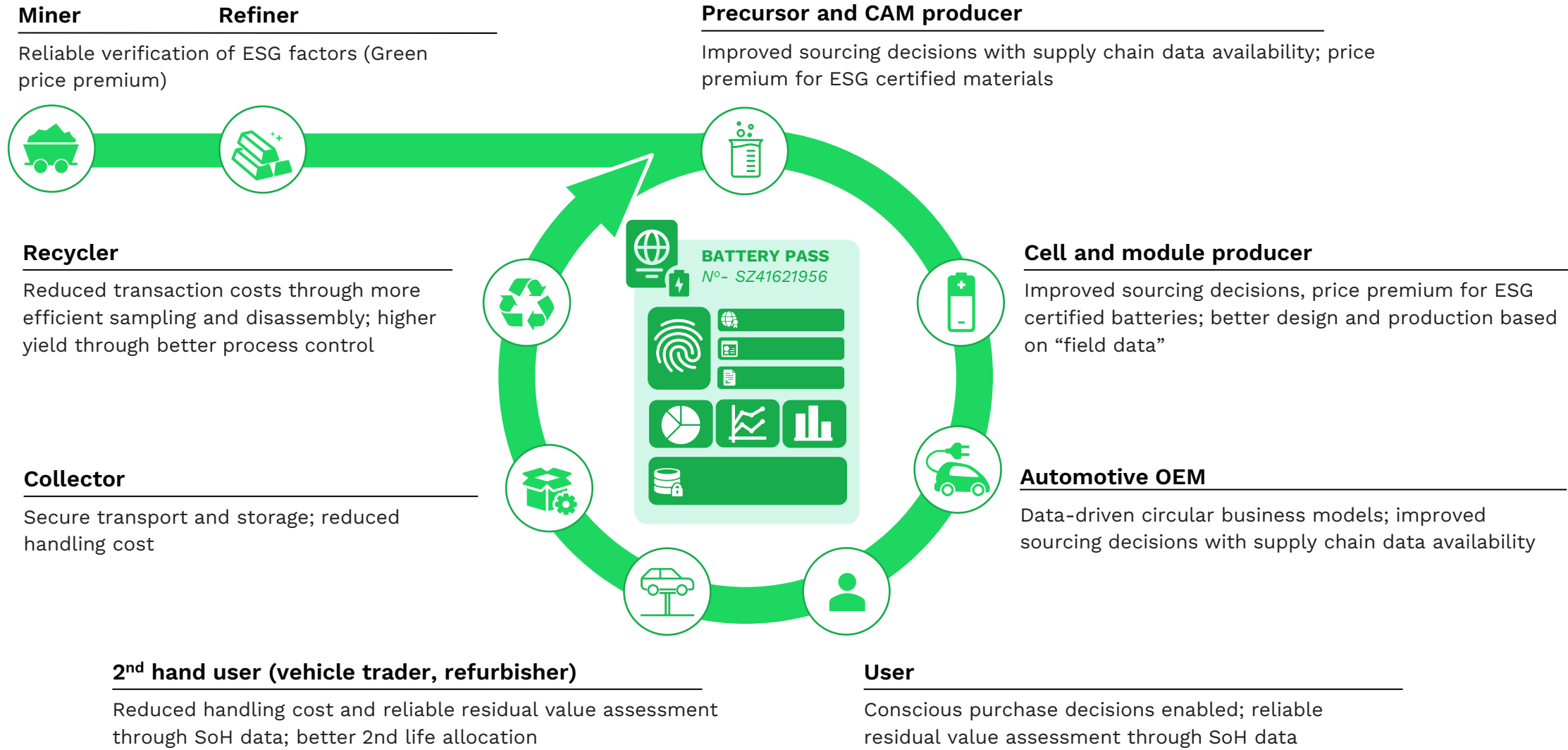
- Provide the required “situational awareness” for batteries including, for example a “product-as-a-service” mode, instead of considering a product a consumable only
- Keep products within the system to save resources and minimize the amount of actual waste
- Switch philosophy from quantity driven to quality driven economy



Create a battery level playing field

- Build the future battery value chain on multi-stakeholder responsibilities
- Move stakeholders to compete on innovation
- Develop business models that operate on value creation, value capture, and value conservation

The battery passport will unlock major value along the entire value chain



The battery passport will be an electronic record of a battery containing a comprehensive set of information collected along the battery life cycle

The digital battery passport

Article 65 of the EU Battery Regulation requires an electronic record for batteries (“battery passport”), which shall contain information relating to the battery model and information specific to the individual battery.

The European Commission defines a digital product passport (DPP) as “a structured collection of product related data with predefined scope and agreed data ownership and access rights conveyed through a unique identifier”

4. Data access via battery passport and Registry

Access rights differing between access groups²

- “General public”
- “Notified bodies, market surveillance authorities and the Commission”
- Interested person: “Any natural or legal person with a legitimate interest”

3. Data processing

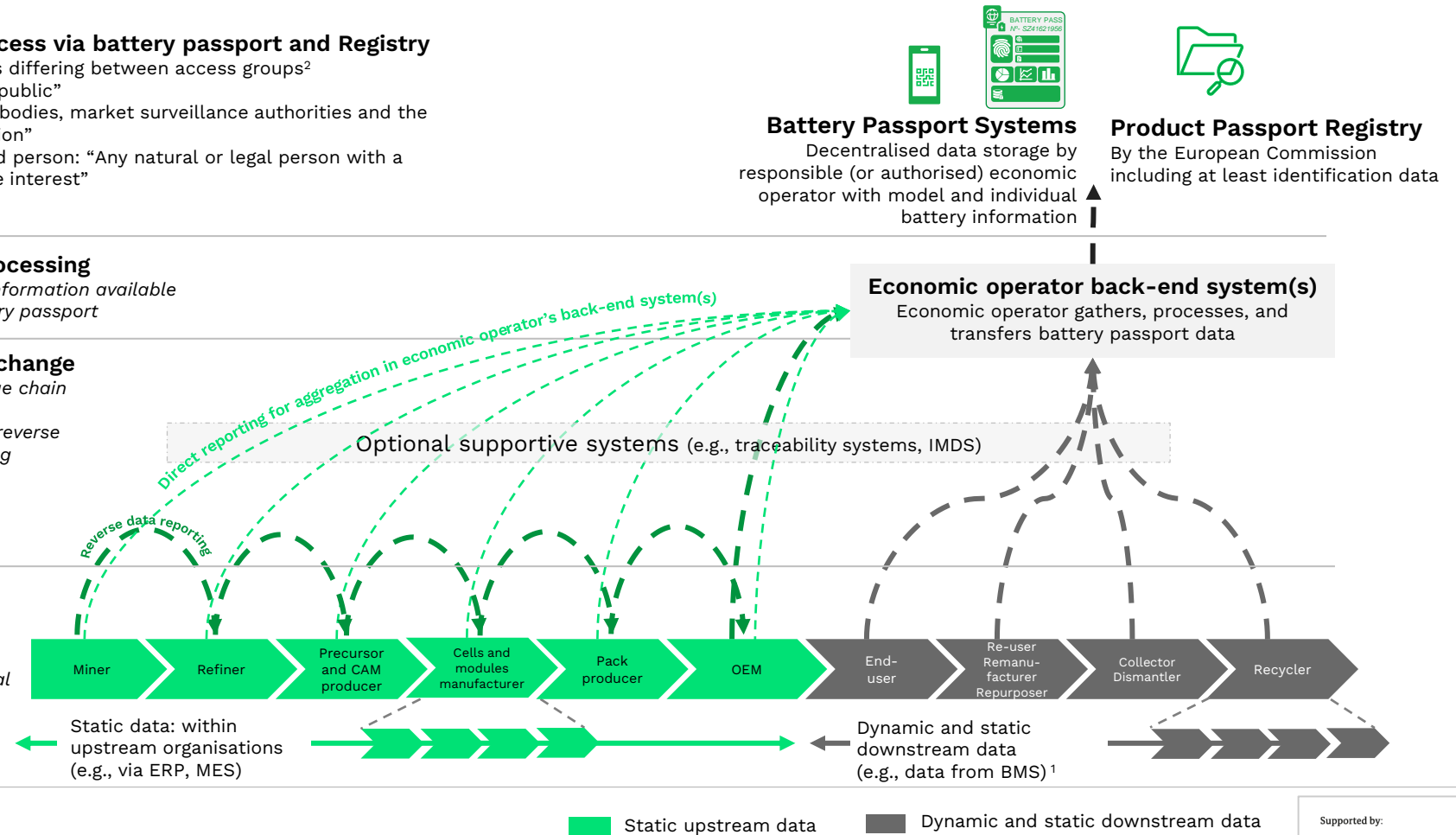
for making information available via the battery passport

2. Data exchange

between value chain participants, via direct or reverse data reporting

1. Data collection

within organizational boundaries



1) Today, only data of the battery's use phase is made accessible via the battery passport
2) The actors named under “data collection” are included in the different access groups with specific access rights to be defined

Specifications of the battery passport such as timeline, scope, responsibility, and access groups are laid out in Article 65 of the EU Battery Regulation

Specifications for the battery passport



Timeline

The battery passport will be required from 42 months after entry into force of the Regulation



Scope

- Batteries in light means of transport (LMT)
- Industrial batteries with a capacity > 2 kWh
- Electric vehicle (EV) batteries



Responsibility

The responsibility lies with the economic operator (or an authorized representative) placing the battery on the market










Access groups

- 1) The “general public”
- 2) “Notified bodies, market surveillance authorities and the Commission”
- 3) “Any natural or legal person with a legitimate interest in accessing and processing that information”

Deep dives follow

EV, LMT, and industrial batteries > 2 kWh will be in scope for the battery passport

 Within scope of battery passport

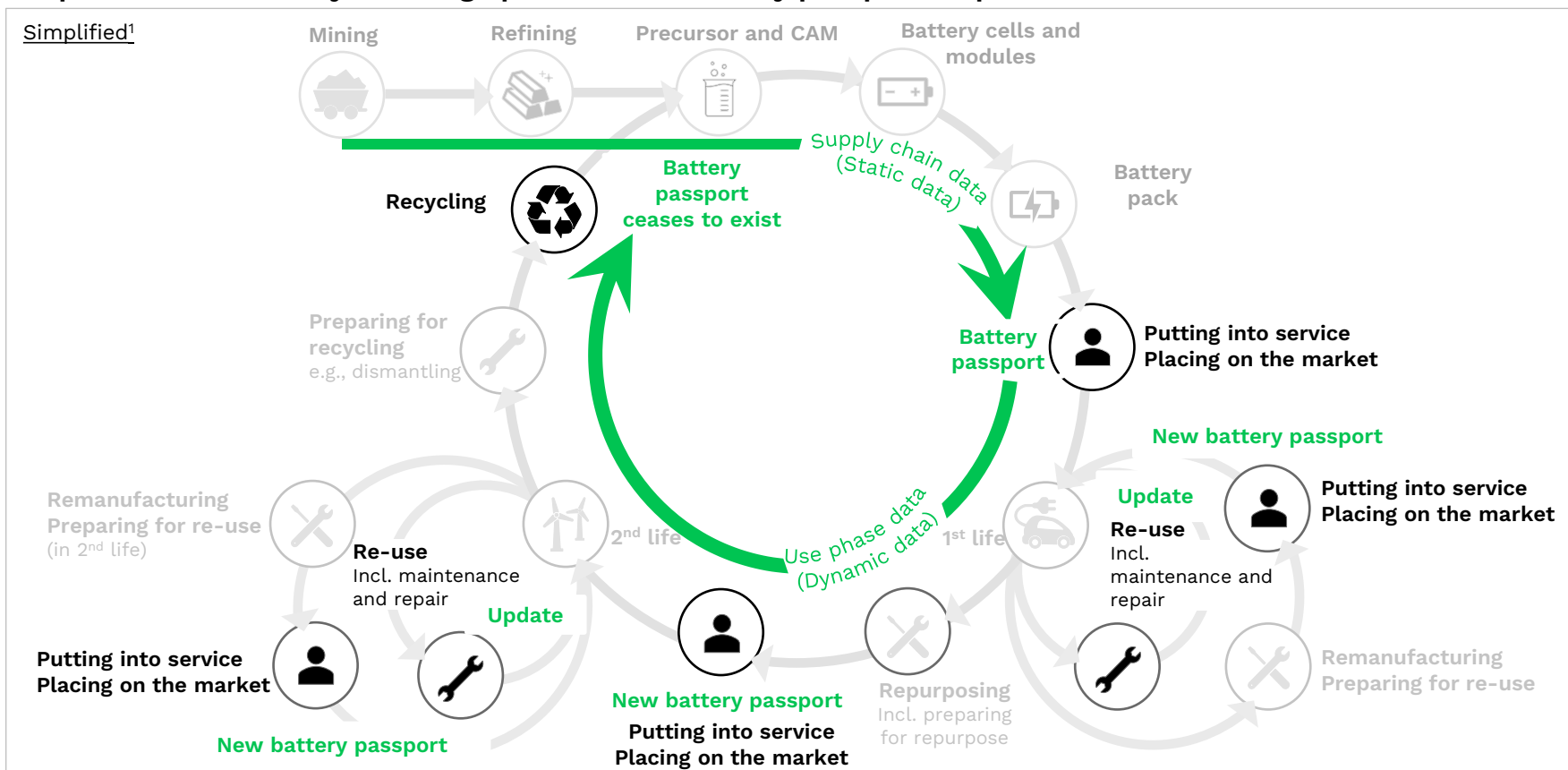
Battery categories	Battery definition and use cases	Battery weight
 Electric vehicle (EV) battery	<ul style="list-style-type: none"> Provide electric power for the traction to hybrid or electric vehicles <ul style="list-style-type: none"> of categories L (Regulation (EU) No 168/2013), if larger than 25 kg, or of categories M, N or O (Regulation (EU) 2018/858) 	> 25 kg (category L)
 Light means of transport (LMT) battery	<ul style="list-style-type: none"> Provide electric power for traction to wheeled vehicles that can be powered by the electric motor alone or by a combination of motor and human power including type-approved vehicles of category L (Regulation (EU) No 168/2013), e.g., e-bikes and e-scooters 	≤ 25 kg
 Industrial battery¹	<ul style="list-style-type: none"> Designed specifically for industrial uses, or intended for industrial uses after being subject to preparing for repurpose or repurposing, or any battery above 5 kg that is not an LMT, EV or SLI battery Industrial uses include (<i>Recital 12</i>) <ul style="list-style-type: none"> industrial activities communication infrastructure agricultural activities energy storage in private or domestic environments generation and distribution of electric energy traction in other transport vehicles incl. rail, waterborne, aviation or off-road machinery <p><i>Sub-category: Stationary battery energy storage system</i></p> <ul style="list-style-type: none"> Industrial battery with internal storage <ul style="list-style-type: none"> specifically designed to store and deliver electric energy from and into the grid or store and deliver electric energy to end-user, regardless of where and by whom this battery is being used 	> 5 kg (if no other category applies)
 SLI (starter, lighting, or ignition) battery	<ul style="list-style-type: none"> Designed to supply electric power for starter, lighting, or ignition May also be used for auxiliary or backup purposes in vehicles, other means of transport or machinery 	-
 Portable battery	<ul style="list-style-type: none"> Not designed specifically for industrial uses Neither an electric vehicle battery, nor a light means of transport battery, nor an SLI battery 	≤ 5 kg
 Portable battery of general use	<ul style="list-style-type: none"> Rechargeable and non-rechargeable portable batteries specifically produced to be interoperable Common formats: 4,5 Volts (3R12), button cell, D, C, AA, AAA, AAAA, A23, 9 Volts (PP3) Providing traction to wheeled vehicles considered as toys (within Toy Safety Directive 2009/48/EC) 	

Core responsibilities for the battery passport comprise the issuing of a (new) battery passport as well updating and storing the information

Battery passport responsibilities

- Attribute a unique identifier that is linked to the QR code that the battery is marked with to make the battery passport accessible
- Ensure that the information in the battery passport is accurate, complete, and up-to-date
- Store the data included in the battery passport
- (...) as well as many more general and technical requirements defined in Article 65 and 65a

Implications of battery handling operations on battery passport responsibilities



The manufacturer or importer placing the battery on the market or putting it into service is responsible for fulfilling the battery passport requirements

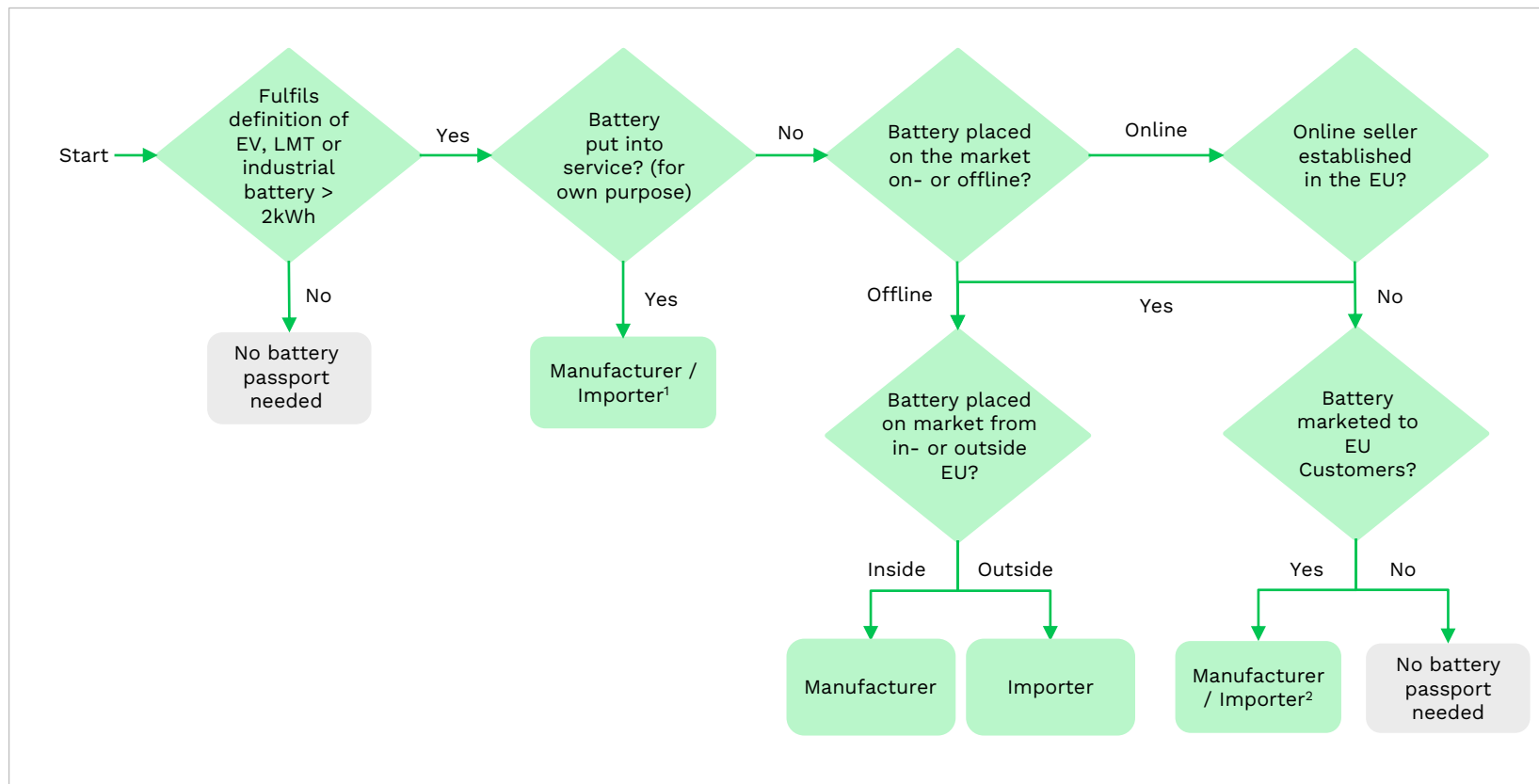
Definition of the responsible economic operator

Responsibility lies with the economic operator **placing a battery on the market** or **putting it into service**.

This could either be the:

- **Manufacturer** (any natural or legal person who manufactures a battery or has a battery designed or manufactured and markets that battery under its own name or trademark or puts it into service for its own purposes), or
- **Importer** (any natural or legal person established within the Union who places a battery on the market from a third country)

Decision tree determining the type of economic operator responsible



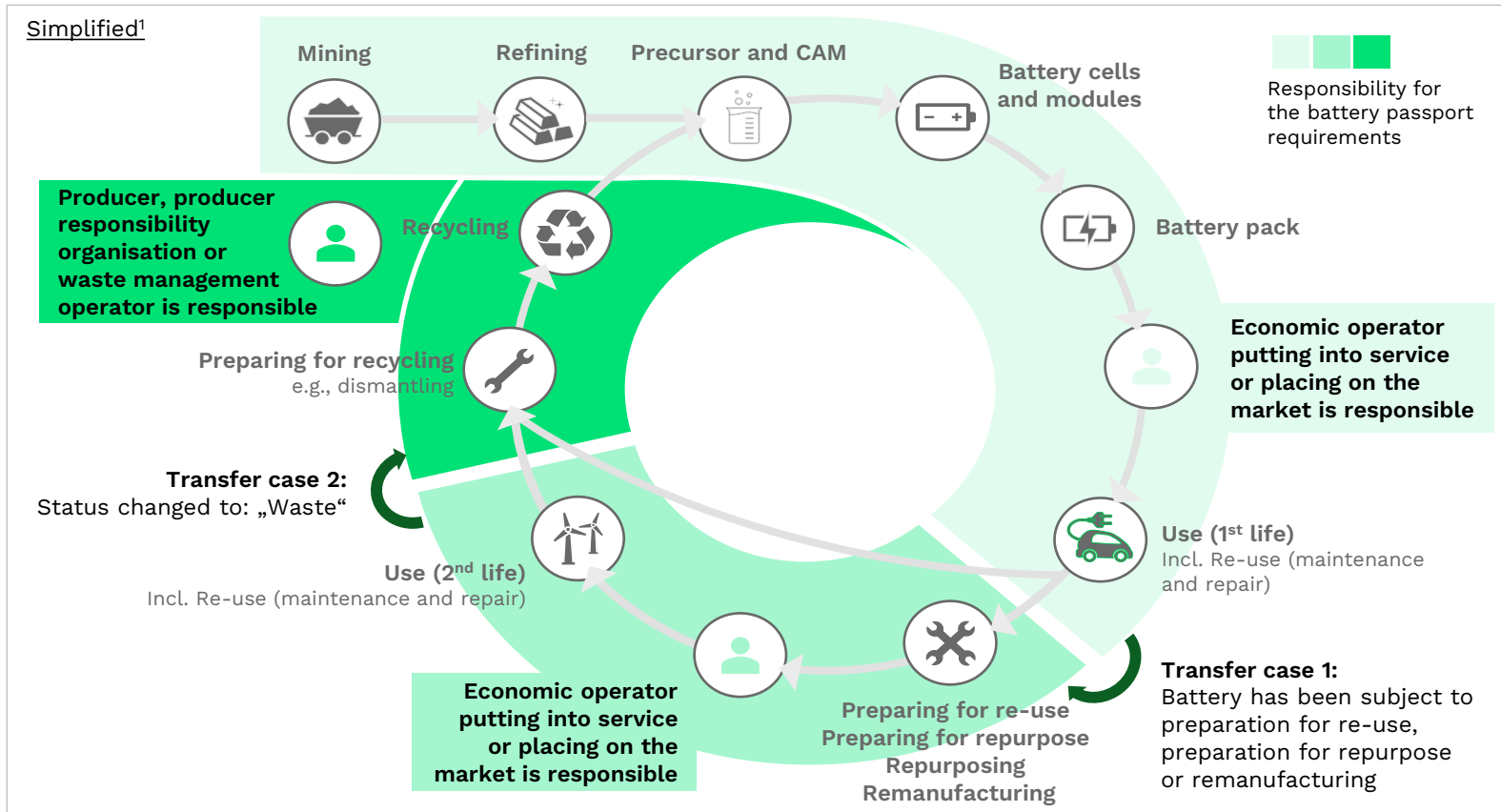
In two specific cases, the responsibility for the battery passport needs to be transferred

Transfer of responsibilities

In two cases, the regulation specifically requires the responsibility for the battery passport to be transferred from one economic operator to another:

- **Transfer case 1:**
Battery has been subject to preparation for re-use, preparation for repurpose, repurposing or remanufacturing
- **Transfer case 2:**
Status changed to “Waste”

Responsibility periods and transfer cases for the battery passport





The Content Requirements for the Battery Passport

The mandatory scope of data attributes for the battery passport is defined by the Battery Regulation with further recommendations made by the Battery Pass

Battery Pass approach

Battery Regulation



The EU Battery Regulation defines **all mandatory data attributes** to be made accessible via the battery passport.

Further regulations



Further regulations serve as a source to:

- complement definitions,
- generate additional background information, and
- harmonise reporting requirements.

Scope was limited to **EU and key Member States** regulations to align with other (upcoming) requirements in the region, e.g., the Proposal for Ecodesign for Sustainable Products Regulation (ESPR) and the German Supply Chain Act.

Battery Pass objective and scope



Guidance on how to achieve **compliance with** the battery passport content requirements as mandated by **the EU Battery Regulation**.



Recommendations how to:



...interpret the regulatory text



...harmonise with other regulations



...increase sustainability & circularity



More than 100 organizations from the broader Battery Pass network participated in a consultation webinar submitting more than 250 comments on the draft report during a feedback phase lasting around two months.

In Annex XIII, the Battery Regulation introduces the comprehensive set of mandatory data attributes for the battery passport, which are detailed out in various articles and annexes

EU Battery Regulation



Article 65
Point 2:
The battery passport shall contain information as set out in Annex XIII

Annex XIII

Information to be included in the battery passport

Battery model information

Point 1: Publicly accessible

- (a) Information of *Part A, Annex VI*
- (b) Material composition
- (f) Carbon footprint of *Articles 7(1) and (2)*
- (g) Information of the due diligence report of *Article 45e(3)*
- (h) Recycled content as in documentation in *Article 8(1)*
- (ha) Renewable content
- (i; j) Capacity; voltages
- (k) Power capability
- (l; m; o; r) Battery lifetime information
- (n) Temperate range
- (p) Round trip energy efficiency
- (q) Internal resistance
- (s) Labelling requirements of *Articles 13(3) and (4)*
- (t) EU declaration of conformity of *Article 18*
- (u) Waste batteries information of *Article 60(1a-f)*

Point 2: Accessible to interested persons and the Commission

- (a) Detailed composition
- (b) Part numbers and contact details of sources for spare parts
- (c) Dismantling information
- (d) Safety measures

Point 3: Accessible to notified bodies, market surveillance authorities, and the Commission

- (a) Results of tests report proving compliance

Individual battery information

Point 4: Accessible to interested persons

- (a) Performance and durability parameters of *Article 10(1)*
- (aa) State of health information of *Article 14*
- (b) Status of the battery
- (c) Information and data as result of its use

Annex VI, Part A: General labelling information

- (1) Manufacturer identification of *Article 38(8)*
- (2) Battery category & identification of *Article 38(7a)*
- (3; 4) Manufacturing place and date
- (5; 5a) Weight and capacity
- (6; 7; 10) Composition
- (9) Extinguishing agent

Article 7: Carbon footprint

Article 45e: Disclosure of information on due diligence policies

Article 8: Recycled content

Article 13: Labelling & marking of batteries

Article 18: EU declaration of conformity

Article 60: Waste batteries information

- (a; b) Role of end-users
- (c) Collection and take-back points
- (d) Safety instructions
- (e) Meaning of labels and symbols
- (f) Impact of substances

Article 10(1): Performance and durability

- (1) Performance and durability parameters in *Annex IV, Part A*
- (1) Elements of *Annex IV, Part B* for technical documentation of *Annex VIII*

Article 14: Performance and durability

- (1) State of health and expected lifetime parameters of *Annex VII*

Annex IV: Electrochemical performance and durability requirements

Part A: Parameters related to the electrochemical performance and durability
Part B: Explanation of the measurements

Annex VII: State of health and expected lifetime parameters

The Battery Pass consortium has grouped the battery passport data attributes into seven content clusters – details on each are following on the next slides



1. General battery & manufacturer info

Overall 7 data attributes, e.g.,:

- Battery identification (unique identifier)
- Manufacturing information (identity, place, date)
- Battery category
- Battery weight
- Battery status



2. Compliance, label, certifications¹

Overall 6 data attributes, e.g.,:

- Symbols and labels: separate collection, cadmium and lead, carbon footprint
- Meaning of labels and symbols
- EU declaration of conformity and its ID
- Compliance of test results



3. Battery carbon footprint

Overall 7 data attributes, e.g.,:

- Carbon Footprint (5 metrics)
- Web link to Carbon Footprint study
- Carbon Footprint performance class



4. Supply chain due diligence

Overall 1 data attribute:

- Due Diligence Report
- *(Potential voluntary additions)*



5. Battery materials and composition

Overall 11 data attributes, e.g.,:

- Battery chemistry
- Critical raw materials
- Hazardous substances and their impact
- Materials used in the cathode, anode, electrolyte



6. Circularity and resource efficiency

Overall 20 data attributes, e.g.,:

- Manuals for battery removal, disassembly, dismantling
- Component part numbers & spare parts information
- Safety measures/instructions & extinguishing agent
- Pre- and post-consumer recycled content shares (nickel, cobalt, lithium, lead)
- Renewable content shares
- Information on the role of end-users in waste prevention and management
- Information on battery waste collection, second life preparation, and recycling



7. Performance and durability

Overall 38 data attributes, e.g.,:

- Capacity, Energy, SoH, and voltage information
- Power capability information
- Energy round trip efficiency and self-discharge
- Internal resistance

- Expected lifetime
- Temperature conditions
- Negative events



General battery information is of interest for end-users as well as authorities in the context of tracing back liability and verifying compliance



General battery information to increase transparency and liability

- General battery information (e.g., who manufactured the battery where and when) is often **difficult to obtain from the battery label**, especially for end-users.
- Furthermore, e.g., authorities struggle to accurately **trace back liability and verify compliance** since information is difficult to allocate and link to the respective battery and requirements differ between battery categories.

Battery labelling in the regulatory context

- The **Battery Directive** introduced **registration requirements**, to be adopted into national law, including some general manufacturer and battery type information.
- As continuation of the Battery Directive, the **Battery Regulation** requires several **general information for the label of batteries** as well as clear, understandable, and readable **instructions**.
- Beyond batteries, the **Proposal for Ecodesign for Sustainable Products Regulation** introduces mandatory digital product passport requirements, including general product and manufacturing information.



General battery information in the battery passport

- For the battery passport, the Battery Regulation requires economic operators to identify the **battery, its manufacturing** (manufacturer, place, date), the battery **category, weight, and status**. Except for the status, these information shall be publicly accessible.
- The usage of **unique identifiers**, as introduced by the Battery Regulation and the ESPR, is important for the battery passport, e.g., to unambiguously determine **liabilities and responsibilities for data**.



General battery and manufacturer information can be largely based on standardized reporting such as unique identifiers or manufacturing codes

Battery passport reporting requirements

Battery Regulation Annex VI, part A, reference from Annex XIII, 1(a):

- **Data attributes:** General information about batteries (*as listed on the right side*), also to be printed on the battery label
- **Access:** to the public

Battery Regulation Annex XIII, 4(b):

- **Data attribute:** Information on the status of the battery
- **Access:** to interested persons

Battery Pass assessment and recommendation

Data requirements per Battery Regulation	Battery Pass reporting recommendation	Reasoning / value of the data
Battery identification	Unique battery identifier	Unambiguous identification of an individual battery, its manufacturing, and its corresponding battery passport: ensuring liability, responsibility, and clear attribution of data to the battery passport
Manufacturer's identification	Unique operator identifier	
Manufacturing place (manufacturing facility geographical location)	Unique facility identifier	
Manufacturing date (month and year)	Manufacturing codes	Categories with differing reporting requirements: determination of the battery passport content
Battery category	Category: 'stationary battery energy storage system', (other) 'industrial battery', 'LMT battery', or 'electric vehicle battery'.	
Weight	Weight in kg	
Battery status (<i>'original', 'repurposed', 'reused', 'remanufactured' or 'waste'</i>)	Status: 'original', 'repurposed', 'reused', 'remanufactured' or 'waste')	Basic battery characteristics: key information and required to calculate other data



The carbon footprint is a key policy measure to enable decarbonisation in the value chain through transparency



Accurate product carbon footprints (PCF) are crucial for decarbonisation

- While batteries play a significant role in decarbonising the energy and transport sector, they come along with considerable **embedded carbon emissions**.
- **A uniform calculation methodology** is needed **to create transparency**, enabling informed decisions based on primary data that steer operational measures for life cycle decarbonisation.
- **Existing methodologies and standards leave room for interpretation** and do not provide sufficient guidance.

The carbon footprint in the regulatory context

- There are several **voluntary international standards and initiatives** for PCF reporting. In the EU, the carbon footprint is one environmental indicator within the **Product Environmental Footprint Recommendation** of the EU (PEF).
- The Battery Regulation makes the calculation and reporting of the **battery carbon footprint mandatory at placement on the market** in the EU. A **methodology for calculation and verification** of the carbon footprint will follow the Battery Regulation in form of a **Delegated Act**.



The carbon footprint in the battery passport

- The Battery Regulation requires economic operators to declare the carbon footprint for each battery model per manufacturing plant.
- The results of the carbon footprint declaration must be publicly available via **the battery passport**, as an absolute value and differentiated per life cycle stage.



The Battery Regulation defines specific carbon footprint reporting requirements, reflecting the implementation of the carbon footprint measures

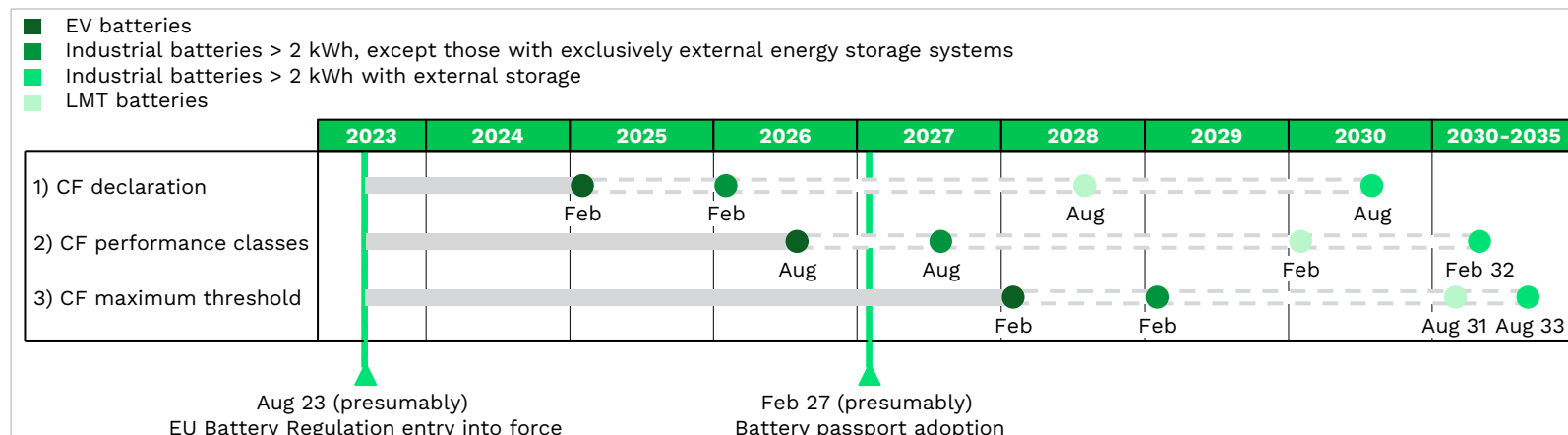
Battery passport reporting requirements

Battery Regulation Annex XIII, part 1, reference to Article 7(1-2)

- **Data attributes:**
 - declared carbon footprint
 - share of battery carbon footprint per life cycle stage
 - carbon footprint performance class
 - web link to public carbon footprint study
 - administrative information about the manufacturer
 - information about the geographic location of the battery manufacturing facility
 - information about the battery model for which the declaration applies
- **Access:** to the public

Carbon footprint timeline

- The CF requirements are implemented in 3 steps (deadline varies for different battery categories):
 - 1) Carbon footprint declaration
 - 2) Carbon footprint performance classes
 - 3) Carbon footprint maximum thresholds (not included in battery passport)
- For EV and industrial batteries w/o exclusively external storage, the CF declaration becomes mandatory before and for LMT batteries and industrial batteries with exclusively external storage after the battery passport adoption
- Only for EV batteries, the CF performance class needs to be reported before battery passport adoption

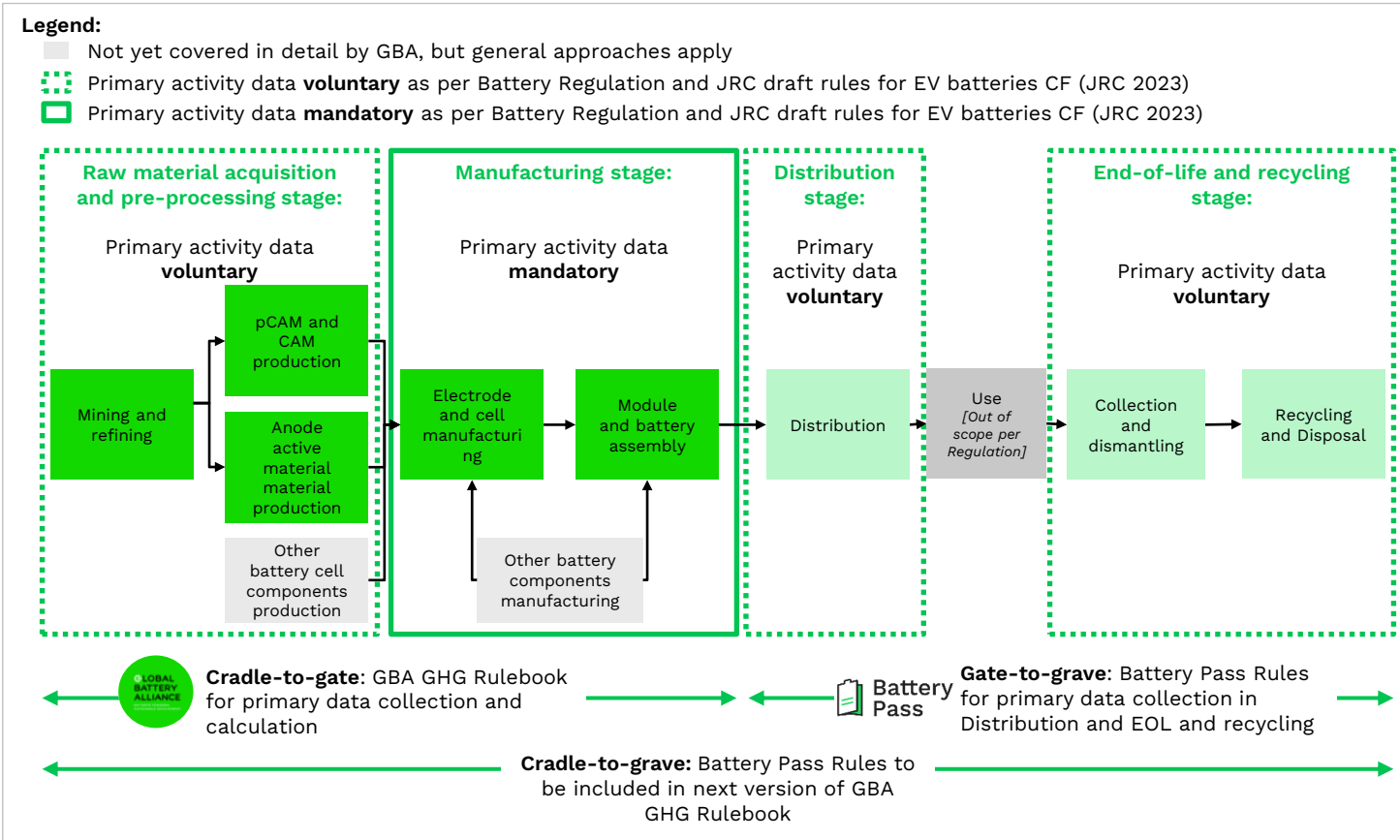


Note: The dates of implementation are based on the Regulation version January 2023, e.g. battery passport to be implemented 42 months after entry into force of the Battery Regulation. If the entry into force date of the Regulation deviates, the implementation dates for the CF measures will shift.

The Battery Pass complemented the Global Battery Alliance's GHG Rulebook recommending to calculate carbon footprints using company-specific data

Battery Pass carbon footprint assessment and recommendation

- **Current developments indicate that primary** (company- or supply chain-specific) data are **only required for the “Main product production / Manufacturing”** life cycle stage which sets the focus of company-specific carbon footprint data on this narrow scope while in other life cycle stages, secondary (i.e., average) data may be used.
- The Battery Pass **consortium recommends calculating** the battery carbon footprint **based on the GBA GHG Rulebook and Battery Pass Rules¹** to provide the data basis for measuring and optimising real-world CFs along the value chain – both documents build on existing standards in compliance with the regulatory requirements and cover the battery life cycle cradle-to-grave based on **guidance and prescriptions for the collection and usage of company-specific data end-to-end.**





Battery due diligence helps to address social and environmental issues in complex battery supply chains



Lack of transparency and regulations to create sustainable supply chains

- Today, battery materials and components are often fraught with **unethical working conditions** (e.g., forced or child labour) and **negative environmental effects** (e.g., water usage and pollution).
- Due to a **lack of supply chain transparency**, downstream suppliers might not appropriately identify and address such risks.
- At the same time, **regulatory requirements** preventing social and environmental issues are falling short.

Due diligence in the regulatory context

- Several legislative initiatives have started to reflect social and environmental supply chain issues in **European** (e.g., EU Supply Chain Due Diligence Directive) and **national** (e.g., German Supply Chain Act) **regulations**.
- On a product level, **the EU Battery Regulation** introduces **battery due diligence obligations** to identify, prevent, and address risks linked to the sourcing, processing and trading of (secondary) raw materials. The requirements span the company's **management system and risk management plan**, e.g., including operating a chain of custody or traceability system.



Due diligence in the battery passport

- For the **battery passport**, the Battery Regulation requires economic operators to make the information indicated in the report on the due diligence policies ("**due diligence report**") available to the **public**.
- Besides this due diligence report, **no additional supply chain due diligence information is mandatory** for the battery passport. Also, a harmonization with due diligence requirements of other regulations is not addressed in the Battery Regulation.



Information of the due diligence report is the only mandatory battery passport data point for responsible supply chains

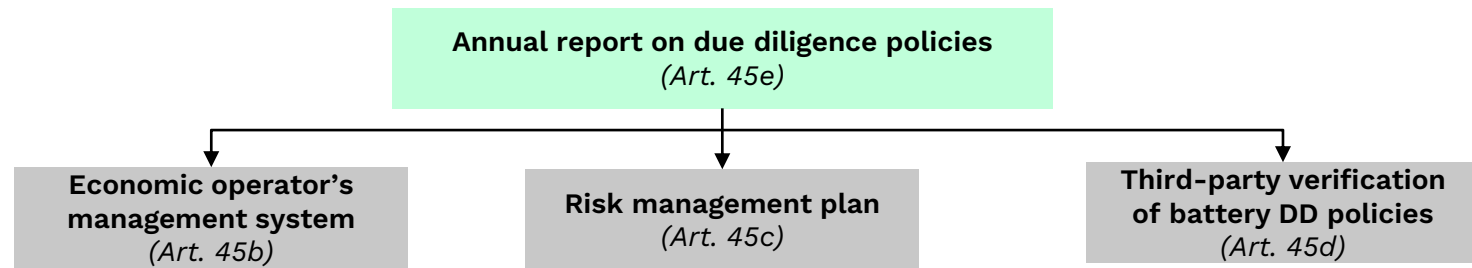
Battery passport reporting requirements

Battery Regulation Annex XIII, part 1, reference to Article 45e(3)

- **Data attribute:** information indicated in the report on the due diligence policies (“due diligence report”)
- **Access:** to the public
- **Action need:** economic operator placing the battery on the market to make the information of the annual due diligence report (valid when placing the battery on the market) available via a PDF (link to company website)

The due diligence report

The due diligence report, made available via the battery passport, shall provide documentation on three main elements (based on the 5-step OECD framework):



Battery Pass recommendations

1. **Harmonise the report with the due diligence requirements of other regulations** (e.g., expand beyond the materials stated in the Battery Regulation, explore synergies of required guidelines/ standards, cover all risk categories)
2. **Ensure additions of the Battery Regulation are covered** (report to also include elaboration on access to information, public participation in decision-making, and access to justice in environmental matters)
3. **Investigate making defined key information of the report** (currently displayed as part of the PDF) **available as individual data points.** Definition of machine readable in the context of the report needed.



Beyond the due diligence report, the Battery Pass consortium recommends exploring voluntary battery passport additions

Beyond requirements

- The due **diligence report is the only mandatory** battery passport supply chain due diligence information
- The Battery Pass consortium recommends exploring **additional voluntary supply chain due diligence information**. This way, transparency, attention and pressure for responsible supply chain practices can be increased.
- In this context, it is therefore recommended to investigate how to make **3rd party assurances, and in the future potentially also supply chain indices and provenance information** available via the battery passport

Battery Pass recommendation: voluntary due diligence additions

The Battery Pass consortium explored potential meaningful additions to the battery passport. While a value for the addition exists, open questions remain to be discussed.

3rd party supply chain assurances (e.g., certifications)

- Can enable companies to engage with others on sustainable practices and enhance risk identification
- For the battery passport, they could allow for differentiation and making sustainability-related claims
- Assurances (and their key information) made available via the battery passport should be recognized under the Battery Regulation, be credible, and of high quality

Supply chain indices (Global Battery Alliance)

- Subsequently to the risk-based due diligence approach of regulations, the focus should shift to accelerating positive impacts through supply chain practices of companies
- The GBA develops ESGE+ indices, allowing to score and benchmark sustainability performance
- A developed reporting framework could be made available via the battery passport

Provenance (material source location)

- Transparency on provenance is increasing with attention to conflict-affected and high-risk-areas, allowing to better monitor practices, identify risks, and implement corrective measures
- In case of a regulatory obligation to unveil the provenance, it could be made available via the battery passport, ideally linked to additional information such as 3rd party assurances



Battery material and composition information is key for logistics, dismantling, and recycling companies as well as consumers



Material information for safe handling and informed decisions

- With the emergence of **various battery chemistries** (e.g., Li-ion, Lead-acid, solid-state batteries), it has become increasingly challenging for actors to effectively manage the variety of batteries.
- Several value chain participants such as **logistics, sorting, dismantling and recycling companies** find it increasingly difficult to e.g., assess safe transport requirements, define a battery's value, choose appropriate handling routes, and accurately calculate recycling efficiencies etc.
- In addition, also the **end-consumer** lacks transparency for informed purchasing decisions.

Materials and composition in the regulatory context

- Today, the European **chemicals legislation** is one of the strictest globally and relevant for battery labelling, (hazardous) substance classification and authorization (e.g., CLP, REACH, SCIP).
- The **Battery Directive** required chemical and separate collection symbols on the label of batteries. **The new Battery Regulation** extends these labelling requirements.
- Beyond regulation, e.g., the automotive industry material data system **IMDS** and the **Global Automotive Declarable Substance List** process information on a substance level.



Materials and composition in the battery passport

- For the battery passport, the Battery Regulation requires economic operators to specify the **general and detailed composition, hazardous substances and their impact, as well as key symbols and their meaning**.
- The information shall be accessible to the **public** - only **materials on cell level have restricted access**.
- The Battery Pass suggests aligning the battery passport reporting on materials and composition to **already established formats** (e.g., standardised identifiers such as CAS numbers).



Information on battery chemistry and critical raw materials shall be made available to the public, the detailed composition also to interested persons

Battery passport reporting requirements

Battery Regulation Annex VI

- **Data attributes:**
 - Battery chemistry
 - Critical raw materials contained above 0.1% weight by weight
- **Access:** to the public

Battery Regulation Annex XIII, 2(a)

- **Data attribute:** Materials used in the cathode, anode, and electrolyte
- **Access:** to interested persons

Battery Pass assessment and recommendation

Requirements per Battery Regulation	Battery Pass reporting recommendation	Reasoning / value of the data
Battery chemistry	Specify chemistry as composition in general terms: cathode and anode active material and electrolyte	Indication for, e.g., logistic companies and consumers on key battery differences, such as safety, lifespan, performance, recycling, and reuse
Critical raw materials	List all critical raw materials above 0.1% weight by weight	Awareness and monitoring of critical raw materials
Detailed composition, incl. materials used in cathode, anode, and electrolyte	Materials above 0.1% weight by weight in anode, cathode, and electrolyte <ul style="list-style-type: none"> • Name materials (public standards) • Related identifiers (CAS numbers) • Weight in grams 	Enable second life operators such as sorters, dismantlers, and recyclers to assess the value of a battery, decide on the handling route, ease recycling processes, and allow a fraud-free and accurate calculation of recycling efficiencies and recycled content



Information on hazardous substances and their potential impact ensures safe and efficient second-life and end-of-life operations

Battery passport reporting requirements

Battery Regulation Annex VI, part A:

- **Data attribute:** Hazardous substances [...] other than mercury, cadmium or lead
- **Access:** to the public

Battery Regulation Annex VI, part B; Article 13(3):

- **Data attribute:** Separate collection symbol
- **Access:** to the public

Battery Regulation Article 13; Article 60:

- **Data attributes:**
 - Symbol for cadmium if +0.002% cadmium
 - Symbol for lead if +0.004% lead
 - Impact of substances, in particular hazardous substances on the environment, human health, or safety of persons, including impact due to inappropriate discarding of waste batteries such as littering or discarding as unsorted municipal waste
 - Meaning of the labels and symbols marked on batteries [...] or printed on their packaging or in the document accompanying batteries
- **Access:** to the public

Battery Pass assessment and recommendation

Requirements per Battery Regulation	Battery Pass reporting recommendation	Reasoning/value of the data
Hazardous substances other than mercury, cadmium or lead	Hazardous substances, suggested above 0.1% weight by weight <ul style="list-style-type: none"> • Substance name (e.g., IUPAC or chemical name) • Hazard classes/categories • Related identifiers (CAS number) • Location of the substance • Concentration range in % 	Fulfill health and safety obligations <ul style="list-style-type: none"> • Ensure safe and improved 2nd life and end-of-life operations such as recycling and dismantling. • Provide key safety information also to end-users
Impact of substances on environment, human health, safety, persons	Impact of substances (aligned with CLP hazard classes) via common hazard statements	
Symbol for cadmium (Cd) if +0.002%	Symbol for cadmium (Cd)	
Symbol or lead (Pb) if +0.004%	Symbol for lead (Pb)	
Symbol for separate collection	Separate collection symbol	Ensure batteries are sent to separate collection facilities for recovery and recycling
Meaning of labels and symbols	Explanation of meaning of all battery's symbols and labels	Ensure comprehensibility



Circularity strategies enable secure and sustainable access to critical battery raw materials in light of demand and supply discrepancies



Circular economy strategies to meet increasing battery (material) demand

- Circular economy strategies enable **secure and sustainable access to critical battery raw materials** by reduction and optimization of material demand, expanding material lifetime/use, and high-quality recycling.
- Today, however, batteries are **rarely designed keeping repairability or replaceability in mind**.
- In 2020, only **47%** of all portable batteries and accumulators sold in the EU were **collected for recycling**.

Battery circularity in the regulatory context

- Circular (battery) design, only scarcely addressed in the Battery Regulation, is taken up by the ESPR, introducing **circular design parameters**.
- To improve recycling, the Battery Regulation introduces **collection and recycling rates** for all batteries. For increased recovery of raw materials, **recycled content** shares, recycling efficiencies, and material recovery rates are defined.
- Via **end-of-life instructions**, the Battery Regulation aims at better informing the end-user on the separate disposal and collection of waste batteries.



Circularity in the battery passport

For the battery passport, the Battery Regulation requires different circularity and resource efficiency information:

- 1) **Battery removability and replaceability:** Dismantling information, information on spare parts and suppliers, safety measures
- 2) **Recycled content** share for cobalt, lead, lithium, nickel
- 3) **Renewable content** share
- 4) **Waste management:** Information on separate disposal of waste batteries, on take-back and collection points



Removability and replaceability: battery removal and disassembly information should be complemented by additional design information and be provided as manuals

Battery passport reporting requirements

Battery Regulation Annex XIII (2 (b-d)):

- **Data attributes:**
 - Dismantling information
 - Part numbers for components and sources for replacement spares
 - Safety measures
- **Access:** to interested persons & Commission

Battery Regulation Annex VI, Part A (9):

- **Data attribute:** Usable extinguishing agent
- **Access:** to the public

Battery Pass assessment and recommendation

- The Battery Pass consortium suggests **providing the dismantling information** required by the EU Battery Regulation **as part of two manuals:**
 - Manual for the removal of the battery from the appliance
 - Manual for disassembly of the battery pack
- Besides the dismantling information required by the Battery Regulation, the Battery Pass consortium advises to integrate the below information in the 'Manual for disassembly of the battery pack'
 - type of construction of battery pack, modules, and cells
 - format and dimensions of battery cells, modules and pack
 - orientation of the battery cells
 - replaceability of modules and cells
 - characteristics of joints, screws, and fasteners
 - fillings, if used
 - casing
- It is suggested **to provide the two manuals, the part numbers and suppliers for components and the safety measures (instructions) as URL linking to pdf**
- Furthermore, it is recommended that the **information on the usable extinguishing agent** refers to **classes of extinguishers** (A, B, C, D, K)



Recycled content: calculating the shares for cobalt, lithium, nickel, and lead is required, distinguishing between pre- and post-consumer waste recommended

Battery passport reporting requirements

Battery Regulation Annex XIII (1), Article 8

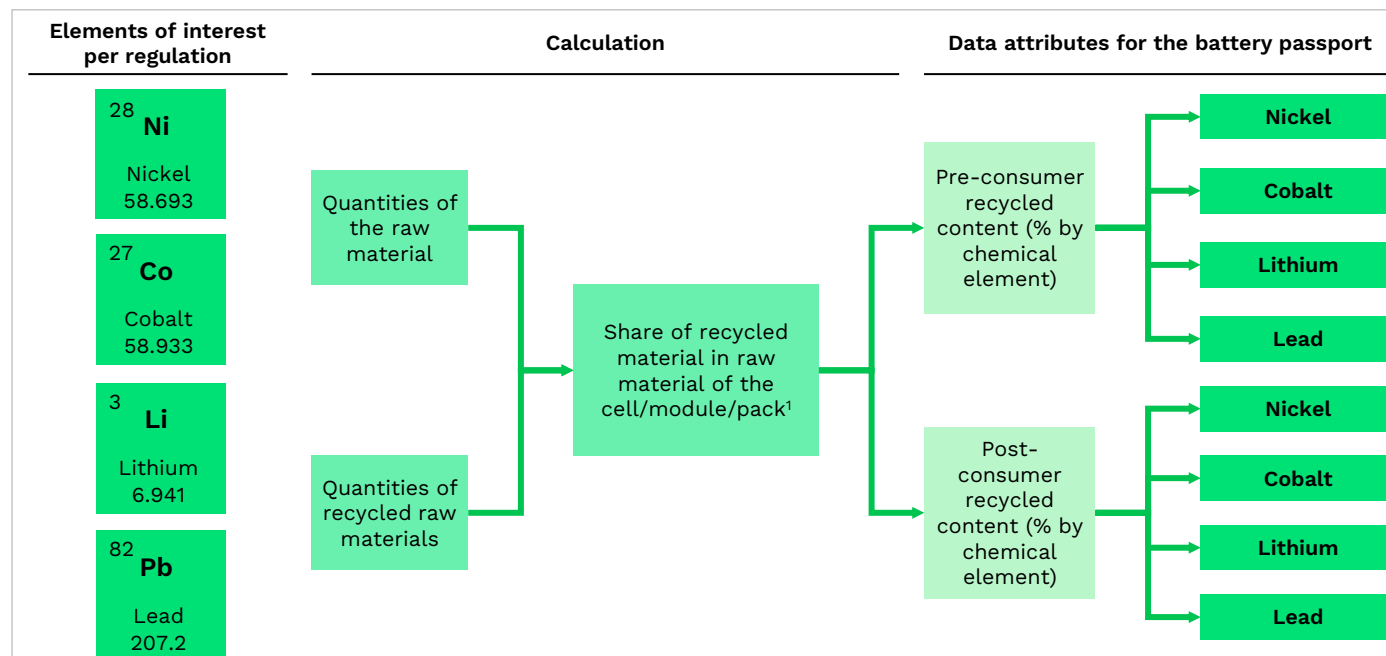
- **Data attributes:**

- Recycled content (share of cobalt, lithium, and nickel recovered from battery manufacturing waste or post-consumer waste present in active materials, and the share of lead recovered from waste present in the battery) for each battery model per year and per manufacturing plant
- Renewable content share

- **Access:** to the public

Battery Pass assessment and recommendation

The Battery pass consortium suggests to calculate and declare the **recycled content** shares from **pre-consumer waste** and **post-consumer waste** of cobalt, lithium, nickel and lead, **separately**. This results in 8 data attributes to be reported for the passport.



¹ The share of recycled material in raw material is calculated for the individual cell, the module or the battery pack. Pre- and post-consumer recycled content refers to the average content on the battery pack level.



Informing end-users on the appropriate and available waste management of used batteries is key to enable recycling

Battery passport reporting requirements

Battery Regulation Article 60 (1a-c):

- **Data attributes:**
 - Information on the role of end-users in contributing to waste prevention
 - Information on the role of end-users in contributing to the separate collection of waste batteries
 - Information on the separate collection, take-back and collection points, preparing for re-use, preparing for repurposing, and recycling operations available for waste batteries
- **Access:** to the public

Battery Pass assessment and recommendation

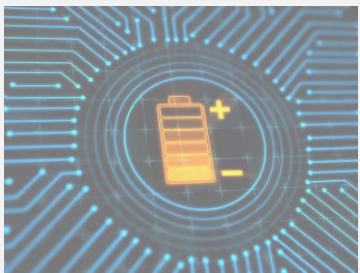
- The respective information mentioned in *Article 60 (1a-c)* should be provided in the battery passport as **URL linking to pdf**.
- Waste batteries shall be discarded in **designated separate collection points** (*Article 60 (1b)*).
- Producers/producer responsibility organizations shall install **take-back and collection points** as well as provide end-users with **corresponding information**.
- **Good practices and recommendations** concerning the use of batteries aiming at extending their use-phase should be developed and be provided to end-users.

Excursus: Value of recycling traceability information for a circular economy

The Battery Regulation emphasizes the need for high collection and recycling of waste batteries, though end-of-life information is currently not required in the battery passport. Tracing recycling information connected to the original battery ID could be valuable in terms of sustainability and reduce the need for primary materials. However, this goal requires careful consideration of how material flows can be traced, especially when a battery has been dismantled into components. This touches on the scope and system boundaries of the battery passport as defined in the Battery Regulation.



Performance and durability information of batteries facilitates a comparison of batteries at purchase and the determination of the value for a second life



Battery performance and durability information is only scarcely shared so far

- Today, **little information on the performance and durability of batteries is shared** between the actors of the value chain. Equally, very **few standards** for the evaluation of performance and durability batteries exist.
- Therefore, at purchase, the **comparability of batteries is limited**. At the same time, the **determination of the residual value** of a battery and its usability in a second-life is hampered.

Performance & durability in the regulatory context

- Per Battery Regulation, several data attributes must be reported in **a document accompanying the battery and the Battery Management System (BMS)**, if in place.
- Batteries will have to **follow minimum requirements on performance and durability**, as to be specified by Delegated Acts of the Battery Regulation.
- In addition, EV batteries will be covered in the upcoming **Euro 7 legislation**.



Performance & durability in the battery passport

Battery passport requirements originate from Articles 65, referring to Articles 10 and 14 and Annexes XIII, IV, and VII.

- 1) Relevant parameters listed in **Annex XIII(1) and (4)**
- 2) The values referred to in **Article 10(1) for LMT batteries, rechargeable industrial batteries with a capacity above 2 kWh, and EV batteries** when the battery is placed on the market and when it is subject to changes in its status
- 3) Information pursuant to **Article 14 for stationary battery energy storage systems, LMT batteries and EV batteries that use a BMS**



Around 40 performance and durability data attributes are required for the battery passport, while detailed descriptions are falling short in the Battery Regulation

Battery passport reporting requirements

Battery Regulation Articles 10, 14 and Annexes IV, VII and XIII

- **Data attributes:**
 - ~40 separate data attributes
Several mandatory data attributes are specific to battery categories (not mandatory for entire battery passport scope)
 - Distinction into static (pre-use) and dynamic (in-use) data; Performance and durability includes most dynamic data attributes of the battery passport
- **Access:** varies between data attributes¹

Battery Pass assessment and recommendation

- The different data attributes were bundled into **content clusters**.
- These consist of **several static and dynamic** data attributes (for an overview see details on next slide).
- Most data attributes **lack a detailed description**, complicating their understanding.
- In addition, **only few standards for evaluation conditions exist**, that are needed to enable the comparison among different batteries.
- The **implementability of data attributes** for different battery categories and designs (High-T, redox-flow) is a major issue for further considerations.

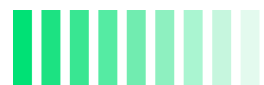
Performance & durability content clusters

Performance

- Capacity, Energy, SoH, Voltage
- Power capability
- Round trip efficiency, self discharge
- Internal resistance

Durability

- Expected lifetime
- Temperature conditions
- Negative events



Outlook

While the content-focused work of the Battery Pass concludes for the time being, select related elements will be considered over the coming months

1.

Update of the Content Guidance

Update and extension of the Content Guidance based on further regulatory processes as well as new insights from the technical and use case work packages during the next year

2.

Recommendations to the European Commission

Provision of recommendations to the European Commission (e.g., in form of a position paper) regarding unclarities in the regulatory text

3.

Involvement in secondary legislation process

Exploration and assessment of possibilities for Battery Pass to get involved in the secondary legislation process (Delegated and Implementing Acts) contributing expertise

4.

Knowledge sharing with other organisations

Support and collaboration with other organisations and initiatives to build on Battery Pass results for complementing purposes (e.g., standardisation efforts)

5.

Handover to other Battery Pass work packages

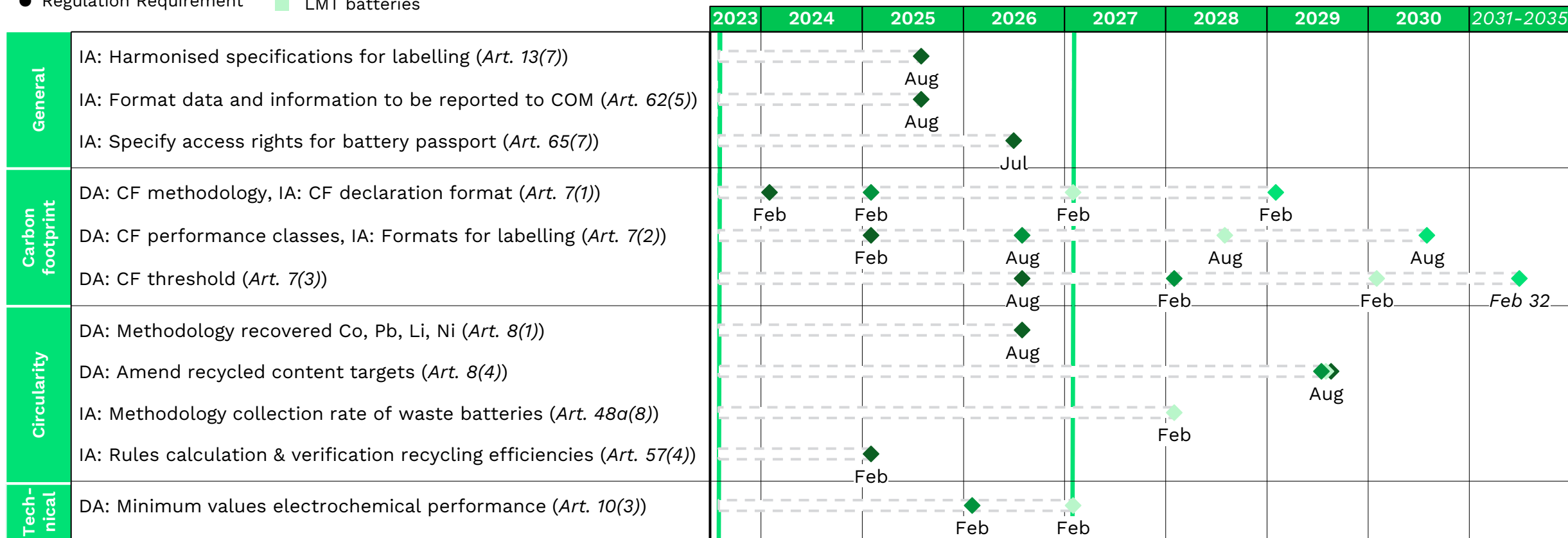
Integration of content-related results into the development of a technical guidance, a demonstrator and the qualitative and quantitative value assessment of the passport

Secondary legislation on the battery passport will continue during the decade

Legend:

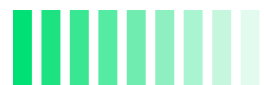
- ◆ DA: Delegated Act
- ◆ IA: Implementing Act
- Regulation Requirement
- EV batteries
- Industrial batteries > 2 kWh, except those with exclusively external energy storage
- Industrial batteries > 2 kWh with external storage
- LMT batteries

Not exhaustive¹



Aug 23 (presumably)
EU Battery Regulation entry into force

Feb 27 (presumably)
Battery passport adoption



Sources

Sources

The work builds on the newest version of the EU Battery Regulation:

European Commission (2023)a: *Proposal for a Regulation of the European Parliament and of the Council concerning batteries and waste batteries*, repealing Directive 2006/66/EC and amending Regulation (EU) No 2019/1020, accessible via https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CONSIL:ST_5469_2023_INIT&from=EN, last accessed 06.04.2023

All other sources used in this presentation are listed in the following in the order that they appear:

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