

Digital Battery Passports: An Enabler for Sustainable and Circular Battery Management

BRIEFING PAPER
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- The European Union, China and multistakeholder initiatives, such as the [Global Battery Alliance \(GBA\)](#) or the [Battery Pass consortium](#), are driving the development of a digital battery passport to increase transparency and enable sustainable and circular value chains.
- The EU Battery Regulation mandates comprehensive content requirements for the digital battery passport, including general battery and manufacturer information, compliance and certifications, carbon footprint, supply chain due diligence, battery materials and composition, circularity and resource efficiency, and performance and durability.
- Following the 2023 revision of the EU Battery Legislation, the Chinese government launched the development of a Chinese digital battery passport. The aim is to facilitate trade with the EU, by requiring similar data transparency requirements along the EV battery value chain in China, such as the carbon footprint, circularity, and ESG.
- Policy-makers can scale digital battery passports globally by standardizing reporting parameters and technical frameworks, integrating with existing systems and initiatives, and advancing and supporting industry action.



Digital battery passports can increase transparency and enable sustainable and circular value chains

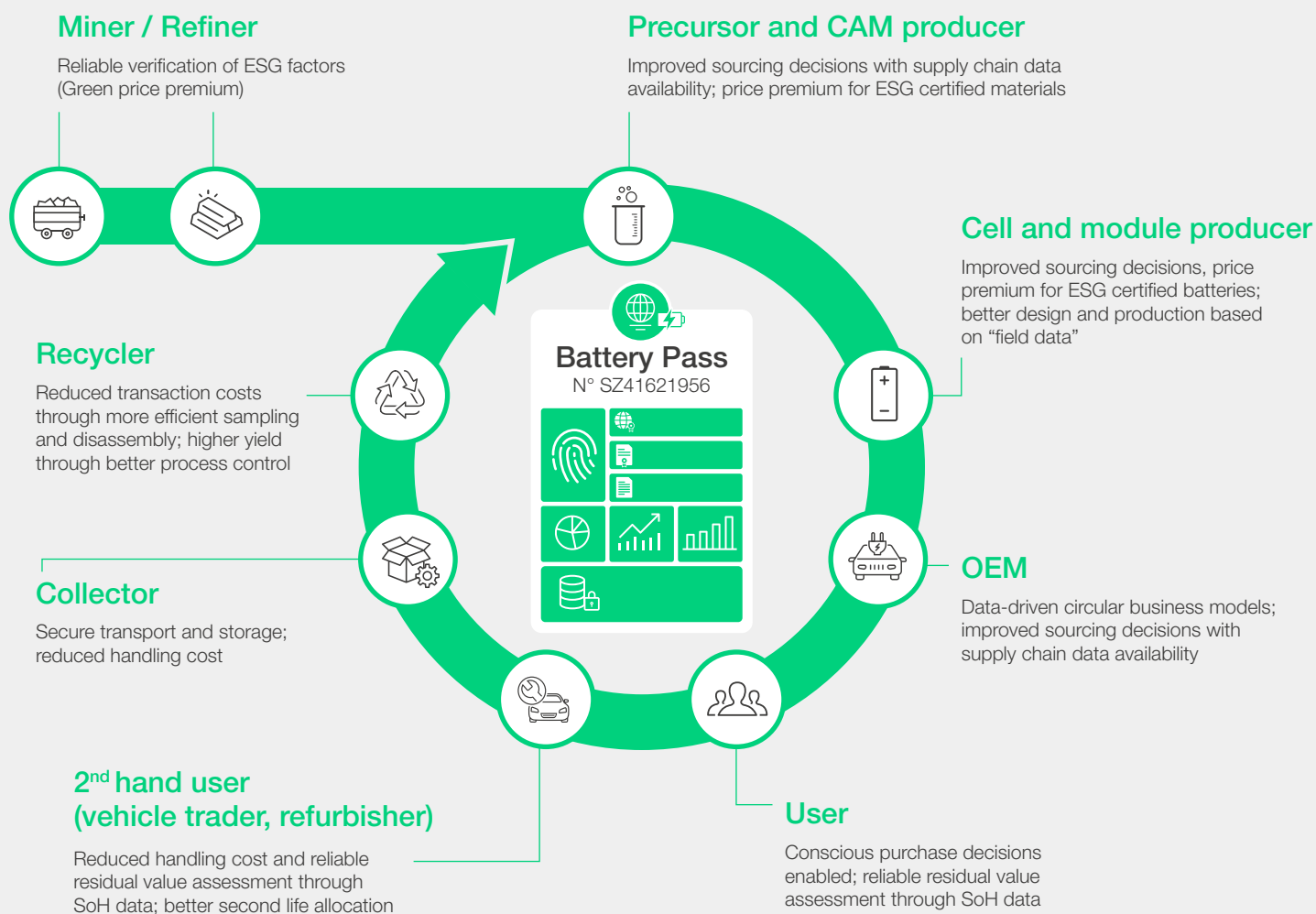
Batteries play a critical role in the shift towards low-carbon transportation and renewable energy. The circular and sustainable management of electric vehicle (EV) traction batteries is essential for meeting the Paris climate goals, achieving resource decoupling and sovereignty, and ensuring sustainable prosperity. To achieve this, a systemic approach is necessary that includes responsible material sourcing, efficient production, and effective second-life and end-of-life processes.

The European Commission requires the introduction of digital product passports as part of the Ecodesign for Sustainable Products Regulation (ESPR). For batteries specifically, a digital battery passport is included in the EU Battery Regulation.

The passport will document and exchange comprehensive data along the entire battery value chain through a digital infrastructure. This information will enable the design of production and value creation processes according to sustainable and circular principles and facilitate informed consumer decisions.

Ultimately, the life cycle of the entire battery system should be extended through cascaded use, and recycling of the raw materials and components should be promoted at the end of the life cycle. Improved data availability is also expected to reduce costs for circular business models throughout the battery's life cycle. The digital battery passport will make data accessible to defined actors throughout the value chain, enabling process improvements, transparency needed to ensure sustainable supply chain practices, and the development of circular business models (see Figure 1).

FIGURE 1 The digital battery passport will unlock major value to industry and society alike



The European Union is driving the development of a digital battery passport

In the European Union, digital product passports are becoming a central instrument to increase the sustainability and circularity of products.

- **[Ecodesign for Sustainable Products Regulation \(ESPR\)](#)**: The EU's Sustainable Products Initiative (SPI), launched in March 2022, includes the Proposal for Ecodesign for Sustainable Products Regulation (ESPR). The regulation will require ecodesign requirements for a wide range of products sold in the EU and mandate the use of digital product passports. These passports will be connected to unique product identifiers and be physically present on the product, packaging, or accompanying documentation. Information included in the passports will be based on open standards, machine-readable, structured and searchable. Product-specific requirements will be detailed in delegated acts. This regulation provides a policy framework for the widespread adoption of digital product passports to enable the transition to a circular economy.
- **[2023 EU Battery Regulation](#)**: The new EU Battery Regulation is groundbreaking, as it is the first legislation to cover the entire life cycle of a product. This regulation replaces the Battery Directive 2006/66/EC and amends regulation 2019/1020. Its comprehensive requirements include transparency on the carbon footprint, metal-specific recycling rates, recycled content quotas, supply chain due diligence obligations, and minimum durability and performance requirements. Additionally, the regulation introduces the digital battery passport, the first of the European digital product passports. In December 2022, the European Parliament and Council reached a provisional agreement on the regulation, which will take effect in the coming months. The Regulation was approved by the EU Parliament in June 2023 and now awaits formal endorsement by the Council before its entry into force.

Minimum requirements for the EU battery passport

According to the EU Battery Regulation, several requirements apply to battery digital passports. This section draws on the [insights](#) from the [Battery Pass consortium](#), which works to advance the implementation of the battery passport in accordance with the requirements of the EU Battery Regulation and beyond.

When will the requirement for a digital battery passport apply?

The digital battery passport will be required 42 months after the EU Battery Regulation will enter into force.

Which batteries fall under the requirement?

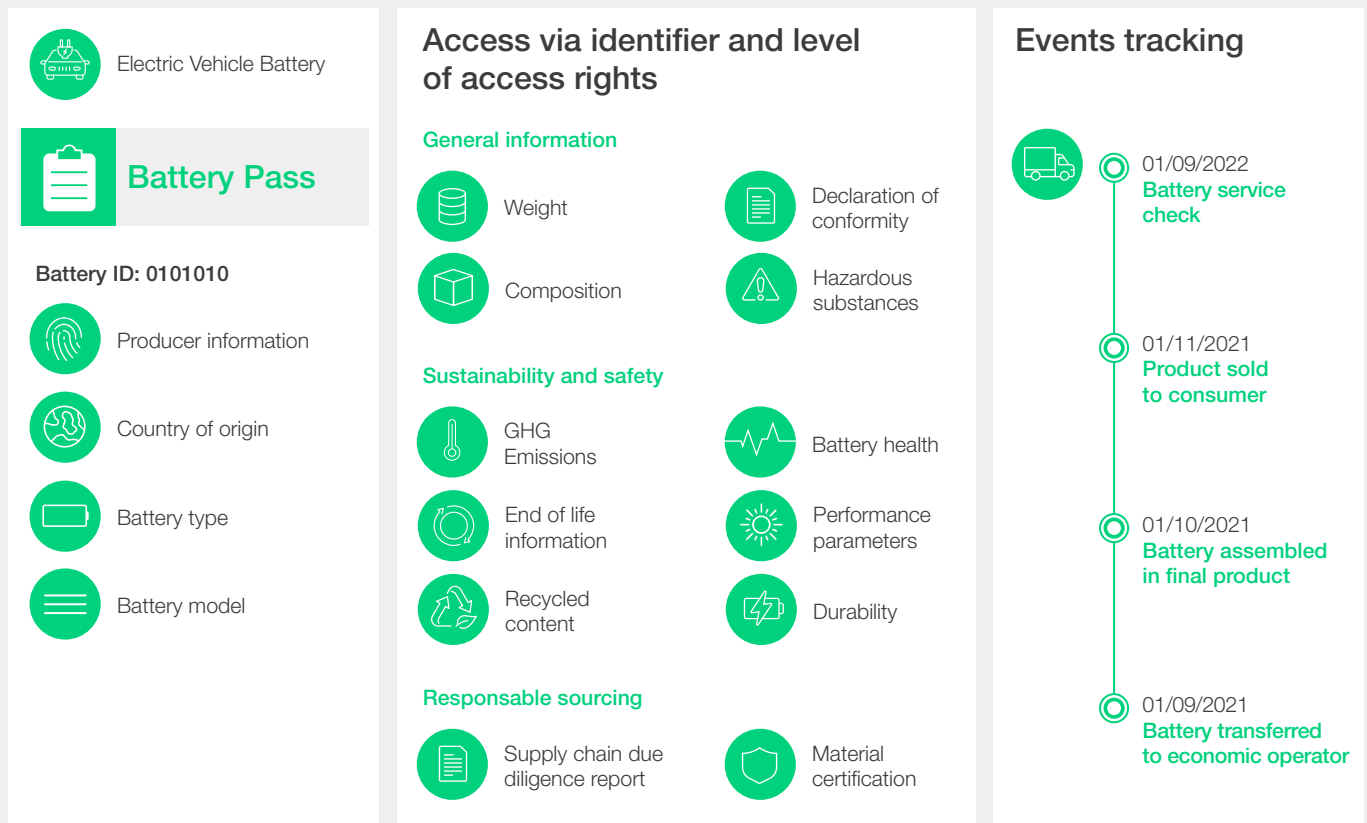
The digital battery passport will be required for all light means of transport batteries, industrial batteries above 2 kWh, and EV batteries placed on the market or put into service.

What type of data will need to be included?

The EU Battery Regulation includes a comprehensive set of information that needs to be made available in the digital battery passport (Article 65 and Annex XIII). According to the Battery Pass consortium, the required mandatory data points can be grouped into the following content clusters (see Figure 2):

- **General battery and manufacturer information**: Battery identification; manufacturer's identification; manufacturing place; manufacturing date; battery category; battery weight; battery status.
- **Compliance, labels, certifications**: Separate collection symbol; symbols for cadmium and lead; carbon footprint label; meaning of labels and symbols; EU declaration of conformity and its ID; compliance of test results.
- **Battery carbon footprint**: 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.
- **Supply chain due diligence**: Information on responsible sourcing as indicated in the report on due diligence policies (the due diligence report is the only mandatory supply chain due diligence requirement for the digital battery passport).
- **Battery materials and composition**: Battery chemistry; critical raw materials; materials used in the cathode, anode, and electrolyte; hazardous substances; impact of substances on the environment and on human health or safety.
- **Circularity and resource efficiency**: Design for circularity information (i.e. disassembly and dismantling information, spare parts information; safety instructions); recycled and renewable content (i.e. recycled content for cobalt, lithium, nickel, and lead; renewable content share); end-of-life battery information (i.e. information on waste prevention and collection).
- **Performance and durability**: Battery performance reporting (e.g. battery capacity, energy round trip efficiency), durability data (e.g. expected lifetime in cycles/calendar years).

FIGURE 2 Mandatory reporting requirements for the EU battery passport



Source: Battery Pass Consortium, 2023

Who is primarily responsible and respectively liable?

The starting point for responsibility is the economic operator concept (Article 2,1(19)). In the specific case of the digital battery passport, this initial range of possible economic operators is limited to some extent by the activities of “placing a battery on the market” or “putting it into service” (Article 65(1)).

In most cases, the economic operator is the manufacturer, if the battery is placed on the market from within the EU, or the importer if the battery is placed on the market from outside the EU. In specific cases, however, other actors, such as distributors may also be considered economic operators. At present, it is unclear if prototypes for safeguarding and test batteries in research are subject to this activity and therefore would require a digital battery passport.

What are the responsibilities related to the digital battery passport?

The economic operator is responsible to:

- attribute a unique identifier that is linked to the QR code that the battery is marked with to make the digital battery passport accessible (Articles 65(3), 13(5) and (6)).

- ensure that the information in the digital battery passport is accurate, complete and up to date (Article 65(4)).
- store the data included in the digital battery passport (Article 65a©).

For the second and third responsibilities, the economic operator placing the battery on the market is explicitly allowed to authorize another operator “to act on their behalf” (Articles 65(4) and Article 65a(c)).

When is the responsibility/liability transferred to another actor (transfer cases)?

There are two cases in which the responsibility for the digital battery passport can be transferred from one economic operator to another (Article 65(6a)):

- If a battery has been subject to preparation for re-use, preparation for repurpose, repurposing or remanufacturing, the responsibility is transferred to the new economic operator.
- If the battery status changes to “waste”, the responsibility is transferred to either the producer or a producer responsibility organization.

What are the consequences in case of non-compliance?

The Battery Regulation suggests that EU Member States' market surveillance authorities are responsible for investigate and enforce compliance with the EU Battery Regulation (*Recital 93*). This is in line with the responsibility of Member State's market surveillance authorities to ensure that only compliant products that fulfil EU requirements are made available on the European market.

Digital Battery Passport Developments beyond the European Union

The digital battery passport concept is gaining traction globally, with different initiatives being implemented in various regions:

– China:

In 2018, China passed the [Interim Provisions on Traceability Management of Power Battery Recycling in New Energy Vehicles](#), which mandates information at all stages from cell manufacturers, automotive OEMs and recyclers to determine recycling effectiveness. In the same year, a traceability system was introduced that collects information on maintenance, battery retirement, recycling and reuse, but does not include carbon footprint data yet. Following the passing of the EU Battery Legislation, the Chinese government launched the development of a Chinese digital battery passport. The aim is to facilitate trade with the EU, by requiring similar data transparency requirements along the EV battery value chain in China, such as the carbon footprint, circularity, and ESG.

– United States:

In the US, recent initiatives promote supply chain localization, such as the [US Inflation Reduction Act](#), and increase the importance of provenance data for battery materials and components. To facilitate the implementation of this act, some form of product passport or traceability system will likely have to be mandated by US regulators.

– Multistakeholder and international initiatives:

The [Global Battery Alliance \(GBA\)](#), for instance, aims to shape the global implementation of the battery passport concept through a multistakeholder approach. In 2023, the GBA established a proof of concept that includes technical parameters, greenhouse gas reporting based on a rulebook developed by the GBA, and information on child labour and human rights, based on specifically developed indices. Funded by the German Federal Ministry of Economic Affairs and Climate Action, the [Battery Pass consortium](#) aims to develop content and technical standards for a digital battery passport and to demonstrate them in a pilot project. [Catena-X](#) is another initiative that links automotive players globally to develop a standardized global common data governance principle.

Recommendations: Harmonizing transparency requirements around the globe

The digital battery passport has the potential to increase transparency across the battery value chain by collecting, exchanging, collating and reporting trusted data across the EV battery value chain. Given the global nature of the EV battery value chain, collective approaches are needed to shape the future of the battery passport. Policy-makers from China, the EU and the US can scale battery passports globally by:

- **Introducing digital battery passports globally:** While policy-makers in China and the EU are working towards implementing digital battery passports, other countries, such as the US, should follow suit to enable the global roll-out of digital battery passports and increased transparency of EV battery value chains globally.
- **Standardizing reporting parameters and technical frameworks:** While countries work to implement digital battery passports, there is a risk that solutions will be fragmented, hindering trade globally. Policy-makers should build on existing global initiatives, such as the EU battery passport standards, to harmonize digital battery passport requirements. This should span harmonizing both content requirements and technical requirements to ensure that digital battery passports are consistent, accurate and accessible to all stakeholders in the value chain.
- **Integrating with existing systems and initiatives:** Policy-makers should work to integrate digital battery passports with existing compliance requirements, such as sustainability reporting frameworks, product labelling schemes, or due diligence obligations. This can help streamline implementation and promote consistency and compatibility. At the same time, integration with existing reporting systems, such as the [IMDS](#) in the automotive industry or the [SCIP](#) database should be aimed for. This will make it easier for businesses and organisations to implement digital battery passports and will help to ensure that information on the sustainability of EV batteries is accessible and usable for stakeholders throughout the supply chain.
- **Advancing and supporting industry action:** Policy-makers should support and advance practical harmonization and implementation by multistakeholder efforts, such as those led by the [Battery Pass](#) consortium or the [GBA](#). Possible measures to support digital battery passport development and implementation could include providing R&D funding, supporting knowledge sharing and capability development initiatives, as well as targeted skill development and training.

Contributions

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