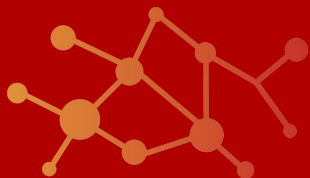# Building a technical ecosystem for digital product passports

4TheRecord

A DPP Consulting Agency

VCI Digital Product Passport Workshop
10. September 2024, Frankfurt

Dr. Susanne Guth-Orlowski

About 4TheRecord - Consulting Agency for Digital Product Passports

Services:

- DPP Business Strategy
- Battery Regulation and Ecodesign for Sustainable Products Regulation Expertise
- (Decentralised) Implementation Concepts

Customers

Advisory

Standardisation

- Stand.ICT Landscape Report for Digital Product Passports
- CEN/CENELEC Standardisation Request Ad-hoc Group
- CEN/CENELEC Standardisation of a DPP System (JTC24)

Learning from Frontrunners

Learning from the Battery Industry

Dr. Susanne Guth-Orlowski

10-steps to introduce and maintain a DPP for a given product segment - Regulator View

1. **Impact Analysis:** Identify or reconfirm product-specific environmental and social negative impact.
2. **Mitigation Plan:** Identify and describe in detail the countermeasures, procedures, and processes to reduce the negative impact and prioritise them.
3. **Regulation Phase - Data & Audit needs:** Identify the data that is required to implement and measure the above-mentioned impact as well as countermeasures, procedures, and processes.
4. **Value Chain Analysis:** Analyse and understand the product-specific value chain with all actors.
5. **Data sources:** Identify which actor can provide which (parts of the) data which has been defined in step 4.
6. **Existing IT infrastructure:** Identify the already existing infrastructure and preferred IT technology stacks, identification schemes, vocabularies, etc.
7. **Business needs:** Understand what needs the supply chain actors have. E.g Business Confidentiality.
8. **Explore existing Ecosystem:** Identify and engage existing industry consortia that are capable of discussing the DPP requirements, share best practices, and further develop technical standards.
9. **Establish missing ecosystem, identify stakeholders:** Form new alliances, make the industry fit for the DPP.
10. **Build the DPP:** Define the final digital product passport content, the sources and recommendations for delegated acts. Kick of the required Standardisation activities.
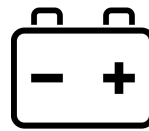
10-steps in the Battery Case
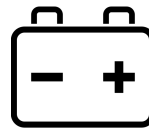
1. Impact Analysis - Example Issues: Land use (Cobalt / Lithium mining), Child Labor (in mining), Disposal of battery material.
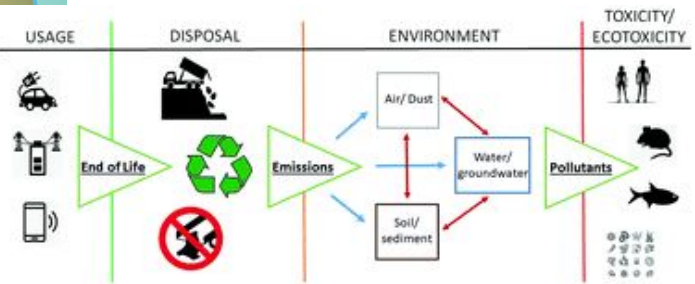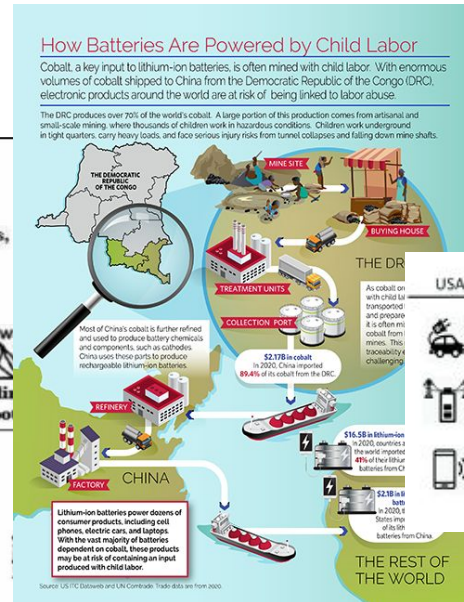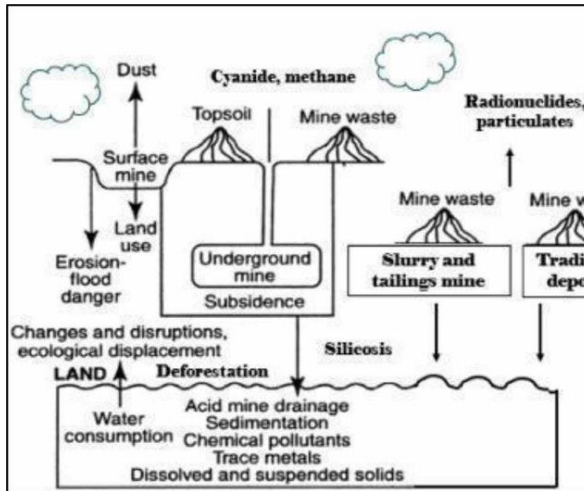
10-steps in the Battery Case

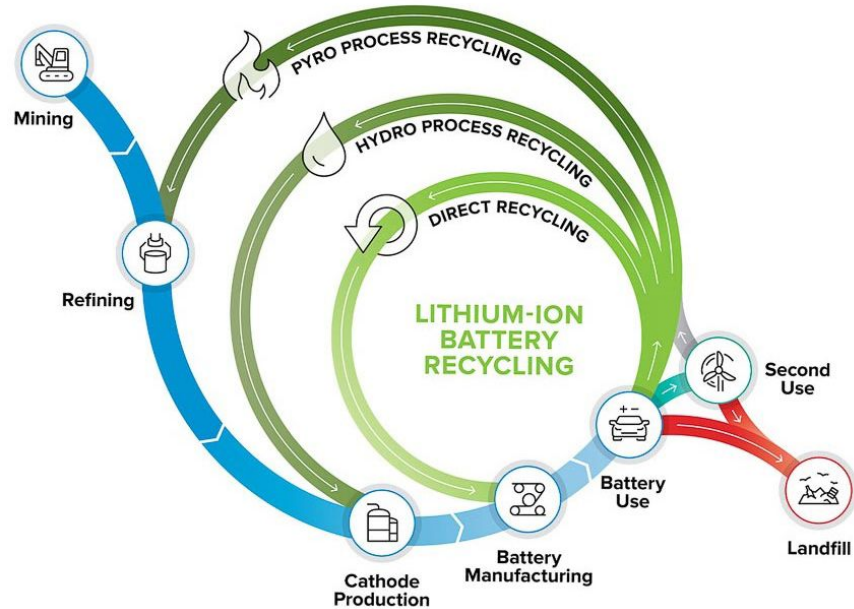## 2. Mitigation Plans:

- Incentivise alternative chemistry,
- Supplier (Mine Site) Certifications,
- Enable & incentivise R-Strategies
  - reuse,
  - repair,
  - repurpose,
  - recycle,
  - etc.

LITHIUM-ION BATTERY RECYCLING

PYRO PROCESS RECYCLING

HYDRO PROCESS RECYCLING

DIRECT RECYCLING

Mining · Refining · Cathode Production · Battery Manufacturing · Battery Use · Second Use · Landfill

10-steps in the Battery Case
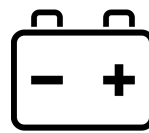
3. Regulation Phase: (Battery Regulation was created and defines requirements)
Define data, audit / data assurance needs - Examples: Due Diligence Certification (e.g. IRMA, CERA, TSM, etc.),

10-steps in the Battery Case - Supply Chain Transparency
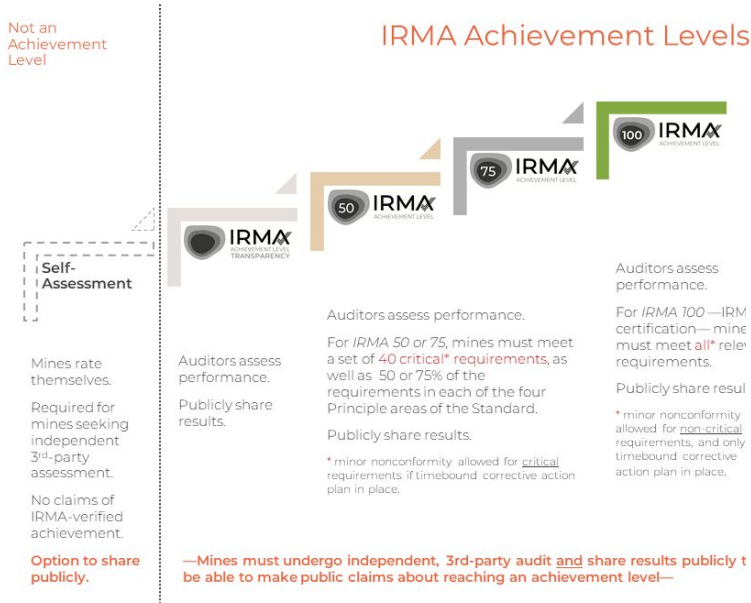
4. (Future) Value Chain Analysis: Miner, Refiner, Active Material, Cell, Module, Pack, OEM, Usage, R-Economy, Disposal.

Data Governance and Impact Evaluation
Ensure save and sovereign data processes
Optimize impact of battery passport for circularity

Certification Authority	Government Authority	Government Authority
Accreditation	Registry	Monitoring, Measures
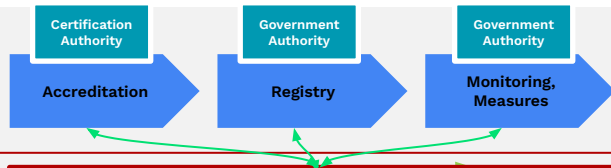
Data Reporting
for the development of a battery passport

Data Exchange
between participants of the battery value chain

Mining / Refining Company	Battery Material Manufacturer	Battery Component Manufacturer	Battery Cell Manufacturer	Battery Module Manufacturer	Battery Pack Manufacturer	OEM	Economic Operator	User	Organisation
Mining & refining	Active material	Compo-nents	Cell production	Module production	Pack production or parts	Integration	Market Placement	(Re-)Use	Repair, repurpose, recycling

Data Collection
within organizational boundaries

Track & Trace System

Battery Pass System

BATTERY PASS
N°~ SZ41621956

10-steps in the Battery Case

5. Data sources: Track & Trace Companies, Auditors, Manufacturers
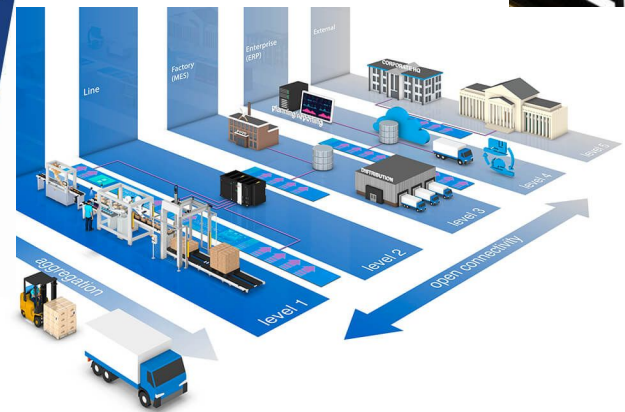
10-steps in the Battery Case

6. Existing (IT) standards & infrastructure: IMDS (International Material Data System), Exchange Protocols, Decentralised Tech, Vocabularies and already required product data (e.g. the safety data sheet).

Automotive Pre-Products Database

Life-Cycle Assessment Database GaBI

Data spaces infrastructure
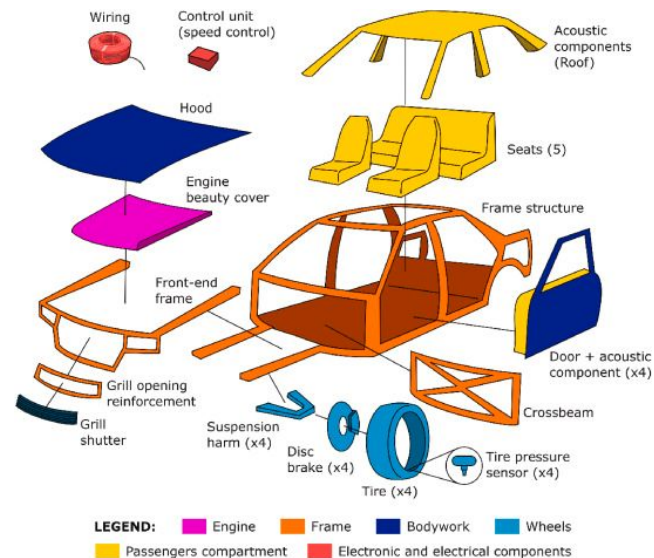
10-steps in the Battery Case

7. Business needs - Example: Business Confidentiality: Cell Manufacturer do not reveal their supply chain to car manufacturers.

Solutions:

- Technical: Access Control Measures to be installed.

- Trusted Third Parties: Track & Trace vendors aggregate and hide information.

10-steps in the Battery Case

8. Explore Ecosystem: Global Battery Alliance, European Battery Alliance, Battery Pass, RECHARGE, PACT, SAE, Catena-X, etc.

Form Industry Alliances

9. Establish missing ecosystem, identify stakeholders: Research Projects, Forums, Industry Initiatives, Consumer Representations, to interpret the legal text, further develop and maintain the product specific DPP specifications, establish enforce industry governance frameworks.
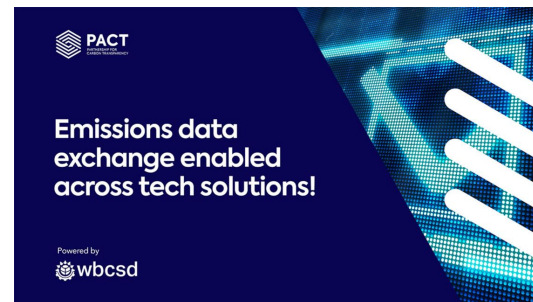
Standardisation Overview in the are of DPPs (example Batteries)

9a. Upstream and downstream initiatives.
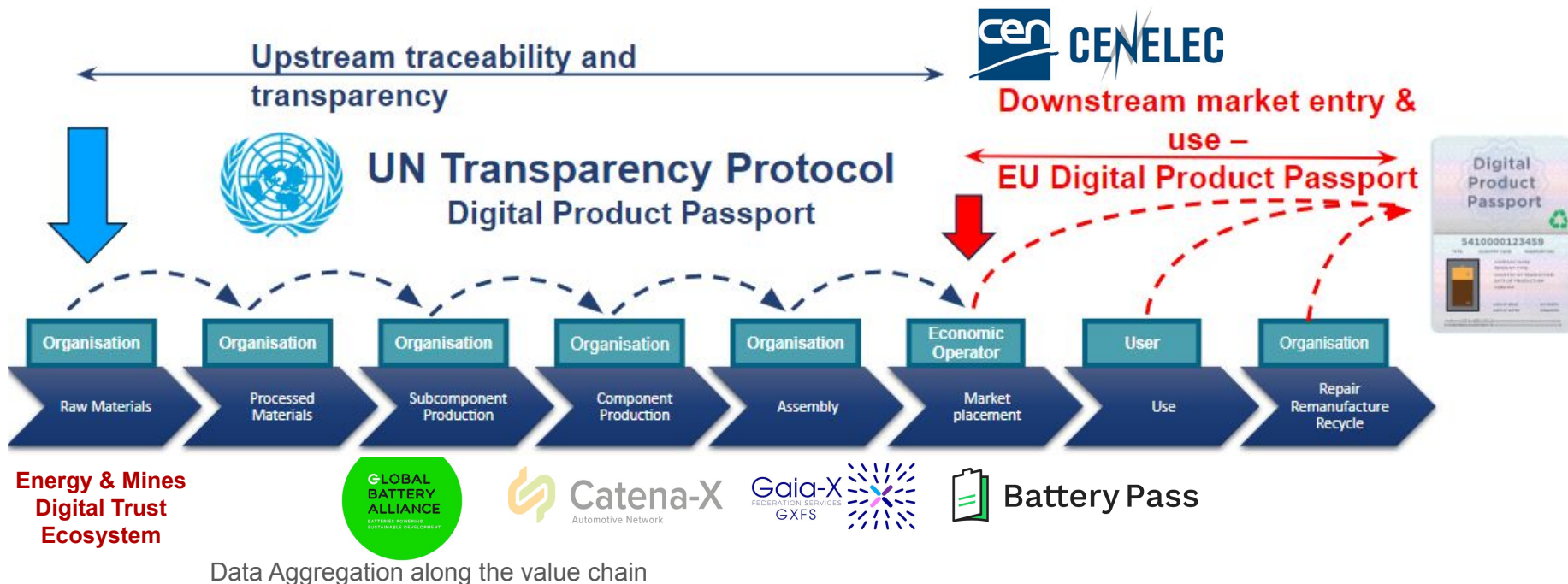
British Columbia Government / Energy & Mines Digital Trust Ecosystem

9b. Raw Material Certification
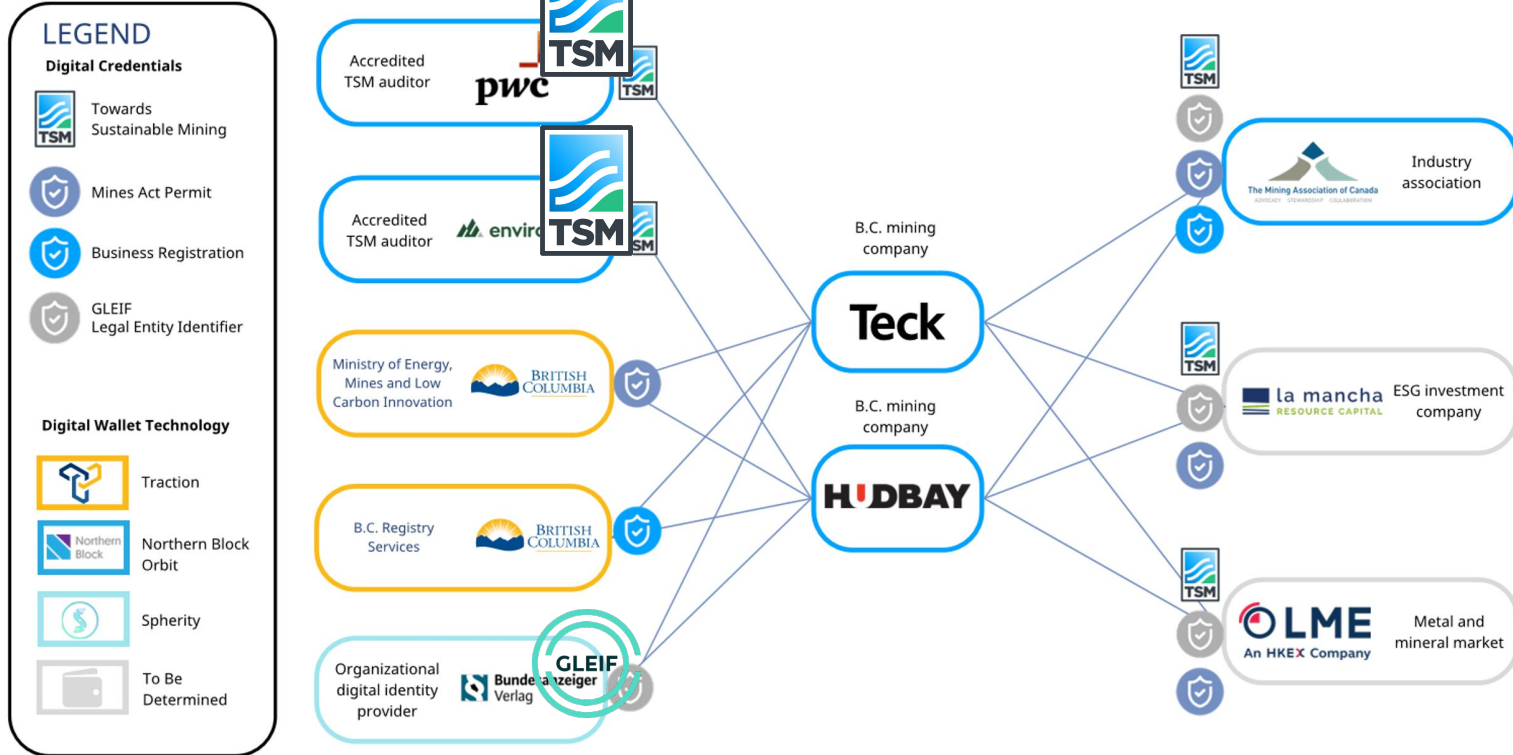
*The GLEIF Legal Entity Identifier credential format used is specific to the EMDT ecosystem.

General Stakeholder Management

9c. Stakeholder Management
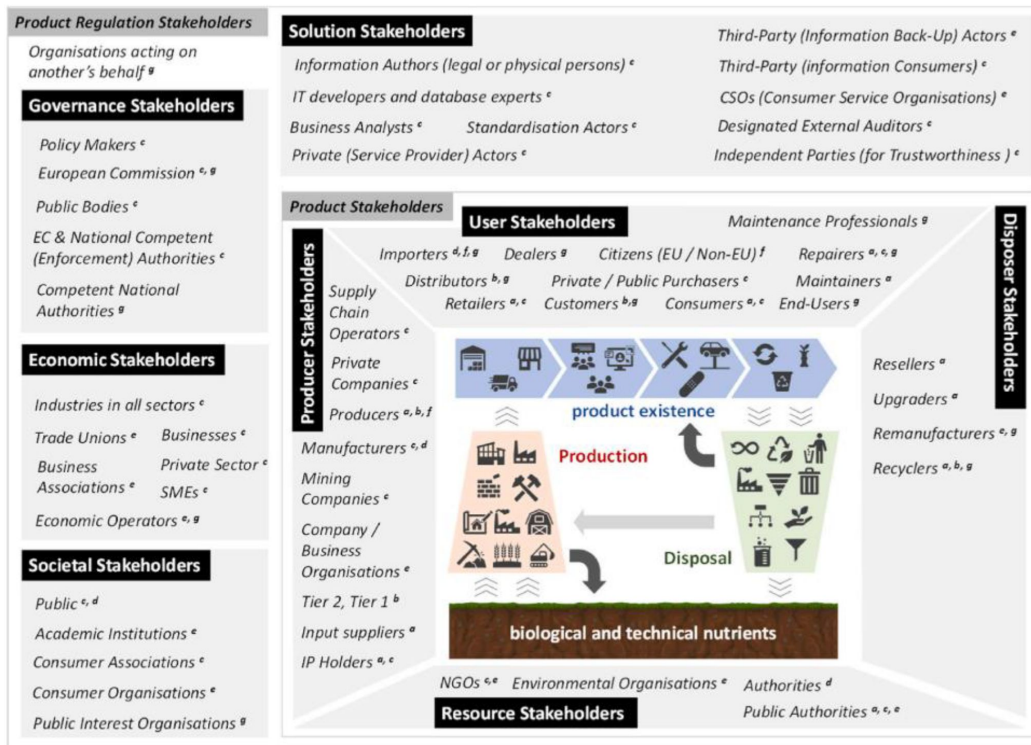
Source: DPP4ALL, Austrian Research Project in the construction industry.

10-steps in the Battery Case

10. Build and maintain the DPP (in iterations): Data Attributes, DIN/ISO Specification, DPP standardisation (CEN/CENELEC JCT24), develop Due Diligence Standards, develop GHG standards, Governance, etc.

Supporting European Experts Presence in International Standardisation Activities in ICT

StandICT.eu   About +   Open Calls +   Results   EUOS +   Experts +   Su
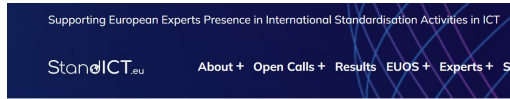
A Landscape of Standards for the Digital Pr

StandICT.eu   Submitted by on 21 March 2023

Product Environmental Footprint

European Standardization Organizations

JTC24 –
Digital Product Passport – Framework and System

ANNEX I
List of standards to be drafted as referred to in Article 1

Table 1: **List of European and harmonised standards[1] to be drafted and deadlines for their adoption**

	Reference information	Deadline for the adoption[2] by the ESOs
1.	Harmonised standard(s) on unique identifiers	31 December 2025
2.	Harmonised standard(s) on data carriers and links between physical product and digital representation	31 December 2025
3.	Harmonised standard(s) on access rights management, information, system security, and business confidentiality	31 December 2025
4.	Harmonised standard(s) on interoperability (technical, semantic, organisation)	31 December 2025
5.	Harmonised standard(s) on data processing, data exchange protocols and data formats	31 December 2025
6.	Harmonised standard(s) on data storage, archiving, and data persistence	31 December 2025
7.	Harmonised standard(s) on data authentication, reliability, integrity	31 December 2025
8.	Standards on APIs for the DPP lifecycle management and searchability	31 December 2025

CIRPASS² Digital Product Passport

Building & Issuing DPPs

What problem are we trying to solve?

Problem #1:

"How can **all industries** agree on a common DPP system that is **compliant** to the requirements of future regulations and that is capable of supporting the massive issuing of DPPs in 2027 (Battery Regulation) ?"

The primary objective of this call is to support the at-scale issuing of DPPs in several sectors and demonstrating its use in downstream business models.

DPP 1.0

This is the primary focus of CIRPASS-2

17
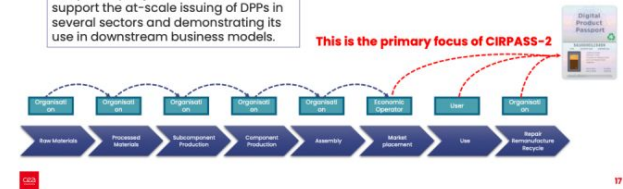
10-steps in the Battery Case

DPP Data Attribute Specification: List of Raw Material Suppliers, Dismantling Information, State-of-Health, etc.

Battery Passport Data Attribute Longlist
In collaboration with the **Global Battery Alliance**
Version 1.1 / December 2023

The Data Attribute Longlist is the current guideline for the mandatory attributes of a battery passport. Is was developed by the Battery Pass project in cooperation with:

- The Global Battery Alliance
- Catena-X Project
- The Battery Pass Consortium
- Public Consultation
- Many additional battery experts from the industry.

Battery Pass Content Guidance goes ISO! (DIN DKE SPEC 99100)

Find all Data Categories in the Battery Pass Showcase!

GBA Track & Trace Guidelines for verifiable ESG data exchange

Added in the chat: Link to the Global Battery Alliance (GBA) Guidelines, that show how trusted data can be exchanged between supply chain actors to produce a verifiable GHG emissions of a battery. The concept is applicable to all other ESG indicators and is currently being worked on by the GBA

Global Battery Alliance

Guidelines for Track & Trace service providers on ESG data declaration, exchange, and aggregation

(GHG Case)

Exchanging and aggregating GHG emissions data along the value chain to calculate the total GHG emissions of a battery.
Enabling Battery Regulation compliance

https://www.globalbattery.org/media/publications/the-tt-guidelines-on-ghg-data-exchange-v1-0.pdf

4TheRecord

Let's get digital - Putting the DPP in practice (Battery Industry)

Try the world's first <u>verifiable</u> Battery Passport

Take out your phone
check out the world's first decentral,
digital battery passport.
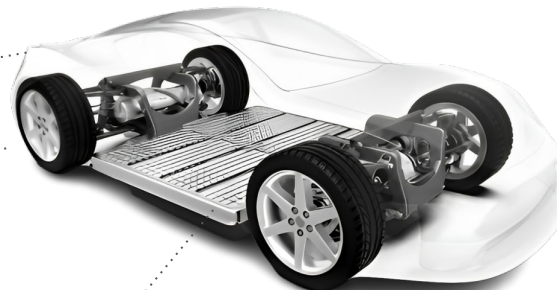
Verify me!
(3rd-party verifier is
embedded in website)

For more information click here to read on
Medium: **Accessing Digital Product
Passports with Decentralized
Identifiers (DIDs)**

Dr. Susanne Guth-Orlowski
Published in Spherity · 13 min read · Feb 21, 2022

Deep Link structure: https://<did-resolver>/<product-did>?service=website

Key Challenges in the Battery Industry

Main challenges for the Battery Industry:

1. **(Global) Supply Chain is unknown.** Only Tier 1 Suppliers are known.
2. **DPP Data is not available.** SAP project to get data from systems / CO_2 footprint per product is not known.
3. **No Standards available:** Data & tech standards and <u>governance</u> needs to be developed.
4. **Industry Consortia are not available:** Industry needs to build platform for alignment & standard setting.
5. **Costs / Business Acceptance:** Reporting burden is already high needs cheap digitisation that is based on standards, also beyond the DPP issuance, ie. upstream data exchange.
6. **Business Confidentiality:** Asian battery pack suppliers do not make their supply chain transparent.
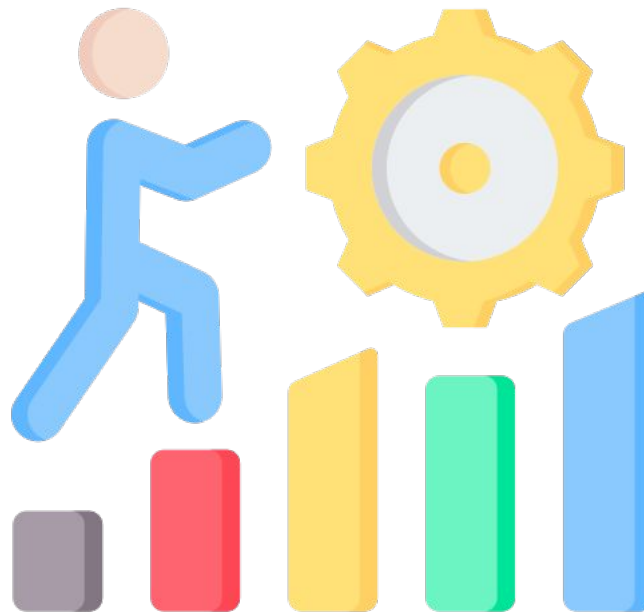
The Digital Product Passport

Workshop Exercise

Dr. Susanne Guth-Orlowski

4TheRecord.io

10-steps to introduce and maintain a DPP for the Chemical Industry

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Reusing SDS for Chemical Product DPPs - eSDS

6. Existing standards & infrastructure:

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- *********************************************************************
eSDScom XML schema definition version 5
Main schema - root element is DatasheetFeed

Source: https://github.com/esdscom/sdscom-xml
License: https://creativecommons.org/licenses/by-nd/4.0/legalcode
********************************************************************* -->
<xs:schema targetNamespace="http://www.esdscom.eu/eSDScom" xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:eSDScom="http://www.esdscom.eu/eSDScom" xmlns:xs="http://www.w3.org/2001/XMLSchema" version="5.5">
        <xs:include schemaLocation="SDSComXMLCT.xsd"/>
        <xs:include schemaLocation="SDSComXMLDT_GHS.xsd"/>
        <!-- Section 1 ========================================================= -->
        <xs:complexType name="IdentificationSubstPrep">
                <xs:annotation>
                        <xs:documentation>SDS section 1</xs:documentation>
                </xs:annotation>
                <xs:sequence>
                        <xs:annotation>
                                <xs:documentation>Although not different in structure, a lot of this information
is market specific and thus specified for each region separately.</xs:documentation>
                        </xs:annotation>
                        <xs:element minOccurs="0" name="SpecificationNo" type="eSDScom:string128">
                                <xs:annotation>
                                        <xs:appinfo>SDScomChem</xs:appinfo>
                                        <xs:documentation>Sender-defined identification of a specification the
chemical is in accordance with, e.g. a formulation number. This is not meant for compliance statements like
international or vendor-internal standards!</xs:documentation>
                                </xs:annotation>
                        </xs:element>
                        <xs:element maxOccurs="unbounded" name="TradeProductIdentity">
                                <xs:annotation>
                                        <xs:appinfo>SDScomBau</xs:appinfo>
                                        <xs:appinfo>SDScomChem</xs:appinfo>
                                        <xs:documentation>At least one instance (with empty UserId) for the
identification as delivered by the supplier. Use more instances for various package sizes, various products in a
group SDS, or (with filled UserId) for reference to relabelled products of the SDS recipient. Also for group
safety data sheets, each instance of TradeProductIdentity covers one substance or product. When importing, make
sure that SDScom documents are not automatically replaced if the product identity is the same! GTINs are not
necessarily unique (they should, but aren't in practice!), and product identities may refer to kits with multiple
products and SDSs. Unique IDs that allow automatic overriding of data require a bilateral agreement between
customer and supplier and should be placed in ProductNo.</xs:documentation>
                                </xs:annotation>
                                <xs:complexType>
```

The eSDScom Tool Chain

The following are the tasks, tools and resources we envision are useful with eSDScom today. Where standard solutions exist, we have listed the products.

- **Use standard phrases:** The eSDScom phrases are what this project recommends, but you can use any phrase catalogue for the SDS main body. (For EU exposure scenarios, industry agreed on an eSDScom phrase subset). The eSDScom phrase tool allows you to browse the standard phrase catalogue and request changes.
- **Convert Safety Data Sheets from PDF into eSDScom:** Several commercial solutions exist. Follow the workshops for more info.
- **Edit/author eSDScom data:** A simple editor is developed via GitHub, but currently stalled.
- **Validate eSDScom:** QualiVali or any standard XML software validates technically.
- **Quality check eSDScom data:** Also called content validation, this remains an expert task. To a certain degree, ECHA or ACEA requirements help with basic quality requirements. A content validation tool and its scope is under discussion.
- **"Print" Safety Data Sheets:** Currently, there is a stylesheet for version 4.4 and an SDBtransfer subset stylesheet for version 4.2. Stylesheets for 5.x are here.
- **Create Operating Directives** according to German law: The GisChem system allows you to upload SDScom data to save effort in authoring of workplace specific directives.

Key Challenges in the Chemical Industry

Workshop Exercise
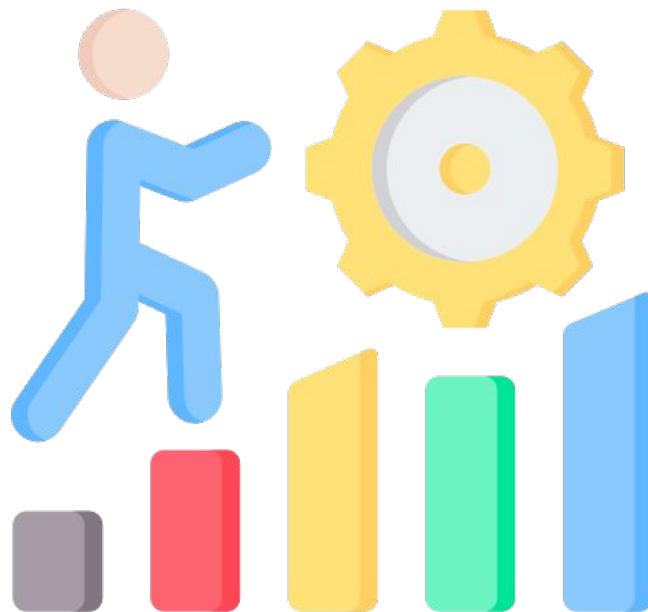
The Digital Product Passport

New Business Models

Dr. Susanne Guth-Orlowski

7 new DPP-enabled Business model areas

1. Kreislaufwirtschaft und "Product-as-a-Service"

- Vermietung und Leasing von Produkten
- Rücknahme und Wiederverwertung

2. Produktdifferenzierung

- Nachhaltigkeitszertifikate:
- Differenzierung durch ethische Herkunft:

3. Neue Servicemodelle durch datenbasierte Wartung

- Predictive Maintenance
- Pay-per-Use-Modelle

4. Personalisierte Dienstleistungen

- Individualisierte Produktangebote:
- After-Sales Services:

5. Datenbasierte Geschäftsmodelle

- Verkauf von Daten oder Datenanalyse-Dienstleistungen
- Digitale Marktplätze

6. Erweiterte Garantie- und Versicherungsmodelle

- Dynamische Garantieverlängerung
- Versicherung auf Grundlage von Nutzungsdaten

7. Verbesserte Lieferkettenmodelle

- **Optimierung der Lieferketten**
- **Bessere Produktentwicklung**

The Digital Product Passport

The first decentally set up compliance tool

Dr. Susanne Guth-Orlowski

4TheRecord.io

DPP: Definition and Purpose

The <u>digital product passport</u> is digital, verifiable information about a product

- that shall help improve the product's **circularity** using R-strategies (reuse, repair, recycling ..)

- that is thus a vehicle to **enable the circular economy** and new circular **business models**

- that shall show the products **manufacturing circumstances**

- that shall help consumers to **make informed choices**

- that shall help authorities to **verify compliance** with legal obligations

- Is mandatory to comply with several EU regulations, such as the Battery Regulation, the **Ecodesign for Sustainable Product Regulation** (ESPR), the detergents, building, toys regulation, etc.

Timeline of Relevant Regulations & Projects

Standards
Standards
Request
Ad-hoc
Working Group

DPP
Standards
Defined
JTC24

DPP for first ESPR
products
(Steel,Textiles)
is mandatory

Ratification
Battery Regulation

Ecodesign Forum
starts

Acts on DPP
(registry, service
providers, data
carriers, digital
credentials)

New
Battery Regulation

Standards
Mandate
& start of JTC24

03/27
Adoption of
ESPR work plan

02/27
DPP for Batteries
is mandatory

DPP is commodity
For many products

2020   **2022**   2023   **2024**   2025   **2026**   **2027**   **2028**   **2029**   **2032**

ESPR
Trilogue

ESPR
Ratification

CO$_2$
Footprint
Batteries
become
mandatory

CIRPASS 2

ESPR Work Plan and priorities (to be reworked in Q1 2025)

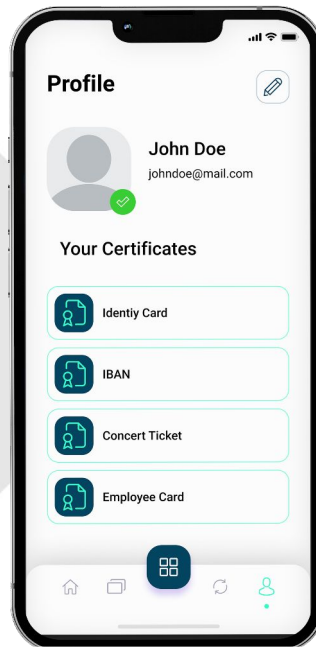| End-use products	Intermediate products	Not shortlisted products
Absorbent Hygiene Products	Aluminium	Biofuels
Bed Mattresses	Chemicals	Books and Printed Paper
Ceramic Products	Glass	Candles
Cosmetic Products	Iron and Steel	Cotton buds
Detergents	Paper, Pulp Paper and Boards	De-icers
Fishing Nets and Gears	Plastic and Polymers	Means of Transportation (road)
Furniture	Non-ferrous Metal Products	Office and Hobby Supply
Lubricants		Pest Control Devices
Paints and Varnishes		Sanitary Additives
Textiles and Footwear		Ski Wax
Toys		Solid Fuels and Firelighting Products
Tyres		Waste Containers for Separate Glass Collection
		Wet Wipes

Link to EC Product Groups: https://susproc.jrc.ec.europa.eu/product-bureau/product-groups

Self-Sovereign Identity (SSI) for Humans

**Passports like in the old days, but digital …
and not only for humans but also for companies and products!**

Profile

John Doe
johndoe@mail.com

Your Certificates

- Identiy Card
- IBAN
- Concert Ticket
- Employee Card

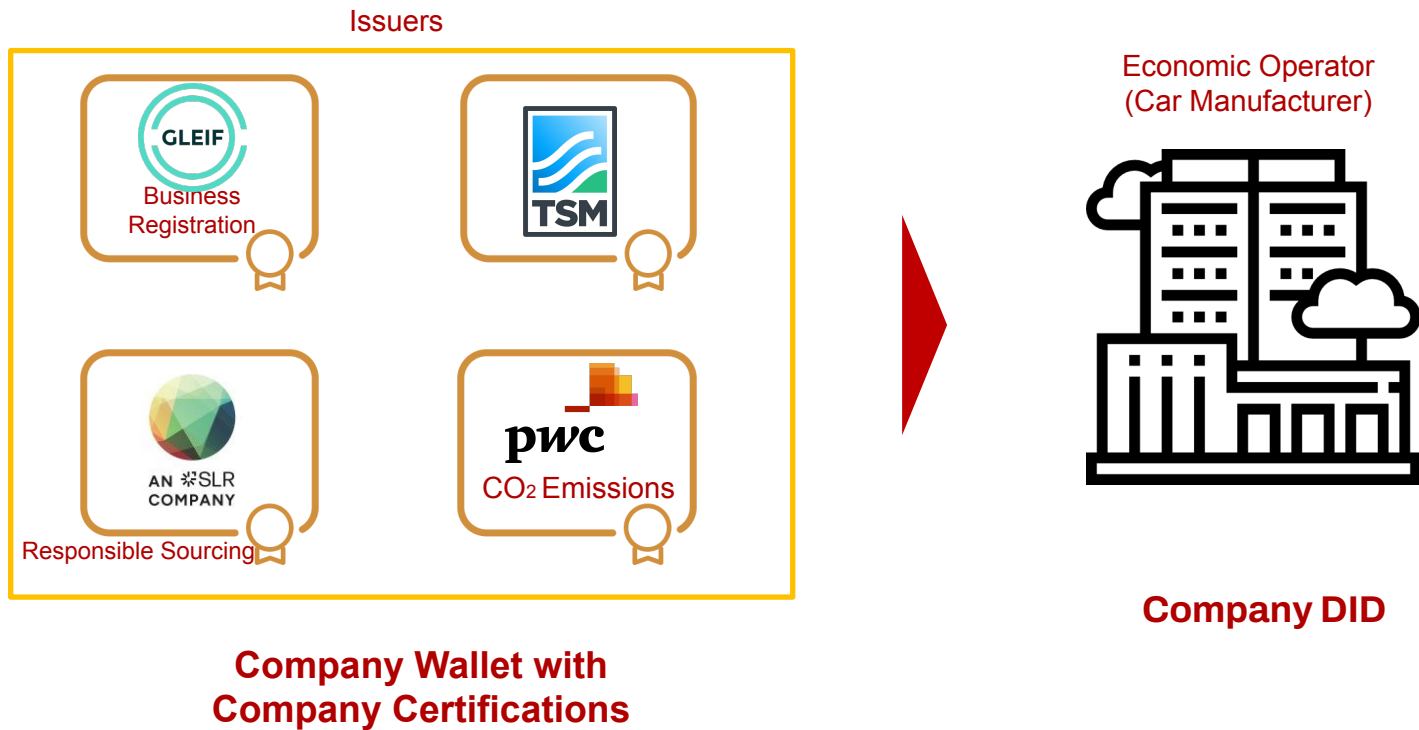"Trust me, because I have **evidence documents** about myself **signed** by **trusted parties**."

Documents = W3C verifiable credentials

Human Decentralised Identifier (DID)

Self-Sovereign Identity for Companies (here Mining)

Issuers

Economic Operator
(Car Manufacturer)

Business
Registration

Responsible Sourcing

CO_2 Emissions

**Company Wallet with
Company Certifications**

Company DID

Self-Sovereign Identity for Products (here EV battery)

Issuers

Product
EV Battery

CE

**Product
Information
(DPP)**

TÜV SÜD
Battery Testing

MINVIRO

CO$_2$ Emissions

**Product Wallet with
Product Certifications**
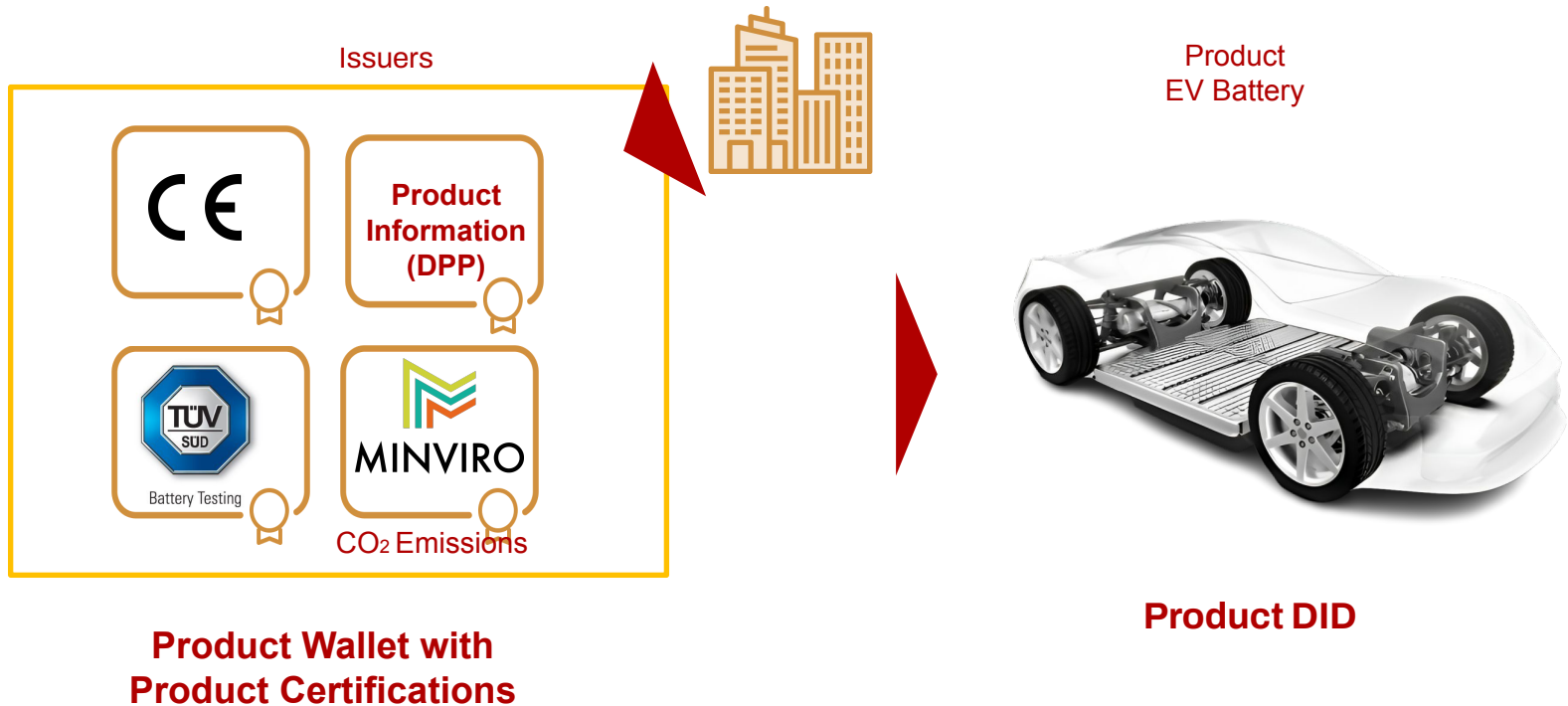
Product DID

Decentralised Identifiers / Verifiable Credentials Lookup

Product
DID

Launch DPP
Website

Battery Passport

Ultium Battery Passport

Explore the essential technical and environmental attributes of the Ultium Battery. Contributing to the broader goals of a greener future.

"Pushing the Limits of Transportation & Technology."

DID
resolver

API/Service Endpoint with public
data / private data including the
credential store

DID
document
V2

Identity Registry

MINVIRO

Decentral Public Key Infrastructure on Trusted Ledger for DPP Verification

Battery Testing

GS1 digital link

Product DID

Browser

Digital Link Resolver (GS1 / Manufacturer)
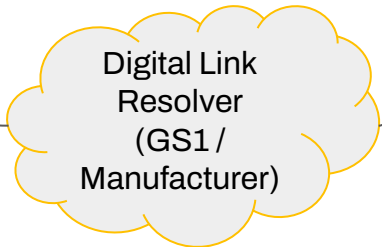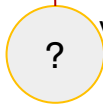
Launch DPP Website

Not standardized

?

API/Service Endpoint with public data / private data including the verifiable information

Battery Passport

Ultium Battery Passport

Explore the essential technical and environmental attributes of the Ultium Battery. Contributing to the broader goals of a greener future.

"Pushing the Limits of Transportation & Technology."

Powered by

RCS | GLOBAL GROUP   SPHERITY

Interested in creating and publishing your own verifiable Battery Passport?
Contact us or RCS Global for a personal demo of our Battery Passport management system.

Get in touch →   Learn more

C E

MINVIRO

TÜV SÜD

Battery Testing

Identification Link

Browser

Product DID

Launch DPP Website

Battery Passport

Ultium Battery Passport

Explore the essential technical and environmental attributes of the Ultium Battery. Contributing to the broader goals of a greener future.

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RCS | GLOBAL GROUP   SPHERITY

Interested in creating and publishing your own verifiable Battery Passport? Contact us or RCS Global for a personal demo of our Battery Passport management system.
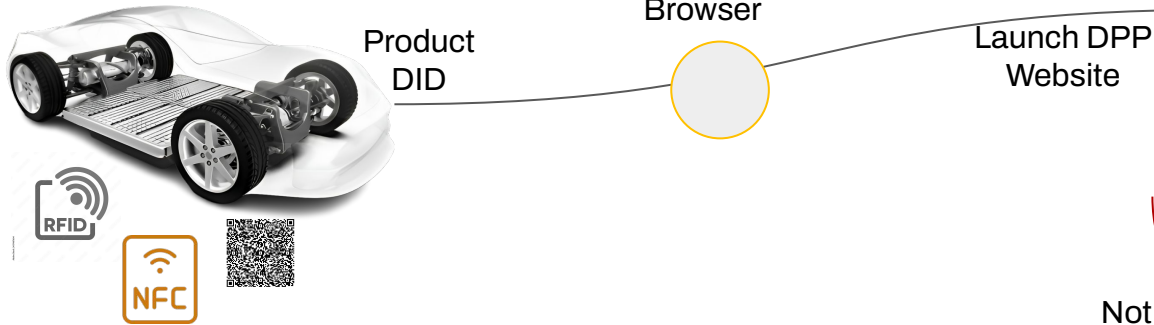
Get in touch →   Learn more

Not standardized

?

API/Service Endpoint with public data / private data including the verifiable information
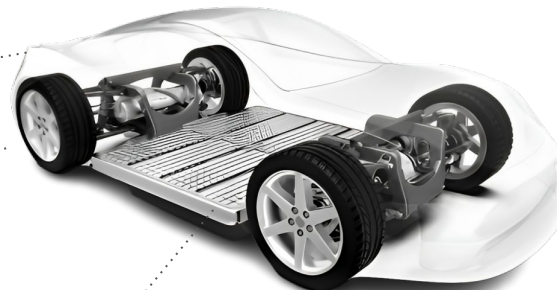
C E

MINVIRO

TÜV SÜD

Battery Testing

Try the world's first <u>verifiable</u> Battery Passport

Take out your phone
check out the world's first decentral,
digital battery passport.

Verify me!
(3rd-party verifier is
embedded in website)

For more information click here to read on Medium: **Accessing Digital Product Passports with Decentralized Identifiers (DIDs)**

Dr. Susanne Guth-Orlowski
Published in Spherity · 13 min read · Feb 21, 2022

Deep Link structure: https://<did-resolver>/<product-did>?service=website

Battery Pass Example - <u>Verifiable</u> Due Diligence Reports and Certifications

| General information | Supply Chain information | Battery Material and Compositions | Design of circularity | Performance and durability |

Supply Chain Information ⌃

Third party supply chain assurances	Additional voluntary	Verify ↗	Download VC ↓	Download File ↓
Sustainbility Report	Additional voluntary	Verify ↗	Download VC ↓	Download File ↓
EU Taxonomy disclosure statement	Additional voluntary	Verify ↗	Download VC ↓	Download File ↓
Information of Due Diligence Report	Due Diligence Report	Verify ↗	Download VC ↓	Download File ↓

Example Certificates in the Chemical Industry: Halal, Koscher, etc.

CEN/CENELEC JTC24

DPP Framework and System: Standardisation

Dr. Susanne Guth-Orlowski

DPP Separation of System & Data

DPP-system

(to be developed before DPP deployment)

Digital Product Passport

DPP-data

(to be identified when developing product-group specific secondary legislation)

- All standards and protocols related to the IT architecture, like standards on:

  ➢ Data carriers and unique identifiers

  ➢ Access rights management

  ➢ Interoperability (technical, semantic, organisation), including data exchange protocols and formats

  ➢ Data storage

  ➢ Data processing (introduction, modification, update)

  ➢ Data authentication, reliability, and integrity

  ➢ Data security and privacy

- The DPP registry

Possible Track & Trace identifiers

- Economic operator's name, registered trade name
- Global Trade Identification Number or equivalent
- TARIC code
- Global location number
- Authorised representative
- Reference of the back-up data repository
- ·

Chemical product specific data

Example of potential attributes

- Description of the material, component, or product
- Recycled content
- Substances of concern
- Environmental footprint profile
- Classes of performance
- Technical parameters
- …

European Commission

JTC24 - Digital Product Passport - Framework and System.

TBD - Delegated act per product segment

CEN/CENELEC JTC24 - Standardisation of the DPP Framework and System

JTC24 Work Definition:

- JTC24 is developing the harmonized standards for the Digital Product Passport and System.
- The scope of the JTC24 has been defined in the DPP Standardisation Request of the European Commission.
- The work of the JTC24 has to be finalised by December 2025 (very short time frame).
- JTC24 will organise the work in 4 working groups:
  - **WG 1 -** Strategic Advisory Group: No standards but informative documents, such as System Architecture, Use Cases, and Semantic Tools
  - **WG 2 -** Unique Identifiers and Data Carriers: One standard for each topic
  - **WG 3 -** Security. Started last Friday
  - **WG 4 -** Interoperability Framework: Standards for exchange protocols and others.

- Status: WGs formed. First standard proposals due in September.

Get in touch!

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