



iPoint

Data exchange platform for a green, detectable and directly recyclable lithium-ion battery

May 10th, 2023 | Going Green – CARE INNOVATION 2023 | Frauke Haenel



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1 | About iPoint

We are iPoint

iPoint Facts & Figures



2001

Over 20 years of experience and know-how in the areas of compliance and sustainability



170+

Employees on 10 locations worldwide, German headquarters



GRO CAPITAL

Backed up by a strong financial partner



250

Global enterprises among customers



75,000

Users from 110+ countries

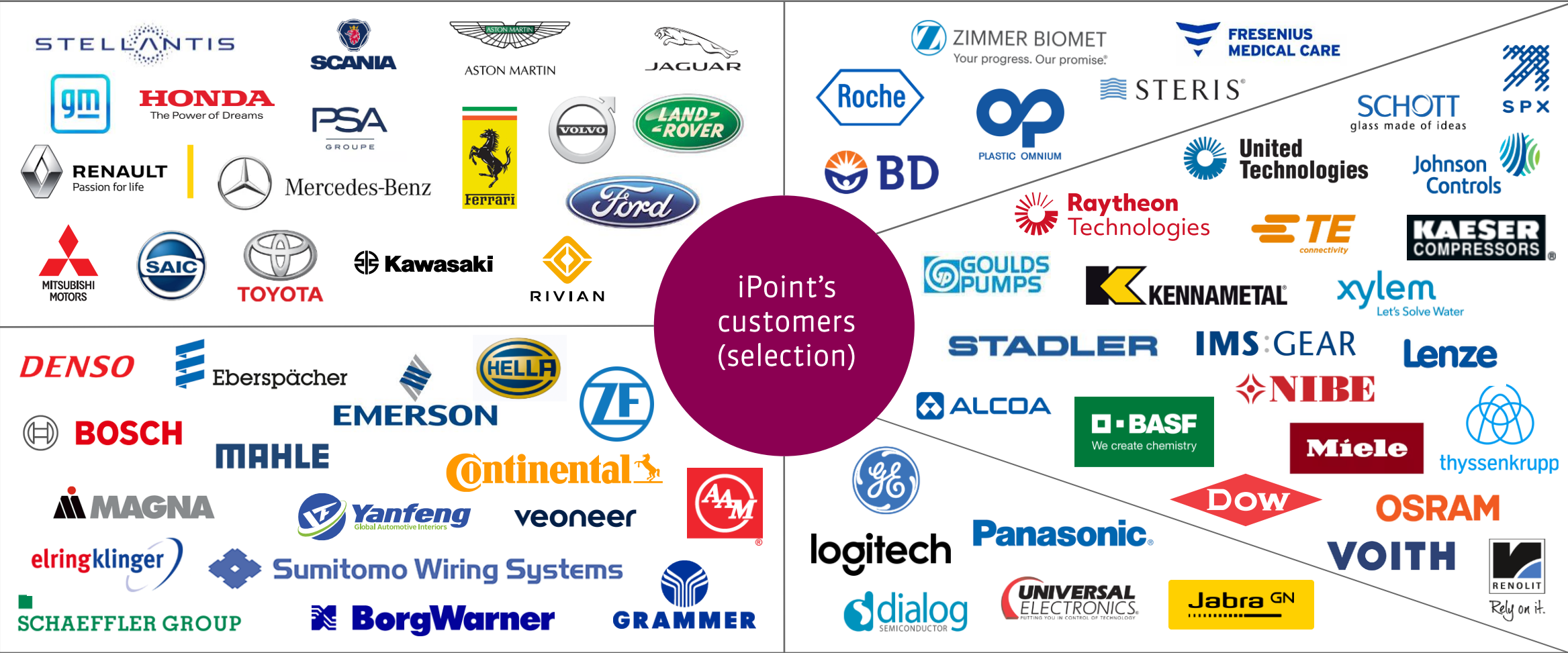


ISO & TISAX

ISO certifications: 9001, 27001
+ TISAX certification

We develop software for...

Compliance, Sustainability, and Risk Management

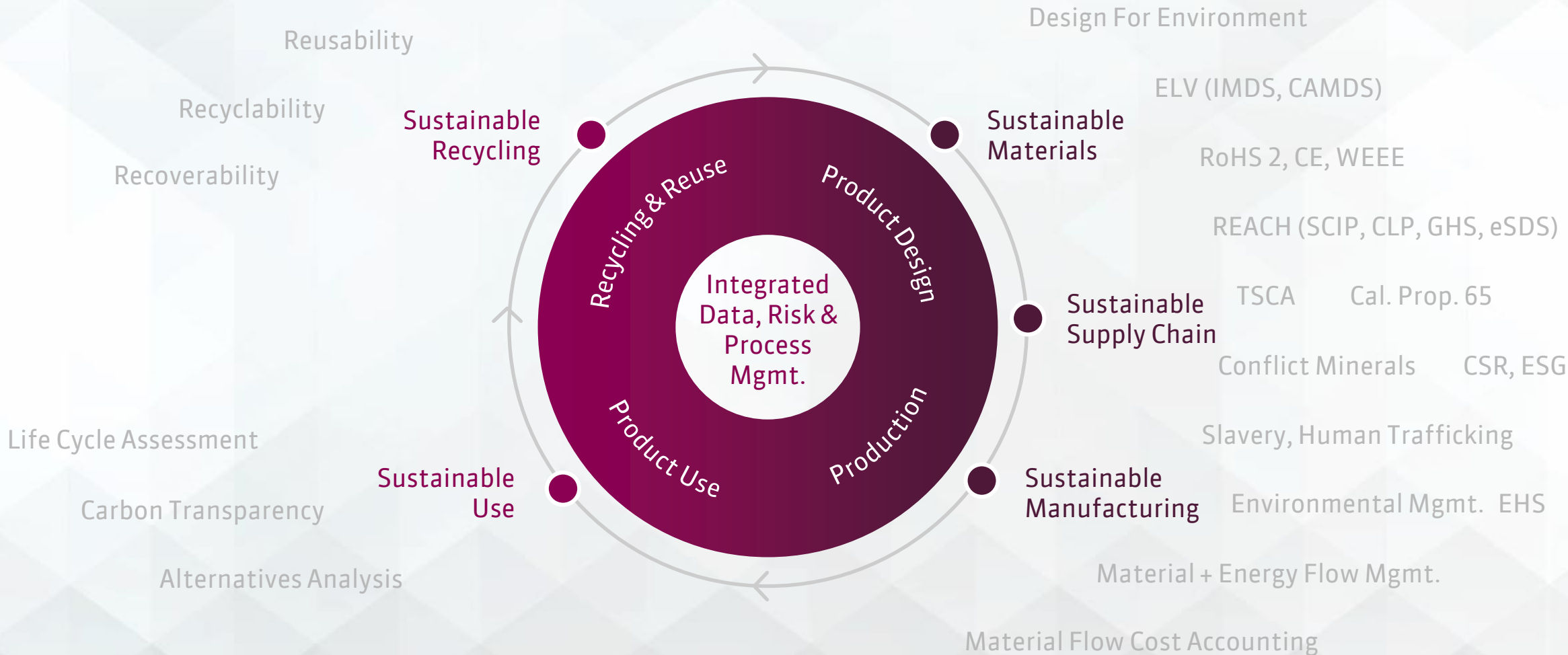


Solutions for the Entire Product Lifecycle

Digital Circular Economy starts with Compliance



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Future solutions: Our research & innovation projects (selection)

Digital Product Passport

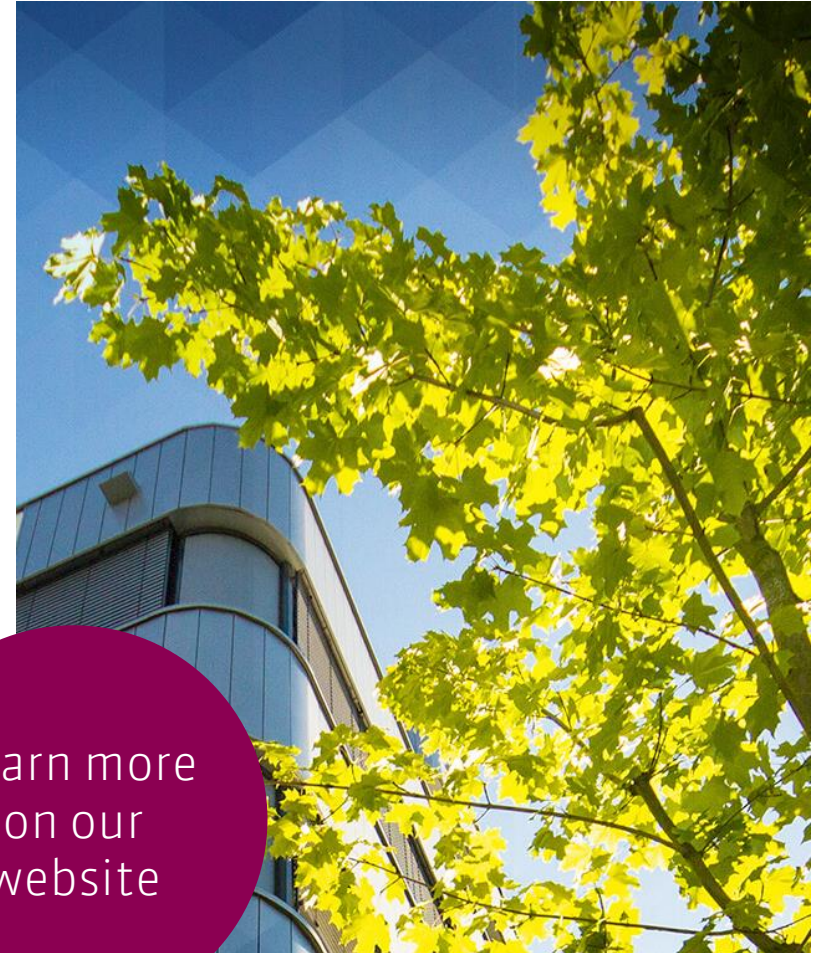
- CE-Pass
- CIRPASS
- DIBICHAIN
- DigiTain
- **IDcycLIB**
- ReDiBlock

Resource Efficiency

- MaFImA

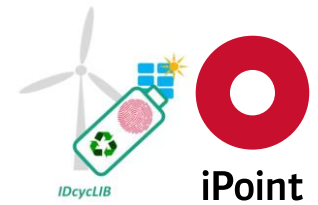
Life Cycle Assessment & Circular Economy

- ACTION
- CARBO BRAKE
- COOLBat
- DigiTain
- DfC-Industry
- iCAREPLAST
- IDcycLIB
- KOLIBRI
- LCT
- LiKE



Learn more
on our
website

IDcycLIB

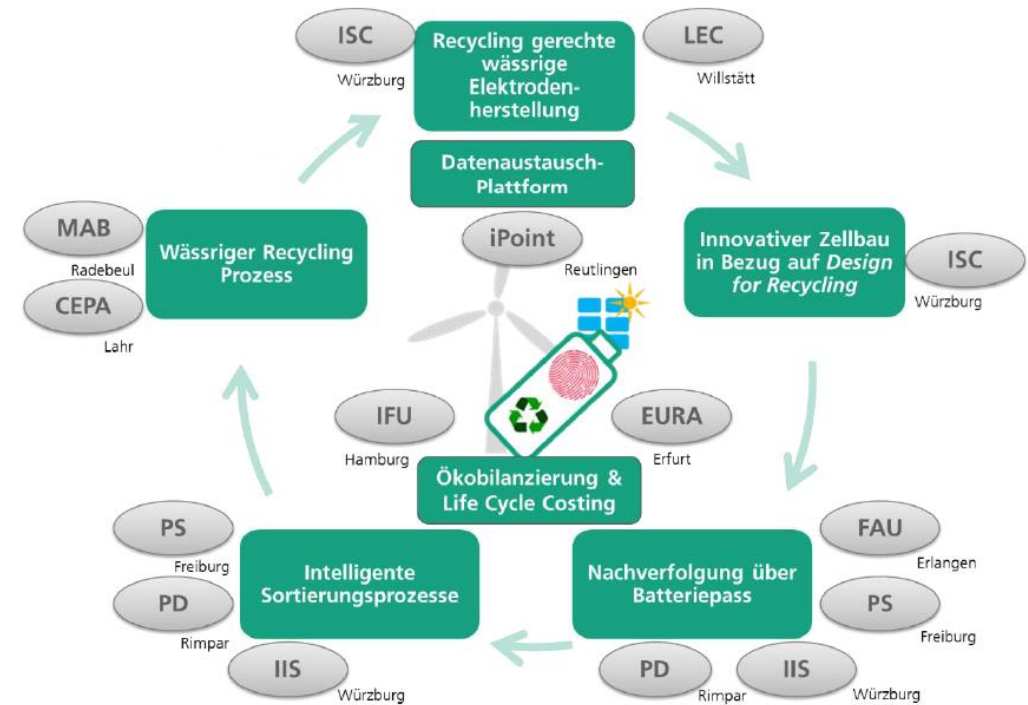


Innovation platform of a green, detectable and directly recyclable lithium-ion battery.

Program Funded by BMBF, cooperation partners: CEPA Zentrifugenbau GmbH, Fraunhofer ISC & IIS, University Erlangen, Polysecure, Pure Devices, MAB Recycling/Reelements, Leclanché, EurA AG

Duration Start 09/2021, 36 months

Goal Development of an aqueous electrode that can be automatically reopened, processed and sorted for recycling.



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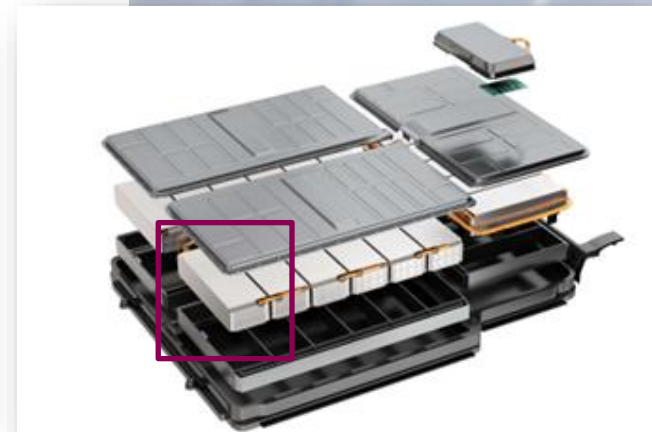
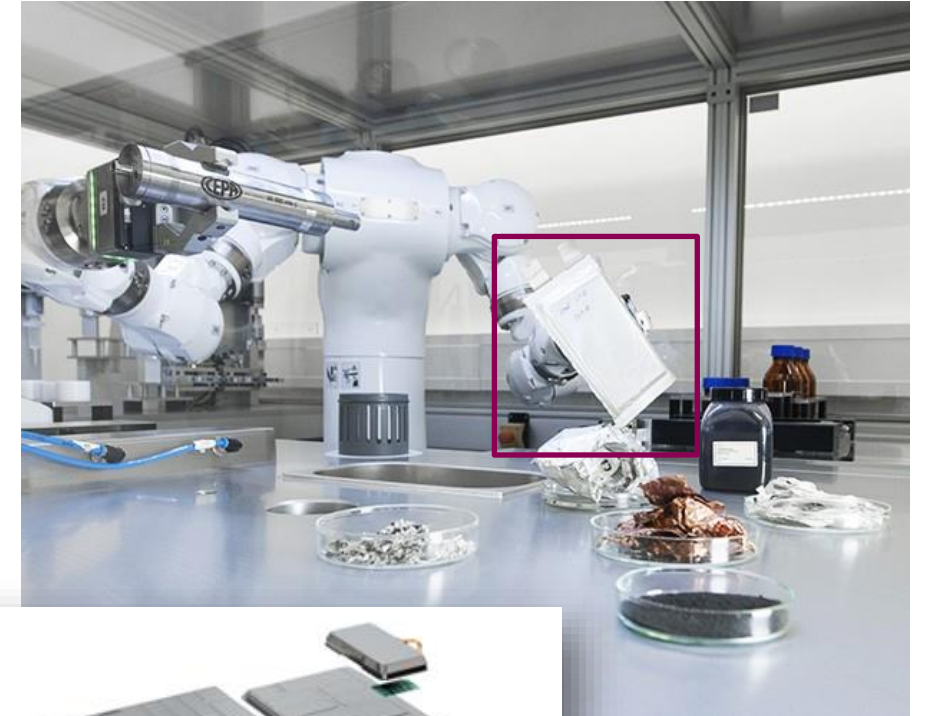
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2| Background and Motivation

Project Goals in Detail

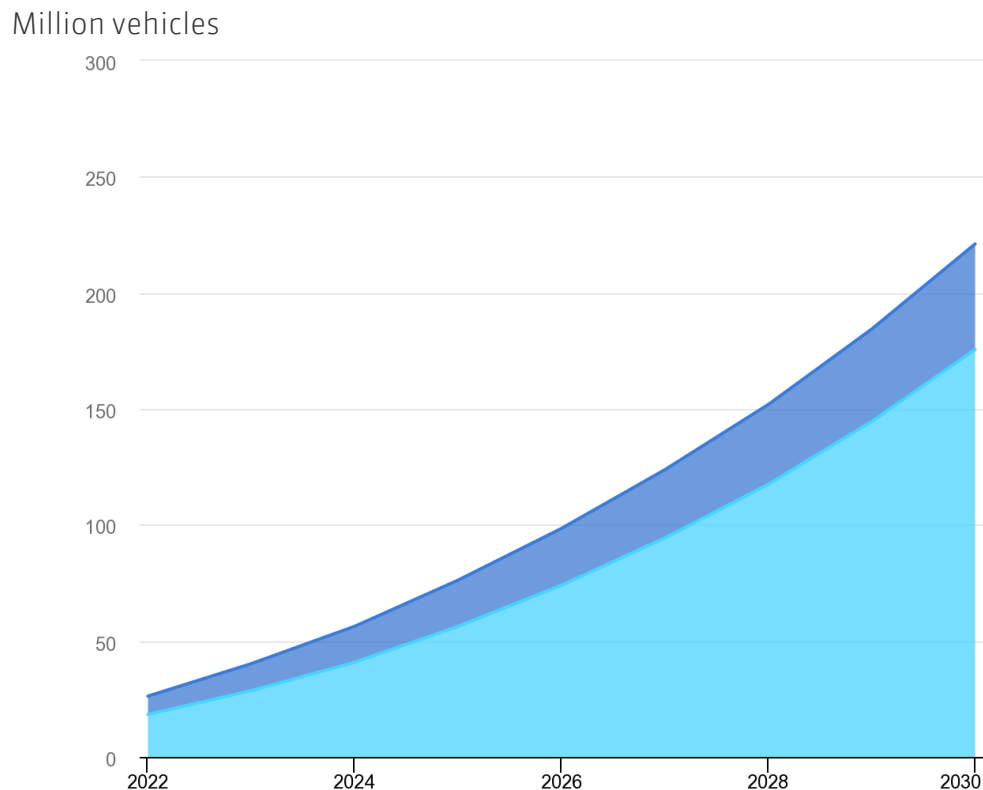
IDcycLIB

1. Development of an automatically recyclable pouch cell for a traction battery (Design for Recycling)
2. Development of long lasting ID-particles (magnetic microparticles and fluorescent tracer)
3. Creation of an eco-friendly production and recycling process for the cathode material (alternative aqueous direct recycling)
4. Digitalization and exchange of relevant data via **digital product passports** and evaluation of the battery's sustainability performance



Digital Battery Passport (DBP)

Why is it important?



- Global electric vehicle fleet to **grow by a factor of eight** or more by 2030
- A sustainable and industrial end-of-life treatment of such batteries is important due to
 - limited accessibility of raw materials
 - the environmental impact of their mining and refining
- **Digital battery passports (DBP)** aim to support efficient recycling of lithium-ion batteries

Passenger light-duty vehicles: battery electric vehicle (light blue); plug-in hybrid electric (dark blue)

IEA, Electric vehicle stock by mode in the Stated Policies Scenario, 2022-2030, IEA, Paris <https://www.iea.org/data-and-statistics/charts/electric-vehicle-stock-by-mode-in-the-stated-policies-scenario-2022-2030>, IEA. Licence: CC BY 4.0

Relevant regulations

Stating digital passports

DBPs will be mandatory for batteries of electric vehicles from 2026 on due to:

EU Battery Regulation

- Replaces the European Battery Directive 2006/66/EC and the Battery Act (BattG)
- 09.12.2022: EU Parliament and Council agreed on revision of EU battery legislation
- Entry into force of new EU regulation expected in Q2/Q3 2023

Ecodesign for Sustainable Products Regulation (ESPR)

- Proposed by the EU Commission in March 2022
- Part of the Sustainability Policy Initiative (SPI) and the Circular Economy Action Plan (CEAP)
- States Digital Product Passports (DPP) for other sectors



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3 | Methods

Methods

Goal: Digitalization & exchange of relevant data via Digital Battery Passport (DBP)

1. Preliminary Assessment
 - a. Investigate the state of the art (initiatives, regulations, existing systems)
 - b. Understand the production and recycling processes to cover the whole value chain
 - c. Analyze the data requirements and identify available and missing data
 - d. Define “Personas” to understand the future user needs

2. Prototype development
 - a. Create concept considering the preliminary assessment
 - b. Establish a data model
 - c. Develop a data exchange platform and the DBP



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4 | Preliminary Assessment

State of the art

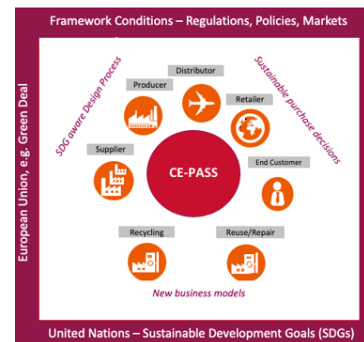
Relevant outcome of projects and initiatives



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Projects:

- **CE-Pass (AUT):** Persona „Designer“ for a traction battery
- **CIRPASS (EU):** Standard's and DPP-pilot's landscape; Stakeholder-Interviews
- **ReDiBlock (DE):** Blockchain-based DPP



Initiatives:

- **Battery Pass:** DBP rulebooks
- **Catena-X:** Data models for automotive industry network
- **GBA:** Child labour & human rights rulebook, DPP proof of concepts



State of the art

Important existing systems

International Material Data System (IMDS)

- Joint system development of the automotive industry
- Allows the collection, maintenance, analysis and archiving of all materials used in the manufacture of automobiles
- Usage enables car manufacturers and their suppliers to be compliant with national and international laws and regulations



[Link to IMDS](#)

Catena-X – Automotive Network

- Association funded by the German Federal Ministry for Economic Affairs and Energy
- The goal: *“To provide an environment for the creation, operation and collaborative use of end-to-end data chains along the entire automotive value chain.”* (automotive manufacturers, suppliers and service providers)
- Catena-X system will enable a standardized data exchange and the possibility to use cross-company applications

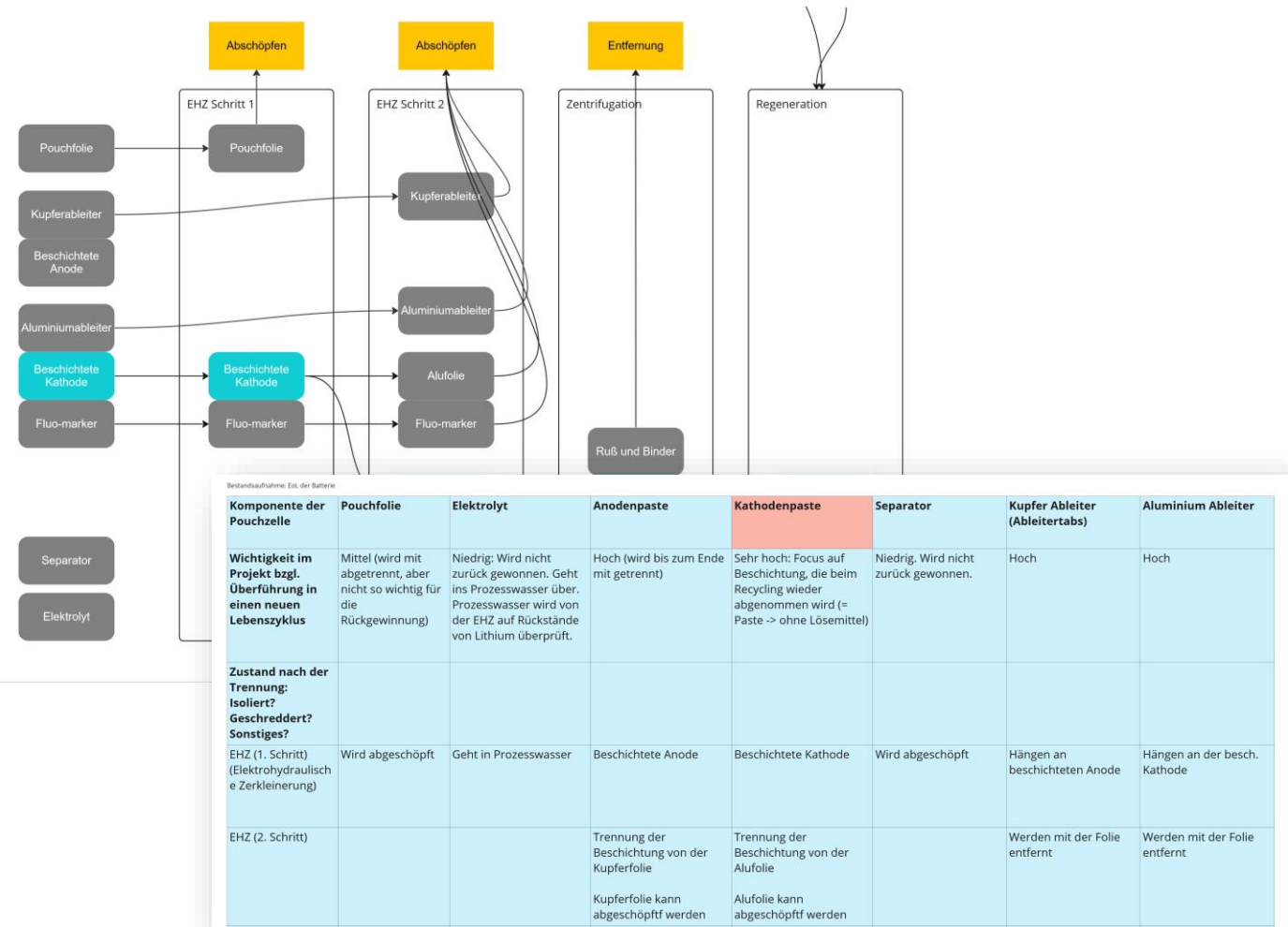


[Link to Catena-X](#)

Process Analysis

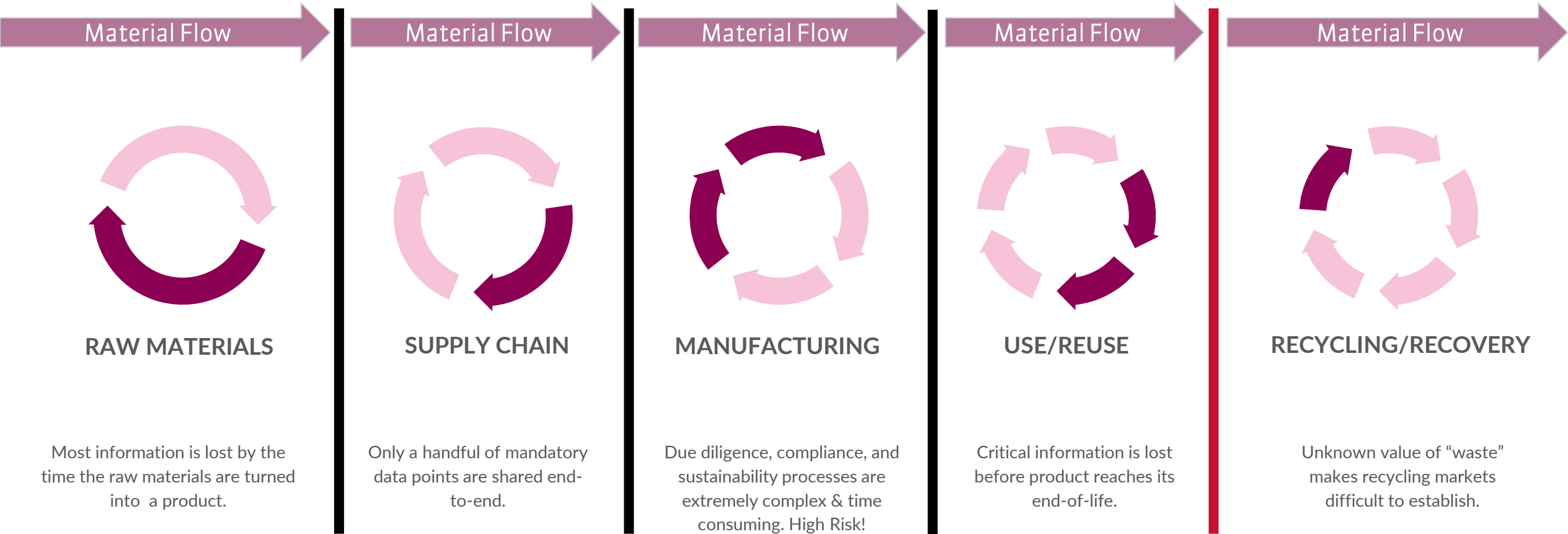
Identification of project boundaries and priorities

- Priorization at component level:
 - Focus on cathode material of a pouch cell
 - Prioritize End of Life (EoL) process
- Diagram to understand alternative EoL process steps (aqueous direct recycling)
- Identification of EoL passport attributes for the cathode material



Process and Data Analysis

Challenge: Information availability & flow



Data Analysis

Limited data availability

- Interviews to identify the importance and accessibility of DBP attributes

Surveys revealed:

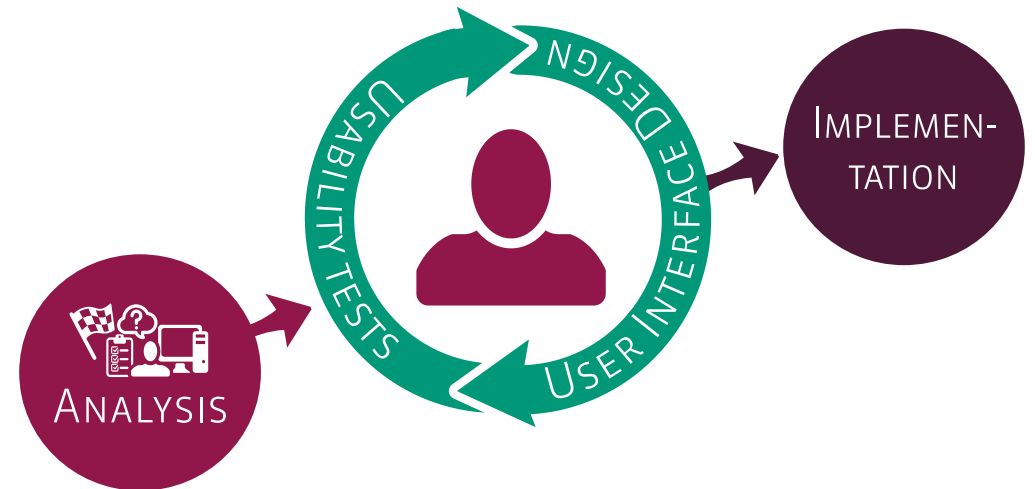
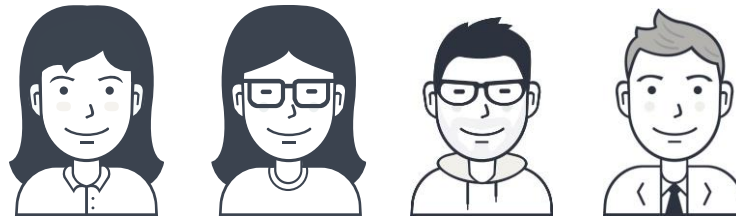
- Importance of chemical composition of cathode material
- Limited data availability for efficient direct recycling

	Bezeichnung des Attributs deutsch	Beschreibung des Attributs deutsch	Relevanz/Wichtigkeit 1=nicht wichtig, 5=sehr wichtig	Zugänglichkeit 1=nicht vorhanden, 5=vorhanden
2	Informationen zu Primärrohstoffen	Informationen (z.B. Herkunft, natürliche Eigenschaften, Regenerierbarkeit, Reinheit) zu den verwendeten Primärrohstoffen. Primärrohstoffe sind natürliche, unbearbeitete Ressourcen, wie beispielsweise Erdöl, Kohle oder Holz.		1
3	Informationen zu Sekundärrohstoffen	Informationen (z.B. Herkunft, Ausgangsmaterial, Wiederaufbereitungsmethode, Reinheit) zu den verwendeten Sekundärrohstoffen wie zum Beispiel zu dem Anteil an Recyclaten. Sekundärrohstoffe stammen nicht unmittelbar von natürlichen Ressourcen, sondern werden durch Wiederaufbereitung (z.B. Recycling) der Primärrohstoffe gewonnen, z.B. recyceltes Bauxit.		1
4	Volldeklaration der Werkstoffe	Detaillierte Informationen zu dem Material (z.B. Aluminium, Nickel), welches für die einzelnen Bauteile der Batterie verwendet wird, z.B. exakte Bezeichnung der Werkstoffe, Werkstoffnummer, Festigkeit und Härtegrad.		2
5	Informationen über die Hersteller	Informationen zu dem jeweiligen Batteriehersteller wie z.B. den Namen des Herstellers und die Kontaktinformationen sowie geografische Details der Batterieherstellung wie Ort, Produktionsstätte, Land und eindeutige Betriebskennung.		5
6	Informationen über die Zulieferer	Informationen zu den Zulieferern wie z.B. den Namen der Zulieferer und Kontaktinformationen sowie geografische Details der Zulieferbetriebe wie Ort, Land etc.		5
7	Physische Dimensionen	Informationen zu Abmaßen, Masse, Gewicht etc.		1
8	Batterietyp und Seriennummer	Informationen zu dem Batterietyp, der Chargen- oder Seriennummer oder jedem anderen Element, das eine eindeutige Identifizierung einer Batterie ermöglicht.		3
9	Bauteilnummer der Komponenten	Die eindeutigen Bauteilnummern der einzelnen Komponenten der Batterie		3
10	Seriennummern der Bauteile	Die eindeutigen Seriennummern der einzelnen Komponenten der Batterie		2
11	Anzahl der Batteriemodule und -zellen	/		1
12	Spezifikation der Zellenmodule und Zellen	Information bzgl. der vollständigen technischen Spezifikation der Materialien in der Batteriezelle, einschließlich der technischen Eigenschaften der Zelle, z.B. Handelsname der Zelle, chemische Zusammensetzung und Abmaße.		5
13	Elektrodenspezifikation (Anode, Kathode und Elektrolyte)	Informationen zur detaillierten Zusammensetzung der Kathode (Gesamtmenge an Nickel, Kobalt und Litium), Anode (Gesamtmenge an Naturgraphit und Blei) und des Elektrolyts (Auflistung der in der Elektrolyte enthaltenen Materialien).		4
14	Erwartete Reichweite	Information bzgl. der erwarteten Distanz, die mit dem jeweiligen batterieelektrischen Fahrzeug nach einer Aufladung zurückgelegt werden		5
15	Erwartete Lebensdauer	Informationen zur erwarteten Batterie-Lebensdauer, ausgedrückt in Zyklen.		2

Persona definition

Pain points and future user needs

- Persona = fictional representation of a software user
- Identified personas to be further refined:
 - Dismantler
 - Recycler





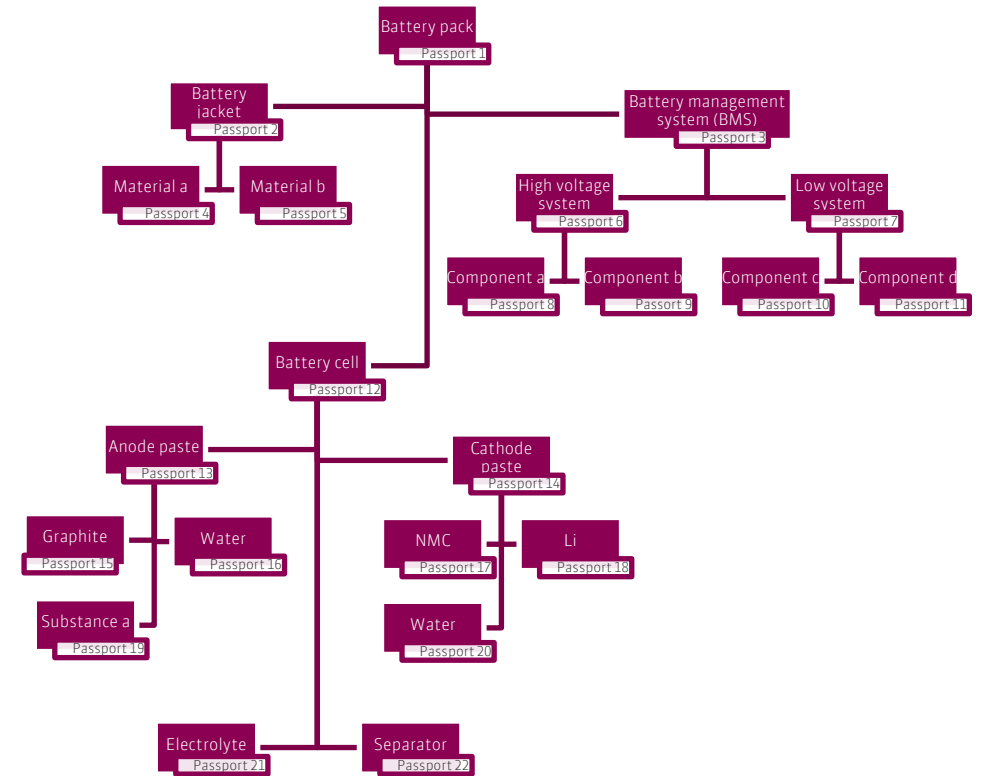
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5 | Prototype Development

First concept for a battery passport

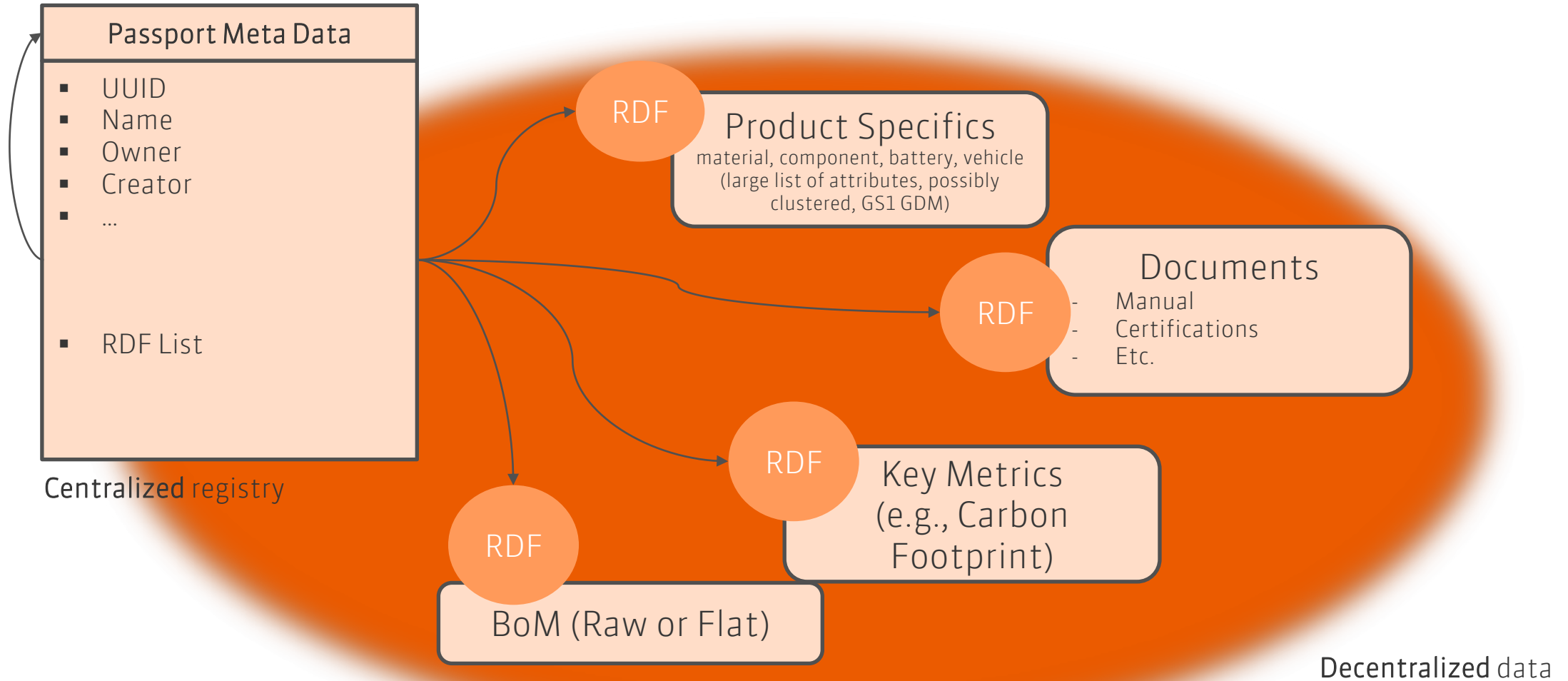
BOM-based

1. Passes for different levels (product level, component, ...)
2. DPP hierarchy follows a tree structure (given by the Bill of Material/BOM)
 - The DPP of a product refers to the DPPs of its components
 - The DPP of a component refers to the DPPs of its materials
 - ...
3. DPPs represent assets
4. Passports can be created, owned or transferred, or accepted or rejected



Draft for a Data Model

Centralized meta data & decentralized product data





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6 | Outlook

Outlook

Work to do to develop a DBP prototype

1. Further observation of relevant regulations
2. Investigate initiatives and networks
3. Refine Personas
4. Adjust data model



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