



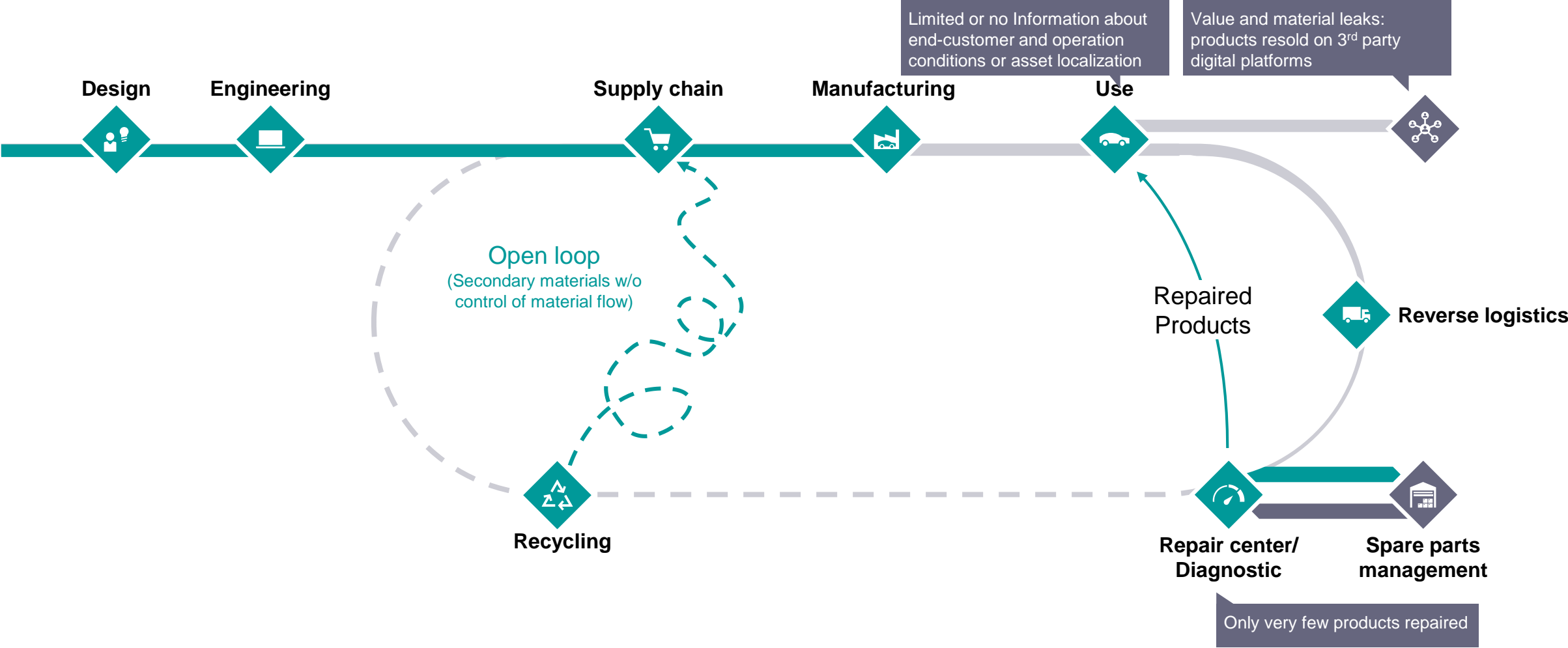
greenict.connect²³



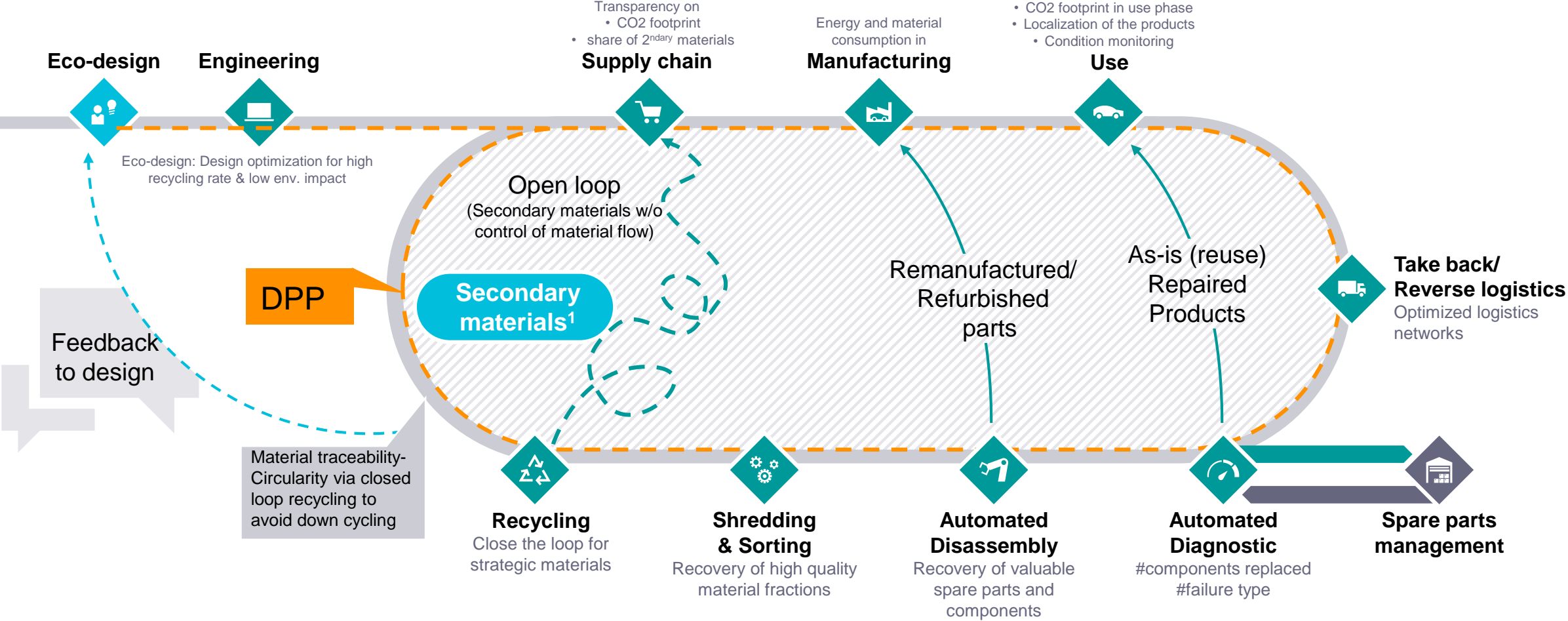
Digital Product Passport: transparency on product and environmental data along the value chain

Dr. Caroline Cassagnol
Principal Key Expert
Siemens Technology

Today producers have little transparency on product and environmental impact beyond the manufacturing phase



The digital product passport will provide transparency along the product life cycle. It is a key element to close the loop and foster circular economy

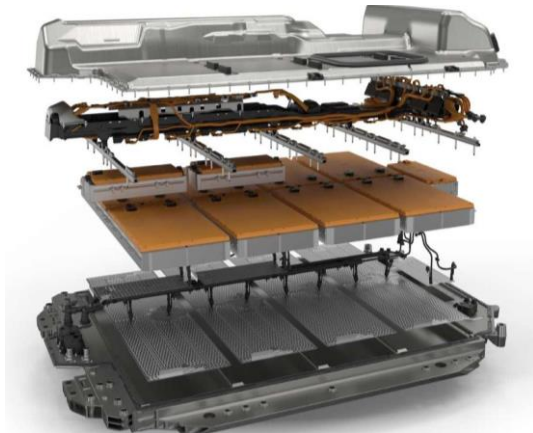


Digital Product Passport

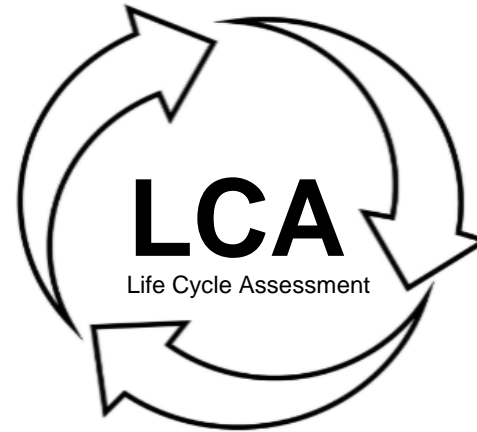
Transparency, sustainability and automation through life cycle information



The DPP is a data set that transparently presents information about a product, such as the manufacturer, contained materials and chemical substances.



DPP is a key element of ESPR; blue print with Batteries. **Battery Passport to be implemented** until 2026.



Transparent communication of sustainability KPIs over the life cycle enables improved environmental impact calculations.



7MF03..-.....-.....

SITRANS P320 7MF03 / HNU
SITRANS P320 Pressure transmitter

■ Sales release	01.08.18
■ Delivery release	17.09.18
■ Announcement of product phase-out	
■ Product cancellation	
■ Product discontinuation	

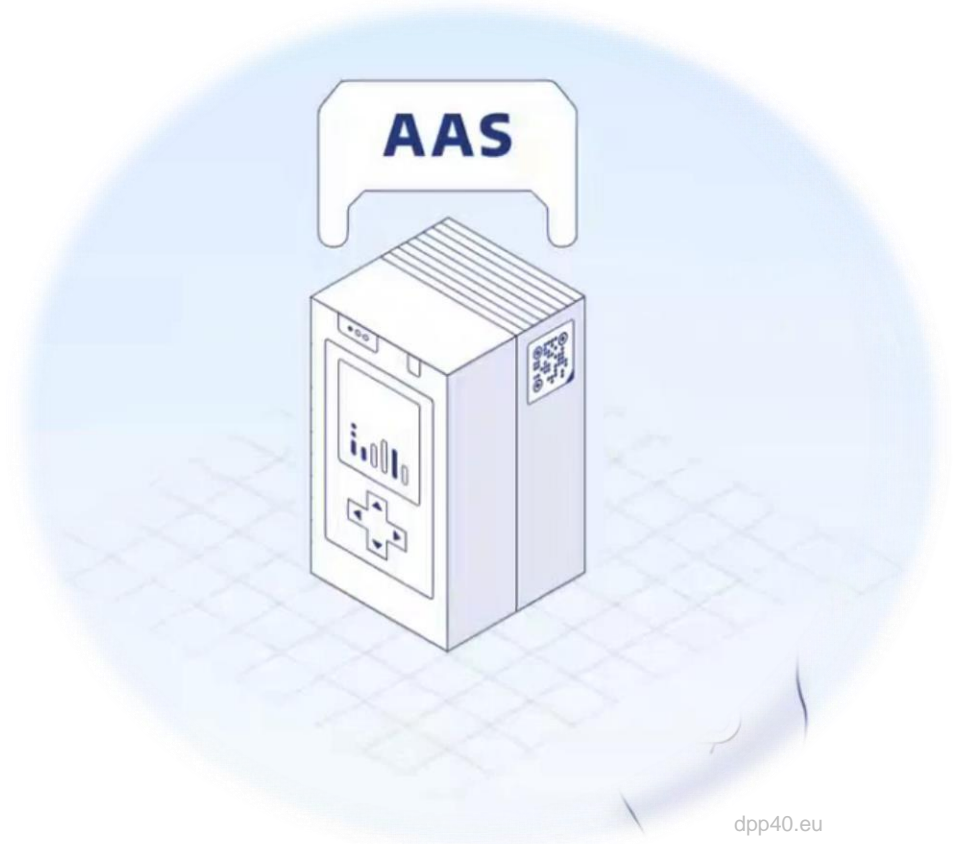
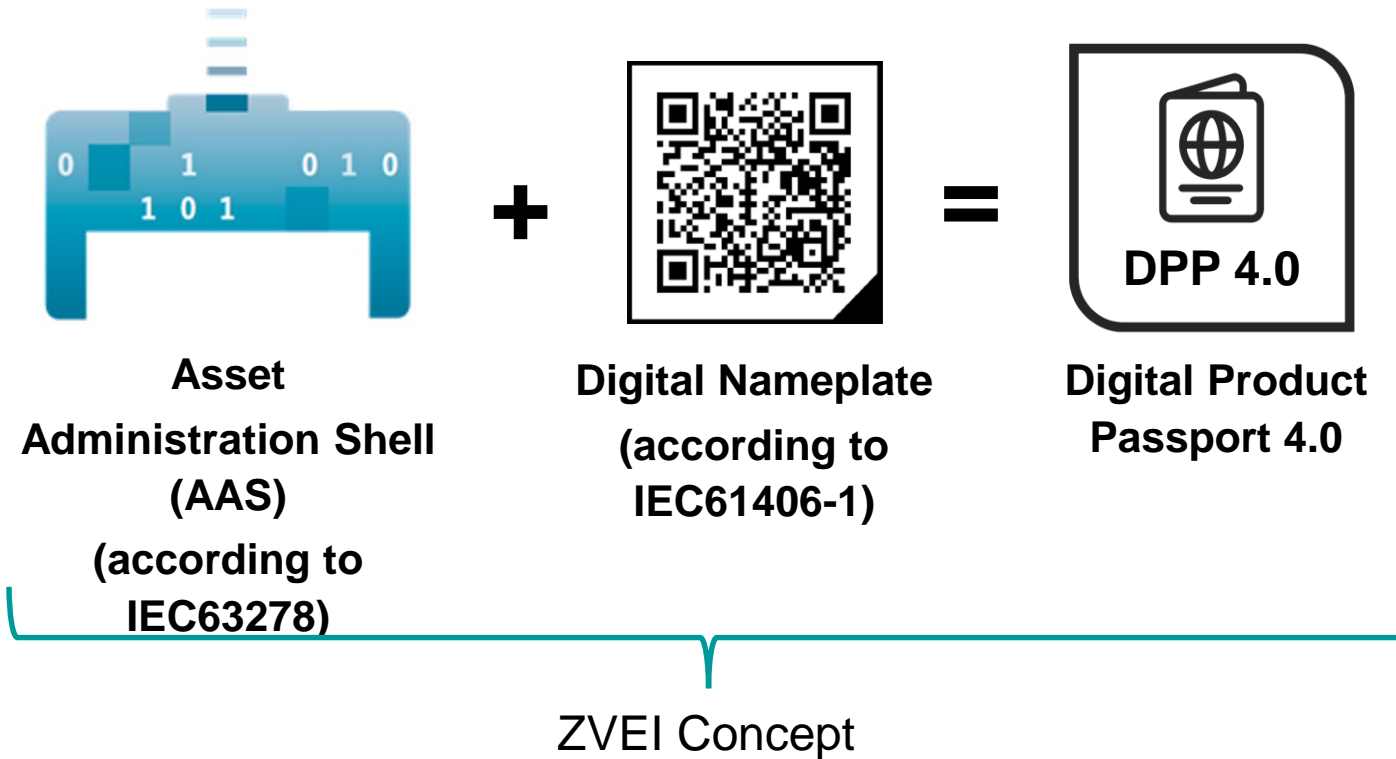
Digital nameplate



The **Digital Nameplate** serves as a replacement for analogue type plates and is an integral part of the DPP.

Digital Product Passport 4.0

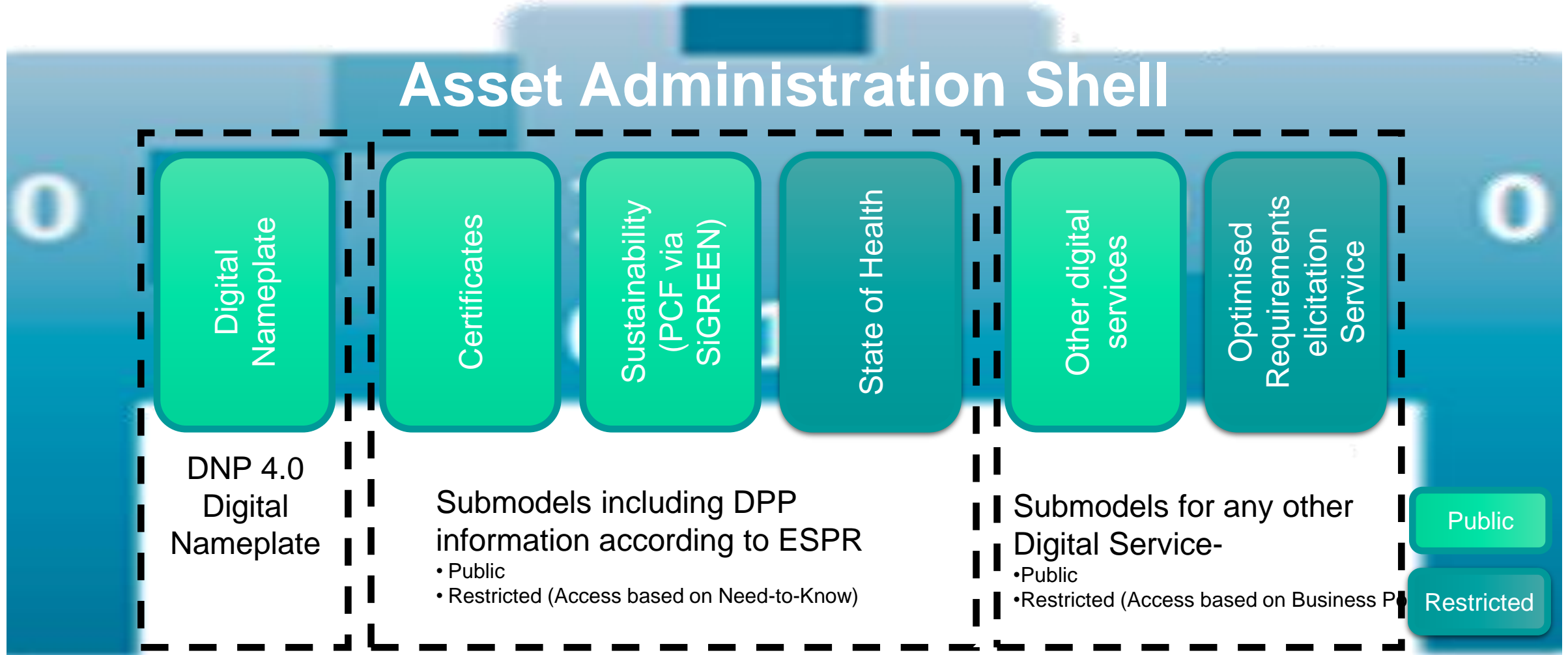
Definition and relationship to the real physical asset



Source: D. Wegener et al., Panel discussion @HMI 2023 “DPP 4.0- The digital product passport for industry 4.0”

AAS for the implementation of user-specific views on the data

AAS is a digital model that represents assets and a way to implement the Digital Twin in Industrie 4.0.



Digital Product Passport realised with the Asset Administration Shell

Real application example with Siemens S7 Controller

File Workspace Options Help

based on specifications of Platform Industrie 4.0 **INDUSTRIE 4.0**


www.company.com/demo/aas/1234554842136874684321

Submodel

Submodel element

Submodel element

www.siemens.com/ids/asset/ML
FB=6ES7515-2FM00-0AB0&SN=C-E9S35353



AAS "Siemens_S7_CPU1515" V1.0 [IRI, www.company.com/demo/aas/1234554842136874684321] of

- SM** "Nameplate" [IRI, www.company.com/demo/sm/instance/F9CC779860FC10391]
 - HSU** Nameplate Submodel of the HSU ready
 - Prop** "ManufacturerName" = Siemens AG
 - Prop** "ManufacturerProductDesignation" = CPU 1515F-2 PN
 - SMC** "PhysicalAddress" (4 elements)
 - Prop** "ManufacturerProductFamily" = Programmable logic control (SPS)
 - Prop** "SerialNumber" = C-E9S35353
 - Prop** "BatchNumber"
 - Prop** "ProductCountryOfOrigin" = DE
 - Prop** "YearOfConstruction" = 2014
 - SMC** "Marking_CE" (2 elements)
 - SMC** "Marking_UL" (2 elements)
 - SM** "Identification" [IRI, www.company.com/demo/sm/instance/4F44B8B32822E483]
 - SM** "Service" [IRI, www.company.com/demo/sm/instance/1D77CEFC25CEC482]
 - SM** "Document" [IRI, www.company.com/demo/sm/instance/204F677FF7D40E79]

Element Content

Submodel Element (Property)

Referable:

idShort: BatchNumber
category: PARAMETER

Kind (of model):

kind: Instance

Semantic ID:

semanticId: (ConceptDescription) (local) [IRDI] 0173-1#02-AAQ196#001

Qualifiable:

HasDataSpecification (Reference):

ConceptDescription

Referable:

idShort: BatchNumber

Identifiable:

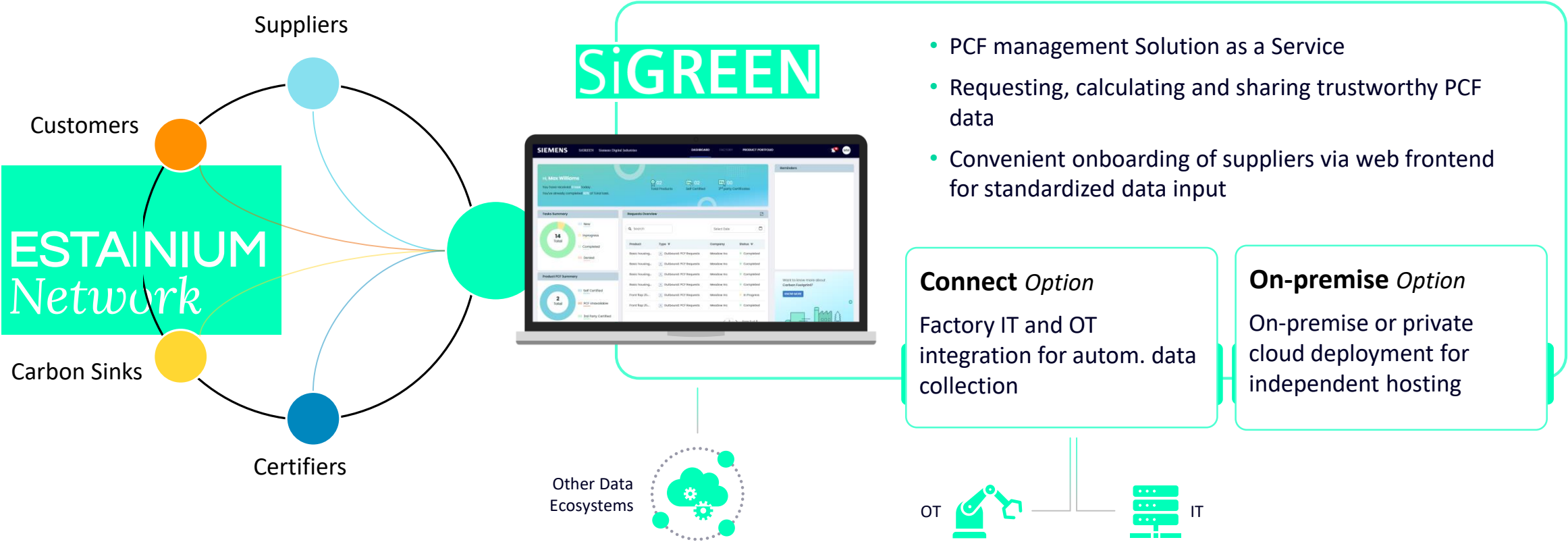
idType: IRDI
id: 0173-1#02-AAQ196#001

isCaseOf:

Reload Drag from here! Show Content



SiGREEN is connected to external partners as well as internal IT and OT infrastructure and will provide sustainability data for the DPP



independent | pre-competitive | cross-industry

Leveraging Siemens' industry expertise

The environmental product declaration (EPD) provides transparency on the environmental impact of the product and can be stored in an AAS submodel



ENVIRONMENTAL PRODUCT DECLARATION

SIRIUS

Contactor 3RT231.-.....

Type II according to ISO 14021 including life cycle impact assessment (LCIA) [siemens.com](https://www.siemens.com)




SIEMENS

General information

This environmental product declaration (EPD) is based on the international standard ISO 14021 ("Environmental labels and declarations – Self-declared environmental claims – Type II"). The data in this EPD has been evaluated on a full-scale life cycle assessment (LCA) study according to ISO 14040/44, taking into account the product category rules (PCR) for electronic and electrotechnical products and systems defined in EN 50693, as well as product specific rules (PSR) for low-voltage switchgear and controlgear equipment in IEC TS 63058 ED1.0.

Siemens is dedicated to an environmentally conscious design of its products in line with IEC 62430 and has implemented an integrated management system according to ISO 9001, ISO 14001 and ISO 45001.

Products: All variants in the range of 3RT231.-.....
 Represented by: 3RT2317-1AP00 (Contactor)
 Product Description: Contactor, AC-1, 22 A/400 V/50 °C, 500, 4-pole, 230 V AC, 50/60 Hz, screw terminal
 Functional Unit: To make, carry and break currents at rated operation voltages U_n and for the utilization categories and N operations according to IEC 60947-4-1 by a remotely operated switching device. To provide galvanic opening of a circuit. To withstand short-circuit currents for specified co-ordination type(s).



Material composition

The following chart outlines the overall material composition of the calculated reference product.

Product weight of 230 g adds up with packaging weight of 36 g to a total weight of 266 g. Packaging consists of triple cardboard *13.5 g and label (white coated, calendared, woodfree paper, FSC certified, *0.4 g).

Substance assessment

At Siemens, we are committed to the development and production of environmentally sound and sustainably produced equipment. This includes avoiding hazardous substances in our products without compromising their benefits for our customers. Please visit the following website to learn more about how we comply with product-related environmental regulations like RoHS, REACH, WEEE and others: [Product Related Environmental Protection](#)

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Life cycle stages and reference scenarios

Manufacturing

This stage covers the extraction of natural resources, production of raw materials, manufacturing, packaging and transport distances.

Operations

This stage covers the product's installation, use and maintenance. Different operating conditions can lead to deviations from the standard scenario.

End-of-life

This stage covers the disassembly, material recycling and thermal treatment of all recyclable materials as well as the disposal of all other materials.

Key environmental performance indicators

The following impact categories characterize the product's environmental footprint. They have been calculated with LCIA methodology EP3.0; LCA tool: GaBi 10.6.1.35; Database: GaBi Professional & Extensions, 2020.

Impact category	Unit	Total	Manufacturing	Operation	End of Life
Acidification	Mole of H+ eq	2,03E-01	1,34E-02	2,04E-01	-1,41E-02
Global warming potential	kg CO ₂ eq	9,44E+01	8,90E-01	9,38E+01	-2,98E-01
Ecotoxicity, freshwater – total	CTUe	7,44E+02	7,40E+00	7,39E+02	-2,09E+00
Eutrophication, freshwater	kg P eq	2,27E-04	8,20E-07	2,21E-04	-3,68E-07
Eutrophication, marine	kg N eq	4,60E-02	5,27E-04	4,58E-02	-3,37E-04
Eutrophication, terrestrial	Mole of N eq	4,82E-01	5,61E-03	4,80E-01	-3,50E-03
Human toxicity, cancer – total	CTUh	2,54E-08	4,83E-09	2,12E-08	-6,49E-10
Human toxicity, non-cancer – total	CTUh	7,77E-07	2,93E-08	7,77E-07	-2,97E-08
Ionising radiation, human health	kg U235 eq	4,58E+01	6,98E-02	4,57E+01	3,57E-02
Land Use	dimensionless (g)	6,07E+02	6,89E-01	6,08E+02	-1,90E+00
Ozone depletion	kg CFC11 eq	5,15E-08	4,94E-08	1,38E-09	-4,60E-10
Particulate matter	Disease incidences	1,70E-06	9,46E-08	1,69E-06	-8,72E-08
Photochemical ozone formation	kg NMVOC eq	1,24E-01	2,41E-03	1,24E-01	-1,76E-03
Resource use, fossils	MJ	1,51E+01	1,69E+03	-4,25E+00	
Resource use, mineral and metals	kg Sb eq	1,41E-04	2,54E-05	-2,08E-04	
Water scarcity	m ³ world eq	9,57E-02	2,12E+01	-9,95E-02	

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Global warming potential

This chart shows the overall global warming potential of the product. The operations phase is the lifecycle phase with the biggest overall impact. Different operating conditions can lead to deviations from the standard scenario.

End-of-life scenario

The end of life stage was modelled by shredding of the device, followed by sorting and material separation process. It leads to:

- an overall product recyclability of up to 67% mainly due to high metal content
- an energy recoverability of up to 26% from plastic materials
- a minimum landfill rate of 7%

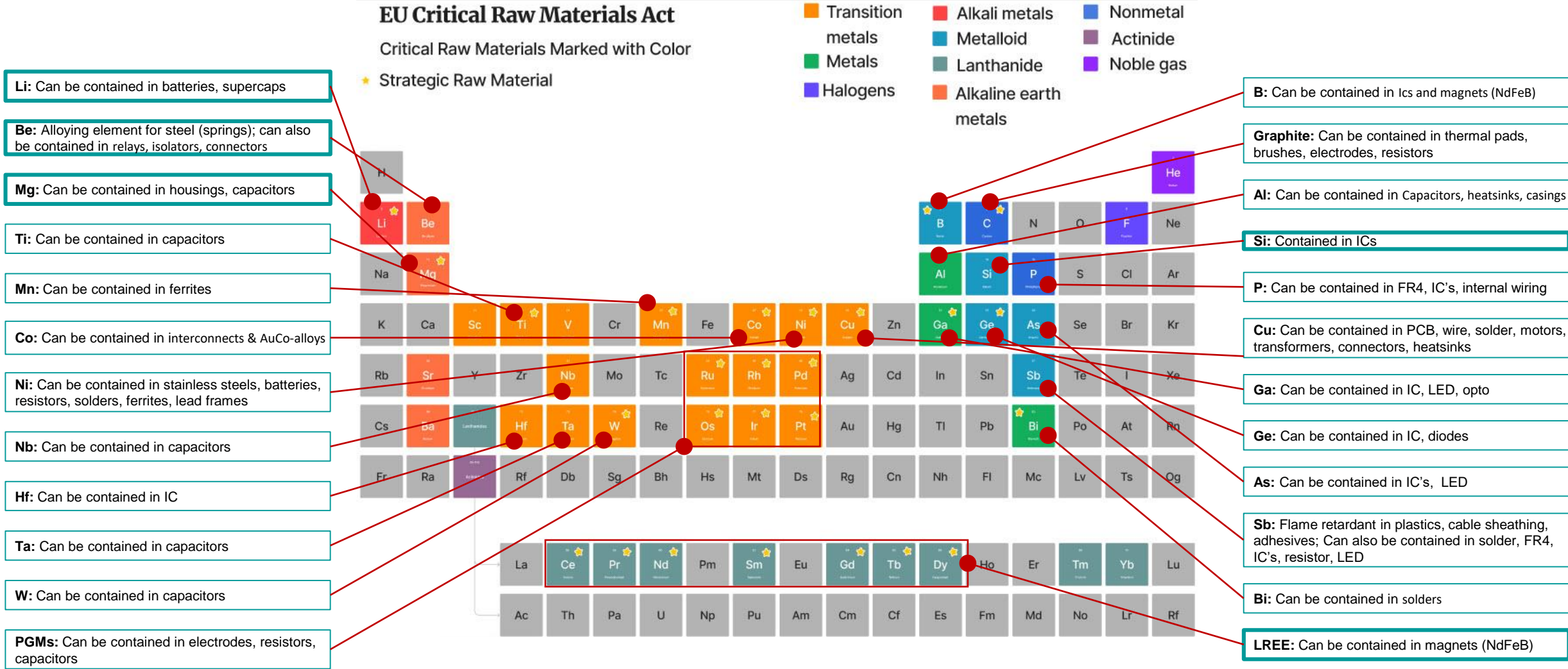
The exact final values depend on the used recycling process and add up to 100%. Note: The device should not be disposed of as unsorted municipal waste. Special treatment for specific components may be mandated by law or ecologically sensible. Observe all local and applicable laws.

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LCIA Results

Critical raw material act (03/2023) establishes the list of strategic material for Europe

Sharing data with recyclers should help to recover them and keep them in closed loop



EU Taxonomy establishes further requirements to electronic equipments



Corresponding sustainability KPI can be shared among partners along the value chain



- Information to customer 
- Substitute Substances of Concern (SoC) 
- Extended responsibility 
- Durability / Longevity (Reliability, Upgradeability) 
- Reuse /remanufacturing 
- Ease dismantling 
- Repairability 
- Recyclability 

+

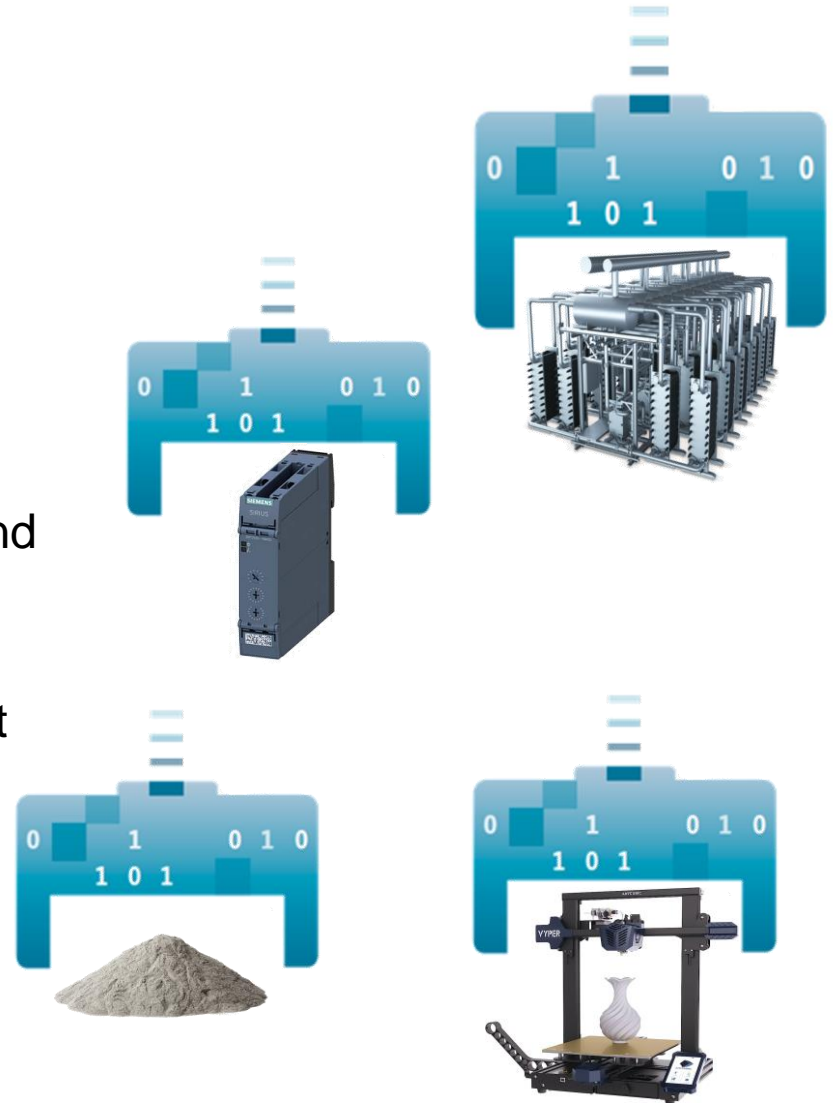
ESPR

- Secondary Materials 
- Energy efficiency 
-

The digital product passport is a key enabler of the twin green and digital transformation

DPP 4.0 will

- share primary data on products among partners across the value chain
- allow an accurate calculation of the environmental footprint based on this primary data
- Improve recovery of value products, (critical/strategic) materials and components through their localization and identification
- Provide real time information on performance and additional services like condition monitoring to improve environmental impact
- Enable a more accurate calculation of circularity metrics and key performance indicators at product and company level
- Support EU taxonomy and make environmental reporting easier
- help to achieve customer's trust



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greenict.connect²³