

PROPOSAL FOR BATTERY PASSPORT TECHNICAL SOLUTIONS

GREEN TRANSPORT DELTA SOUNDING BOARD MEETING

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SECURE CONNECTIONS
FOR A SMARTER WORLD

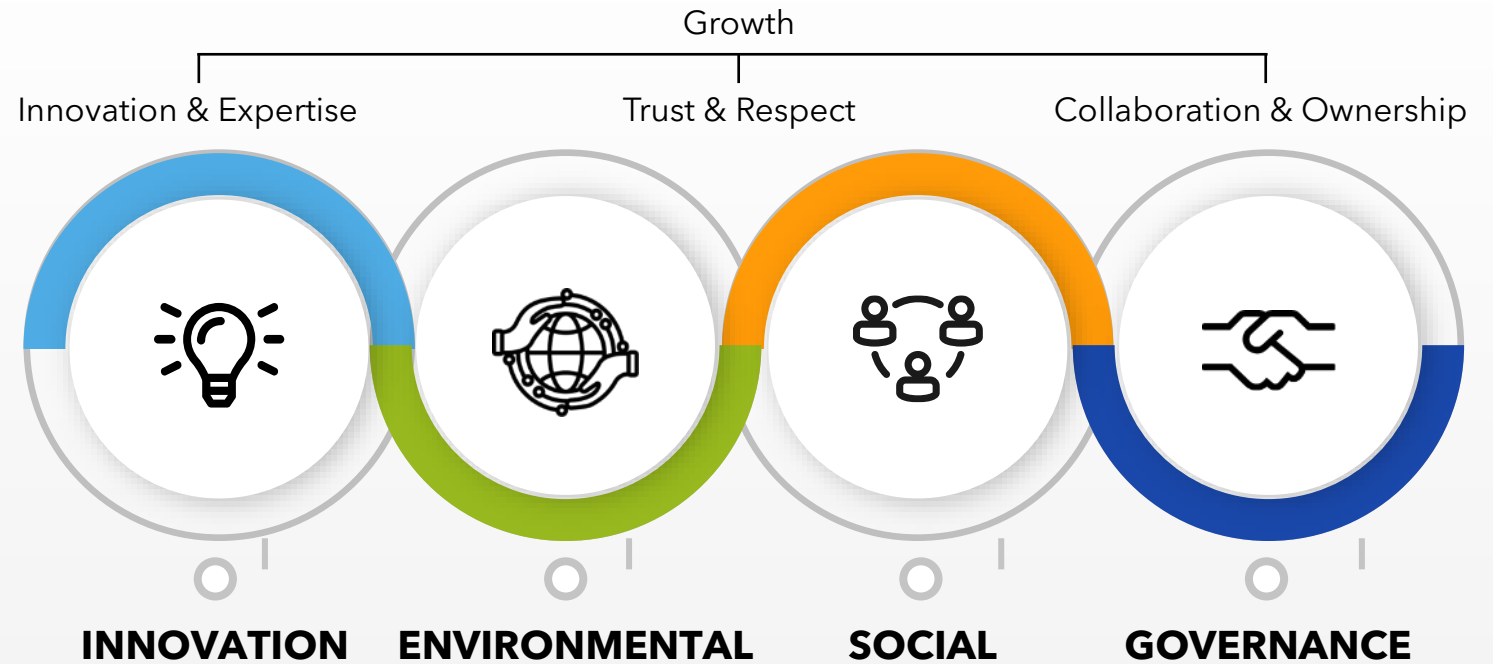
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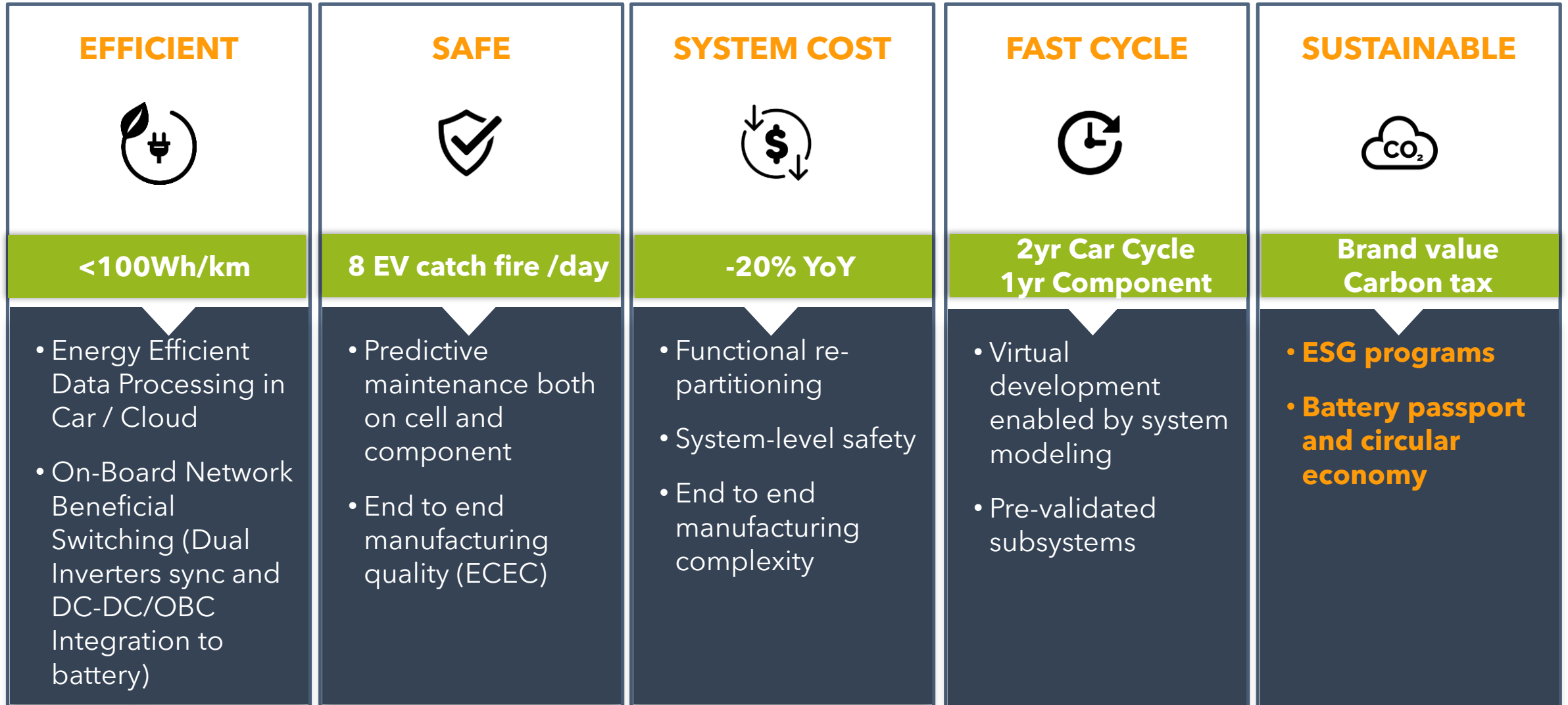
NXP'S ESG GOALS

Our ESG mission is to enable a better, safer, more secure and sustainable world through innovation.



- Design and manufacture technology that positively impacts the planet and society
- Reduce carbon emissions by 35% in 2027 (from 2021 baseline)
- Optimize natural resources by 2027 (50% renewable electricity)
- Carbon Neutrality by 2035

THE NEXT MOVE IN THE EV INDUSTRY



SUPPORTING DOMAIN CONTROL ARCHITECTURE AND SOFTWARE-DEFINED VEHICLE

HIGHLY CONFIGURABLE ANALOG SOLUTIONS → SW-UP-INTEGRATION → CLOUD CONNECTIVITY

A

CLOUD CONNECTIVITY

Connectivity unit to enable cloud-based AI/ML, analytics and OTA updates

B

SOFTWARE UP-INTEGRATION

High-end compute platform in domain propulsion controller to drive energy and range optimization across e-Powertrain, incl most of battery management SW

C

ADVANCED BATTERY MANAGEMENT SYSTEM

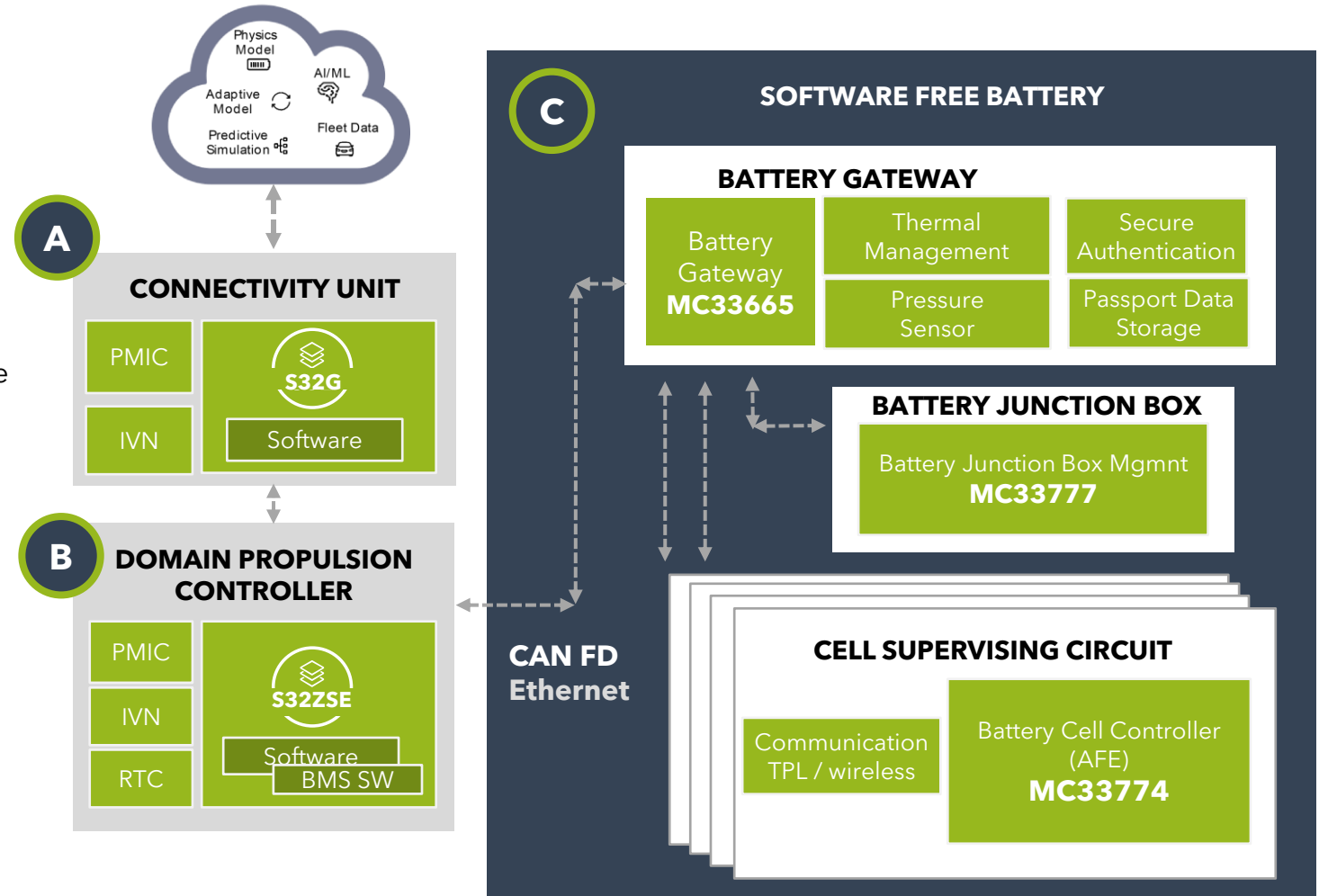
Battery gateway with standardized interface to offload software


Synchronized Battery Junction Box to allow advanced diagnostics w/o MCU

Highly Integrated AFE

High accuracy measurement, filtering and quasi-autonomous balancing

Available with Wired as well as several **Wireless Technologies**

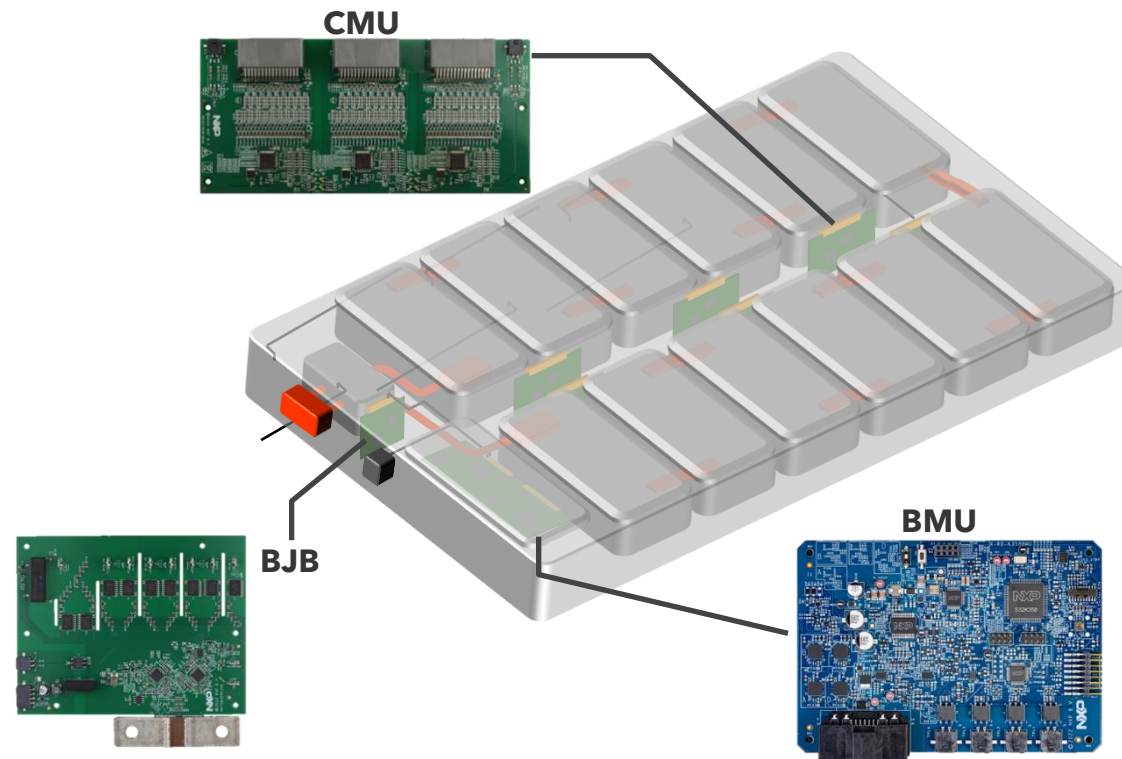
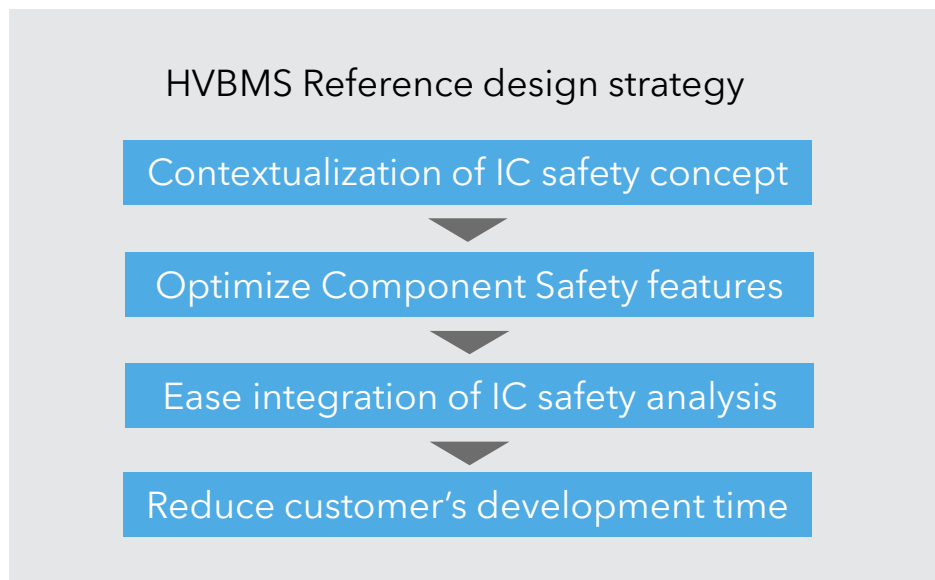


 NXP's embedded control and high precision analog solutions for battery management systems

HVBMS REFERENCE DESIGN

THREE REFERENCE DESIGNS COVERING ALL HVBMS FUNCTIONS

NXP offers a **full system reference design suitable for ASIL compliant BMS systems**



HVBMS-RD Hardware

- Three main application boards:
- BMU (Battery Management Unit)
 - BJB (Battery Junction Box)
 - CMU (Cell Management Unit)

HVBMS-RD Software

Production ready Software including safety library implementing necessary safety mechanisms

HVBMS-RD Safety analysis

Full documentation, database and analysis for a full ASIL D BMS

BATTERY PASSPORT BY GLOBAL BATTERY ALLIANCE

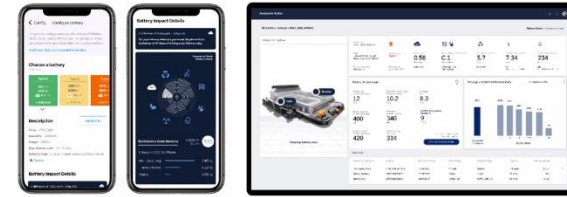
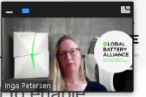
- **Globally harmonized battery passport concept**

- Sustainable data (Material, Footprint, ESG)
- Reliable and comparable data
- Transparent data ownership
- Minimum requirement for global legislative action (but not minimum compromise)
- No technical implementation proposal

- **NXP is part of the GBA and takes part in current activities to harmonize standards in ESG / Sustainability data segment of the passport**

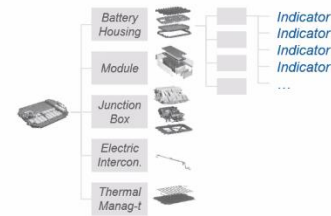
What does GBA actually do?

Action partnerships: Battery Passport

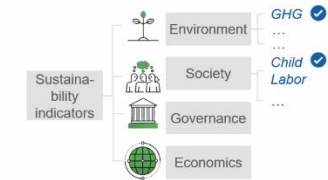


The Battery Passport is the key instrument to enable the development a sustainable, circular, and just battery value chain delivering on GBA's 10 principles by **monitoring the sustainability performance** based on data **U**nderstandable, **S**tandardized, **A**ccurate, **D**ifferentiating, **A**uditable, **C**omprehensive and providing insights to **trigger improvement action**

Indicators follow **physical structure**



GBA community develops indicators



29 indicator developed, focus on 2 of them now

GBA manages **access to data**

GBA BP is to assure proper data aggregation and representation mechanisms, e.g.:

- OEM inspects specific model/product types produced and explore its end-to-end value-chain view to discover bottlenecks in emissions and data compliance of suppliers;
- NGOs and Civil Society access the aggregated information on GBA Battery Passport KPIs and allow drill down, maintaining the privacy of participating partners intact

Source: Global Battery Alliance



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“Electric vehicle batteries, rechargeable industrial batteries with a capacity greater than 2 kWh and LMT batteries shall bear a conspicuous, clearly legible and **indelible label...**”

[EU Battery Regulation 2020/0353 \(COD\) Chapter II Article 7 Paragraph 2](#)

“**Liability** of economic operators to take appropriate action to bring an instance of noncompliance to an end”

[EU Battery Regulation 2020/0353 \(COD\) Chapter VI Article 38 Paragraph 9-11](#)

Read-only access to the data for the parameters set out in Annex VII through the battery management system referred to in paragraph 1 shall be provided

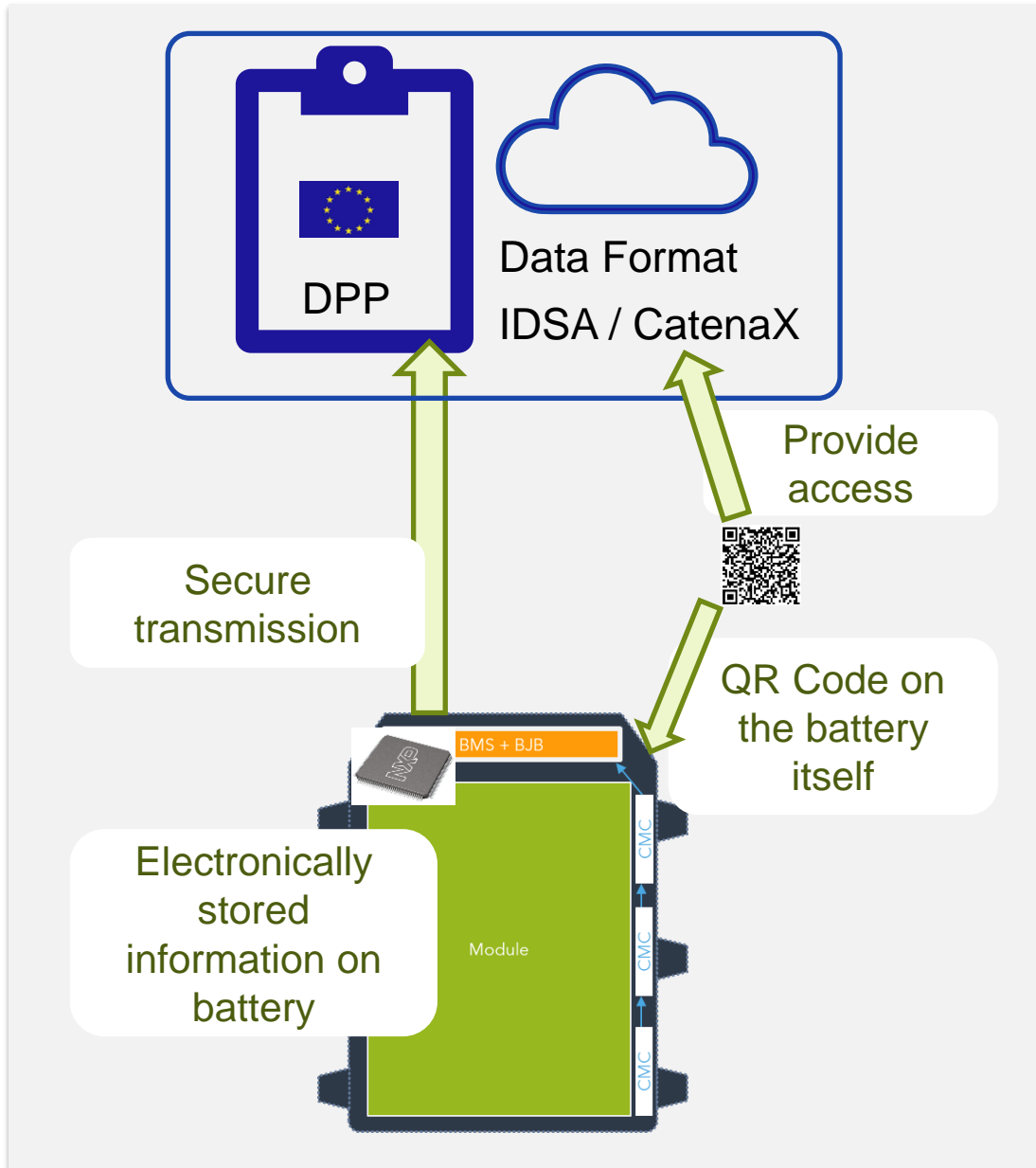
BUT

*“The battery management system shall include a **software reset function**, in case economic operators carrying out preparation for re-use, preparation for repurposing, repurposing or remanufacturing need to upload **different battery management system software**”*

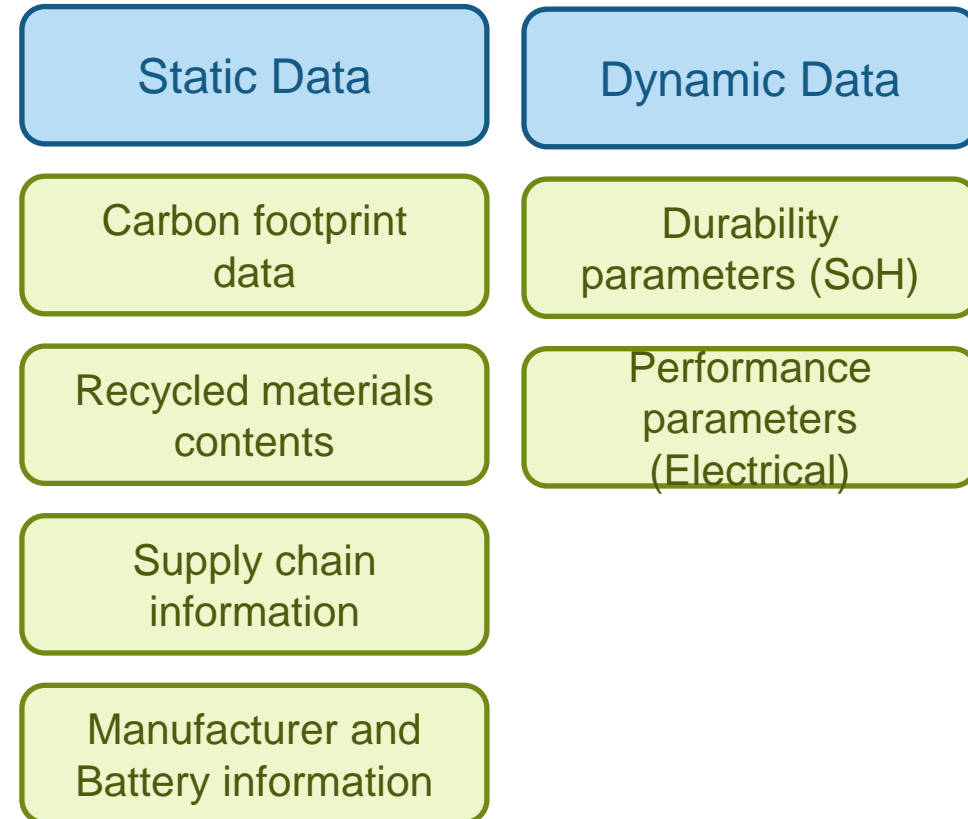
[EU Battery Regulation 2020/0353 \(COD\) Chapter VI Article 14 Paragraph 2 & 3](#)

EU BATTERY REGULATION

- Complex set of rules that in the same time:
 - opens up a market for batteries
 - closes the market due to safety and footprinting
 - makes it circular inside the EU
- Transactions with the battery hardware are to be expected and security is needed!
- Security and safety of the battery system must go hand-in-hand
- CARB is looking to implement a similar structured ruleset, GBA is supporting the global alignment

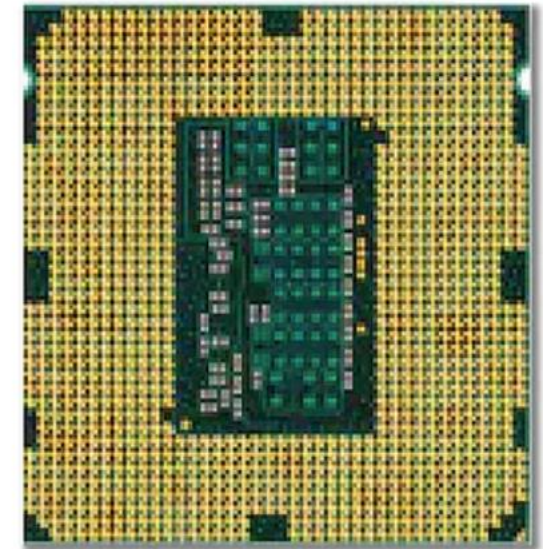


DATASET OF BATTERY PASSPORT



WHAT CAN NXP PROVIDE?

- Data hooks during **Production / Logistics** phase in order to track the content elaboration
- Data and access solutions for secure communication during **in-use phase**



BMS AUTHENTICATION USING SECURE ELEMENTS

- **Use Cases**

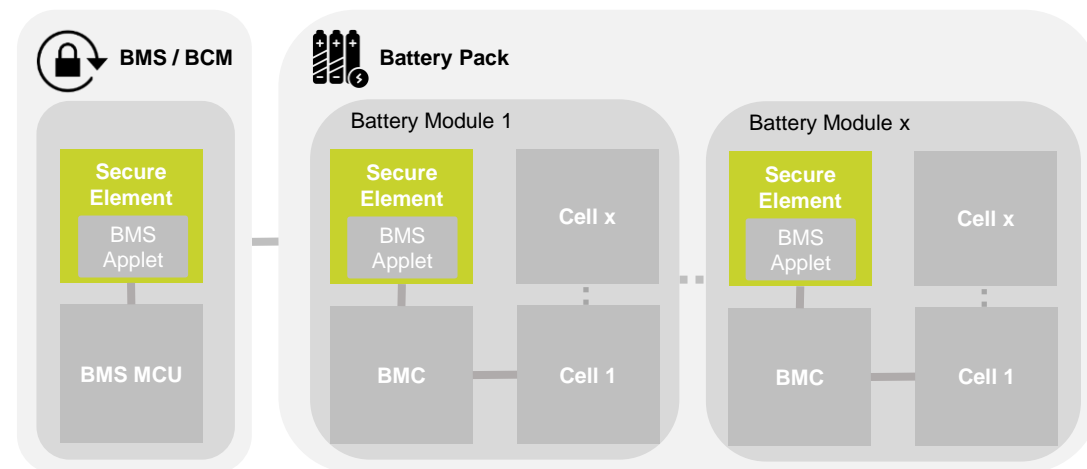
- Secure BMS communication between BMS host and cell modules
- Management of EU battery passport related data and secure cloud connection
- Plug & Charge ISO15518 authentication

- **NXP Reference System Solution - One-Stop Shop**

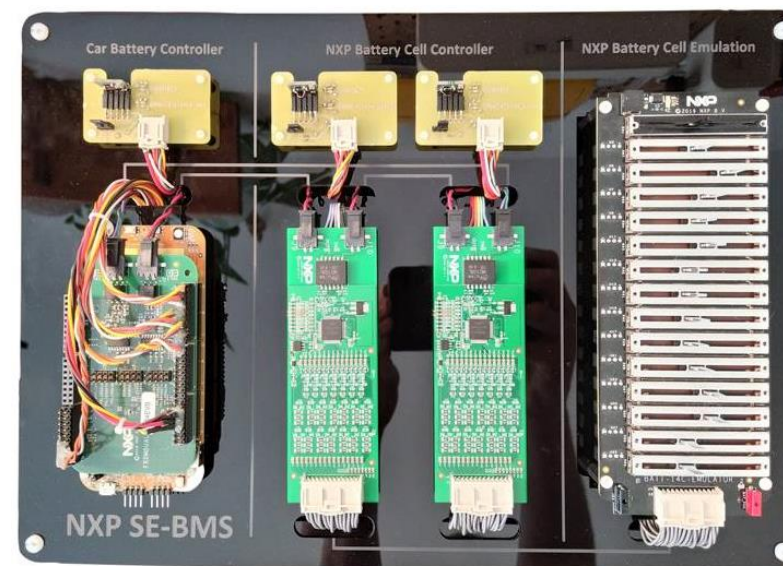
- S32k Host MCU
- MC33664ATL Isolated Network High-Speed Transceiver
- MC3377x Battery Cell Controller IC
- NCJ37x Automotive Secure Element with Secure BMS Applet

- **Security Concept**

- NXP Common Criteria EAL5/6+ certified Automotive Secure Elements
- Secure BMS JCOP Applet with highest security & flexibility
- Secure asymmetric protocol for pairing battery pack & the car. High performant symmetric cryptography for timing critical scenarios (e.g. engine start)
- NXP's EdgeLock 2GO making security lifecycle management easy



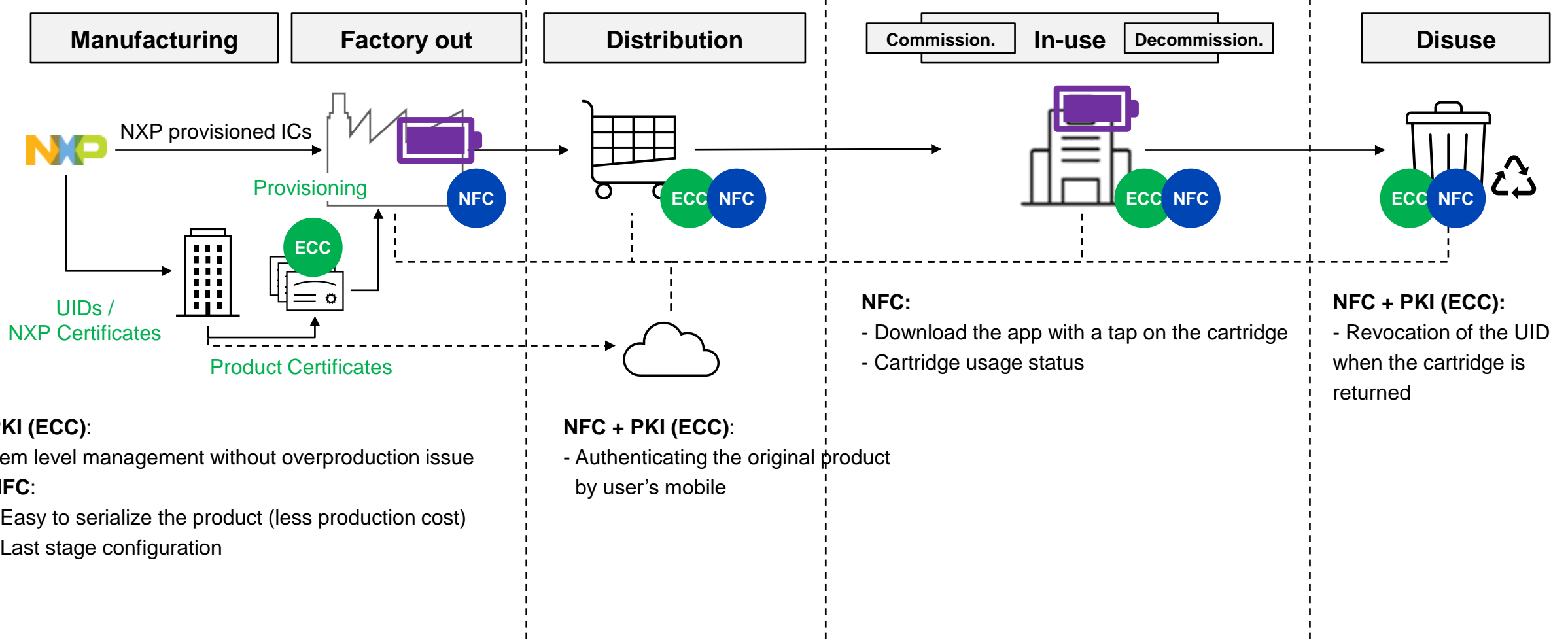
BMS Auth Reference Architecture



BMS Auth Reference Design

HOW NXP CAN SUPPORT DATA GENERATION EFFICIENTLY?

- NXP's solution covers full lifecycle of products, and provides the transparent traceability



Questions & Answers Session



Being the “economic operator” of a TIER1 battery, what is your functional, security & implementation requirements to fulfil the liability that you have in out of the EU Battery regulation?





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