

Circularity by Design for Renault Group

A New Car Door Architecture for Remanufacturing and Recycling in the 2030 Context.

Context

The European automotive industry is among the largest consumers of primary raw materials, and every year over 6 million vehicles reach their end of life in Europe. Although vehicles are often recycled, the recovered metals are of low quality and barely any recycled plastic returns to new vehicles. In response, the EU is tightening regulation through the revised ELV Directive and the Critical Raw Materials Act, pushing the automotive sector, including Renault Group, away from its linear model.

Goal

'Design a circular car door concept to demonstrate the potential created by remanufacturing and recycling, for Renault and its stakeholders within the 2030 sustainable mobility context'

The circularity gap

Renault Group's circular ambition is in place: through The Future is Neutral, the infrastructure for collection, dismantling, remanufacturing and recycling is being built. But the products entering that system are still designed with a linear logic.

The car door shows this in practice. Components sit deep in the assembly and are individually fastened, making disassembly slow and costly. As a result, only parts whose value outweighs the removal time are recovered. The rest is shredded, which contaminates recycling streams resulting in downcycled material.

'The circular system exists, but the products feeding it are not designed for it. **Fast and clean disassembly is needed** to achieve a higher circular impact.'

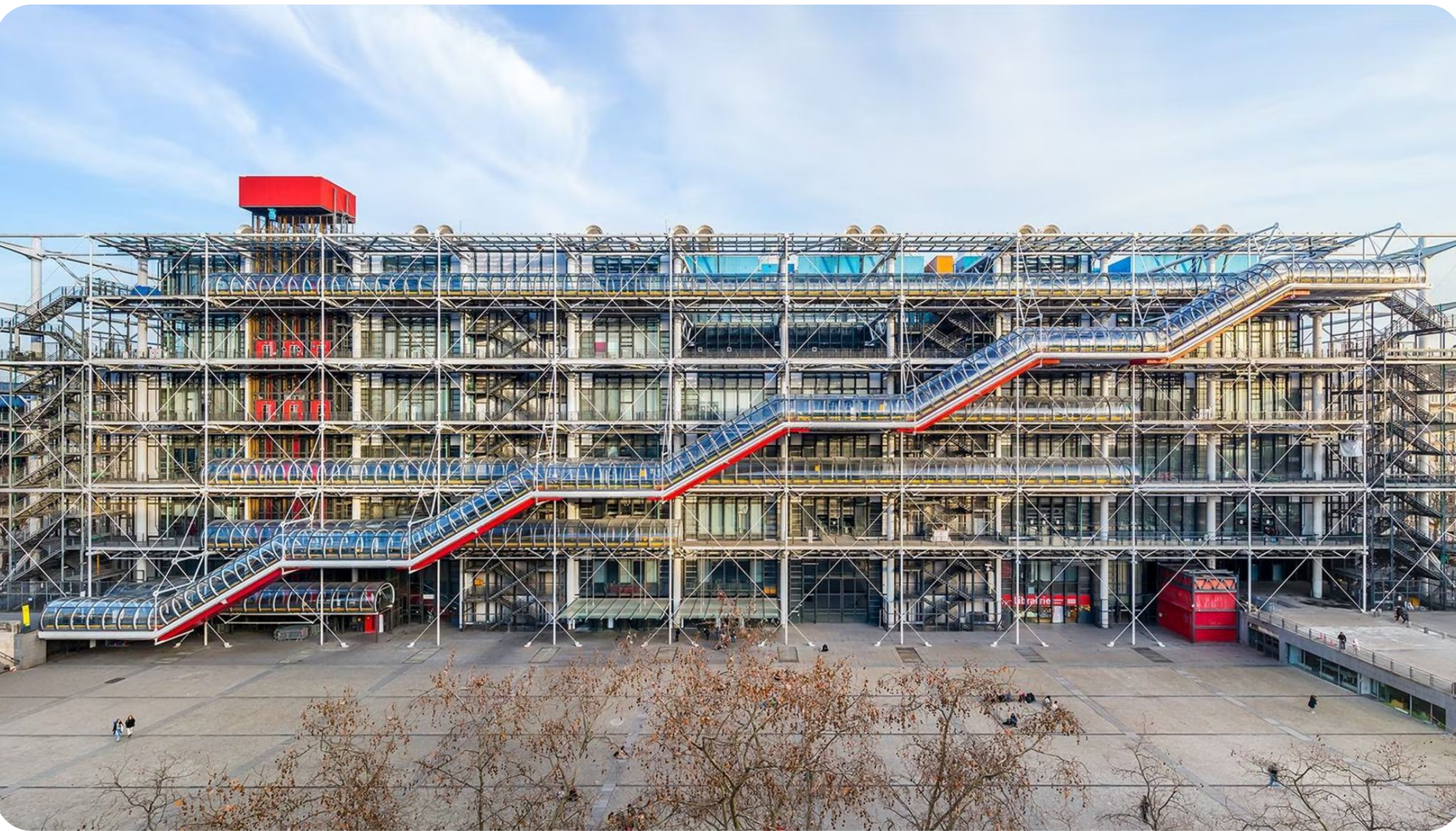
Concepts

Three directions were explored, each targeting a different resource cycle: Slowing the loop (use fewer components and materials), Extending the loop (recover components fast enough for remanufacturing), and Closing the loop (separate materials cleanly before shredding).

Design philosophy

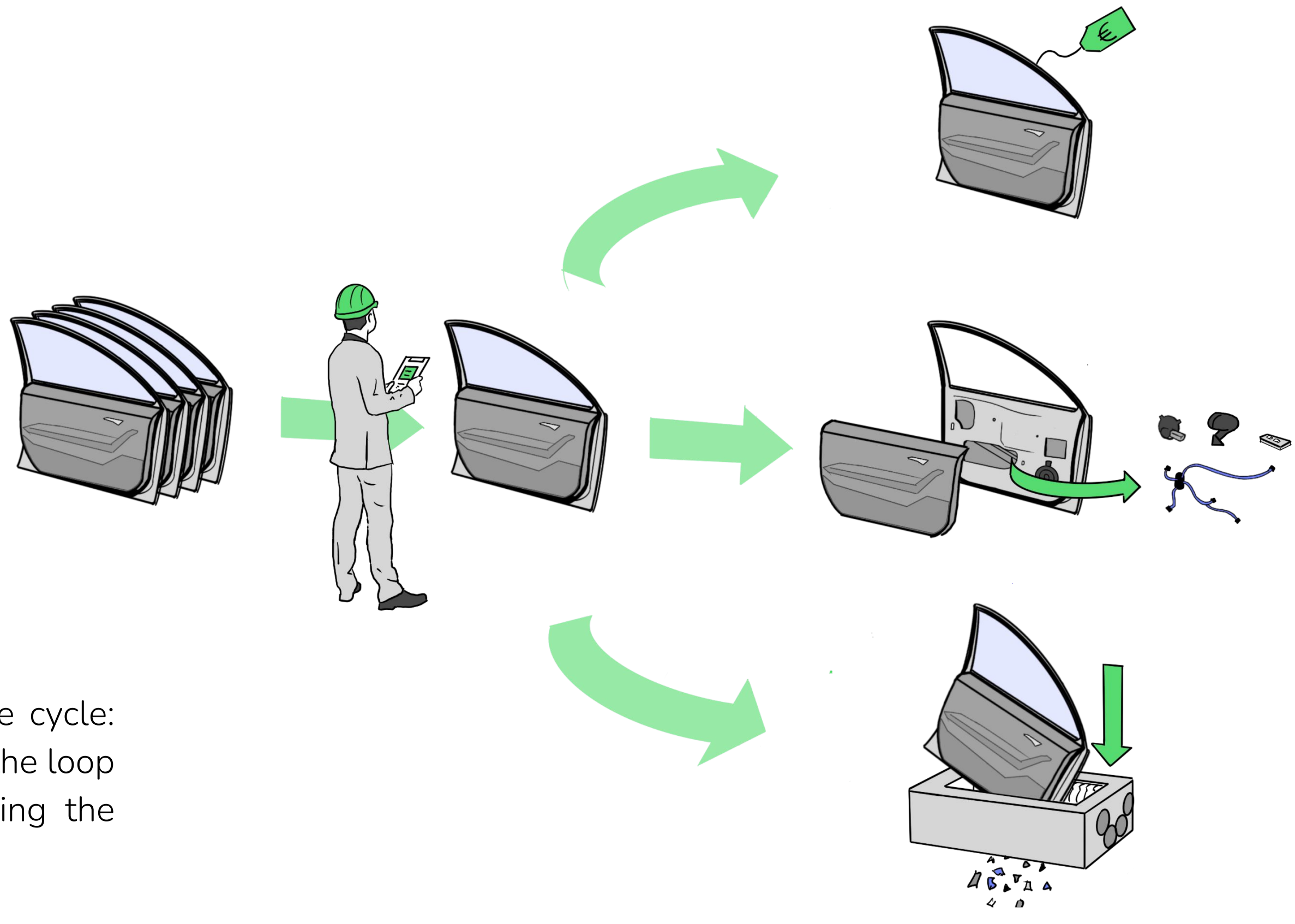
Expose. Legible. Accessible.

"A circular car door should be like the Centre Pompidou: components should be visible, legible and accessible, while still evoking emotion for the user."

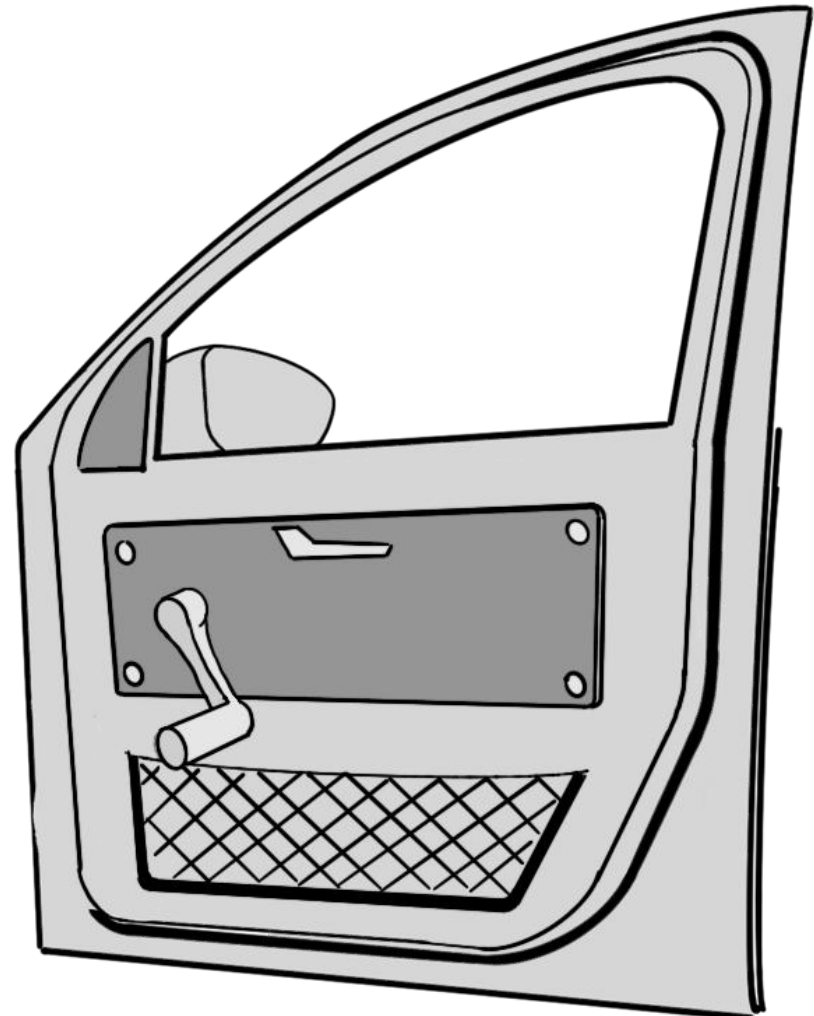


Final concept

The final design combines the concepts into one architecture built around a removable module. A single module clumps and surfaces components to the top of the assembly that lifts out in a quick operation. This makes disassembly both fast, opening up remanufacturing opportunities and clean as copper containing components are removed before shredding, enabling higher-quality recycled material.

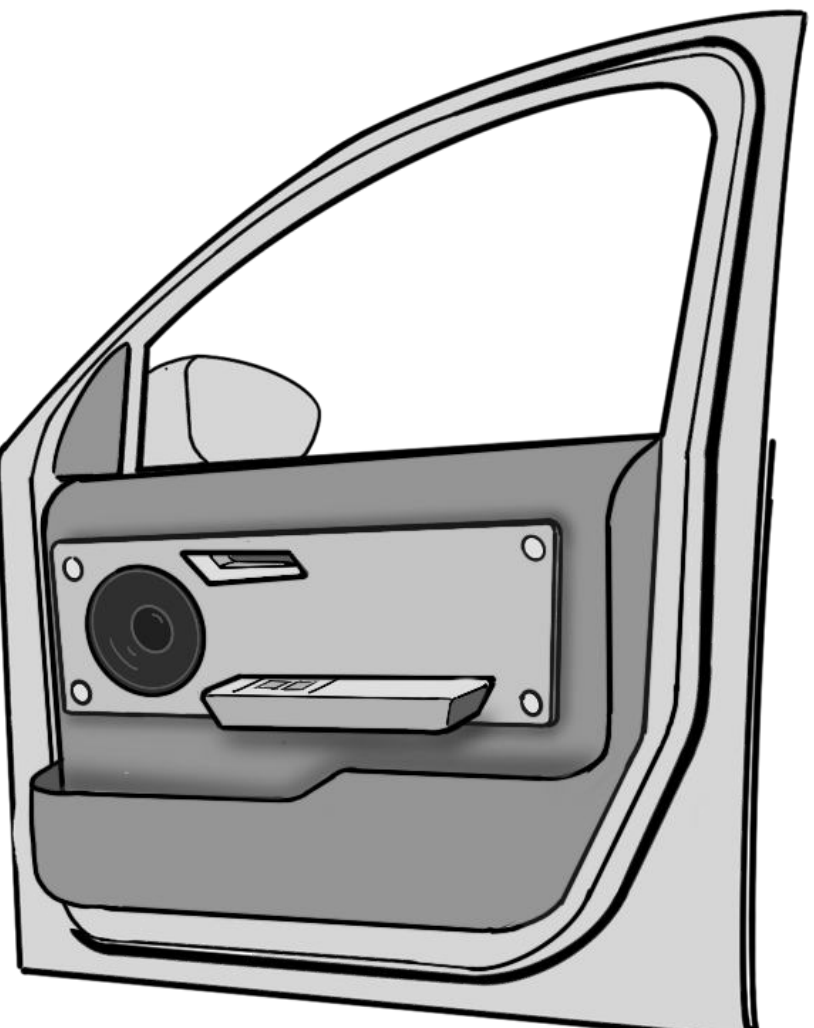


Narrow



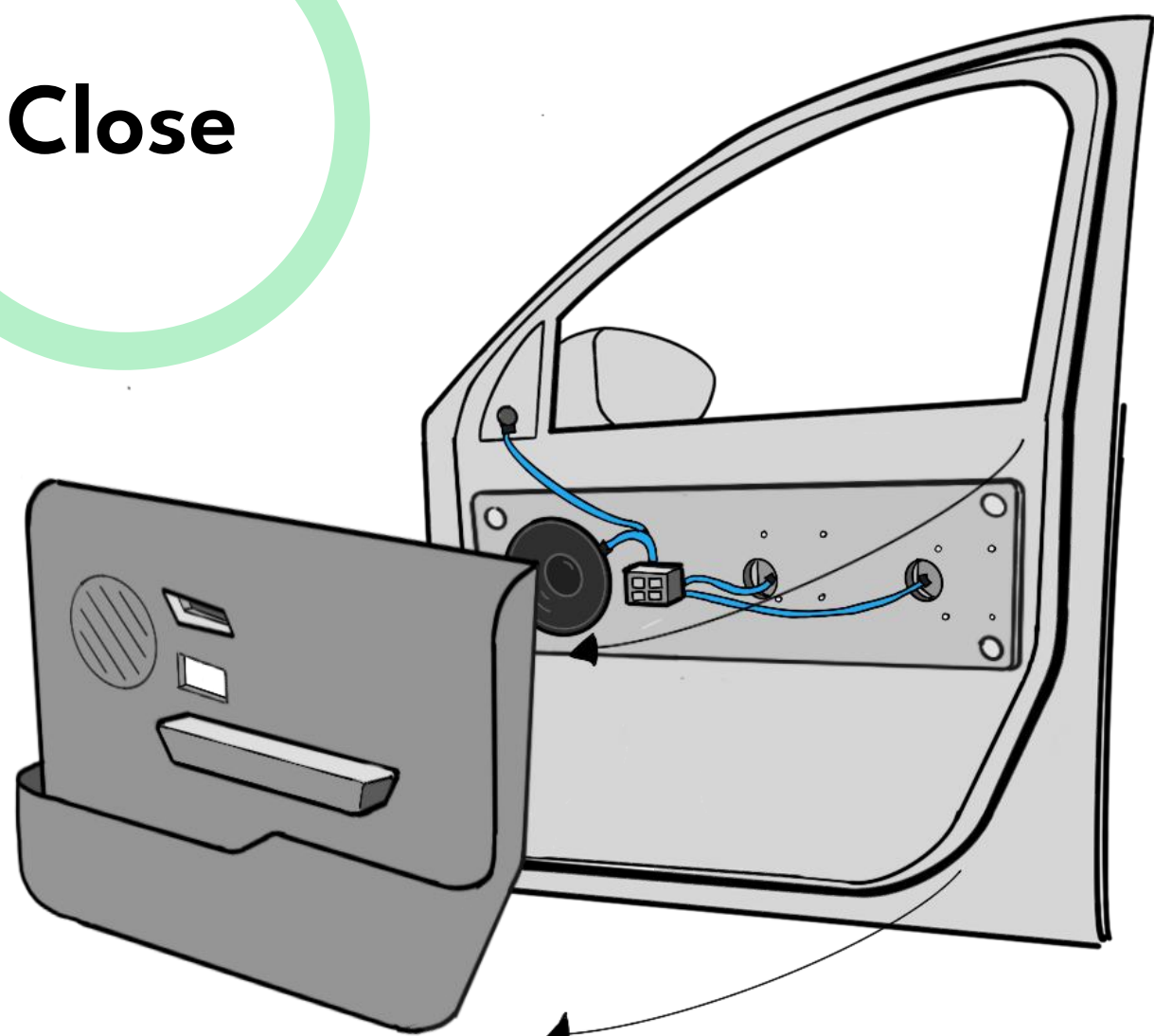
Reduce material use

Slow

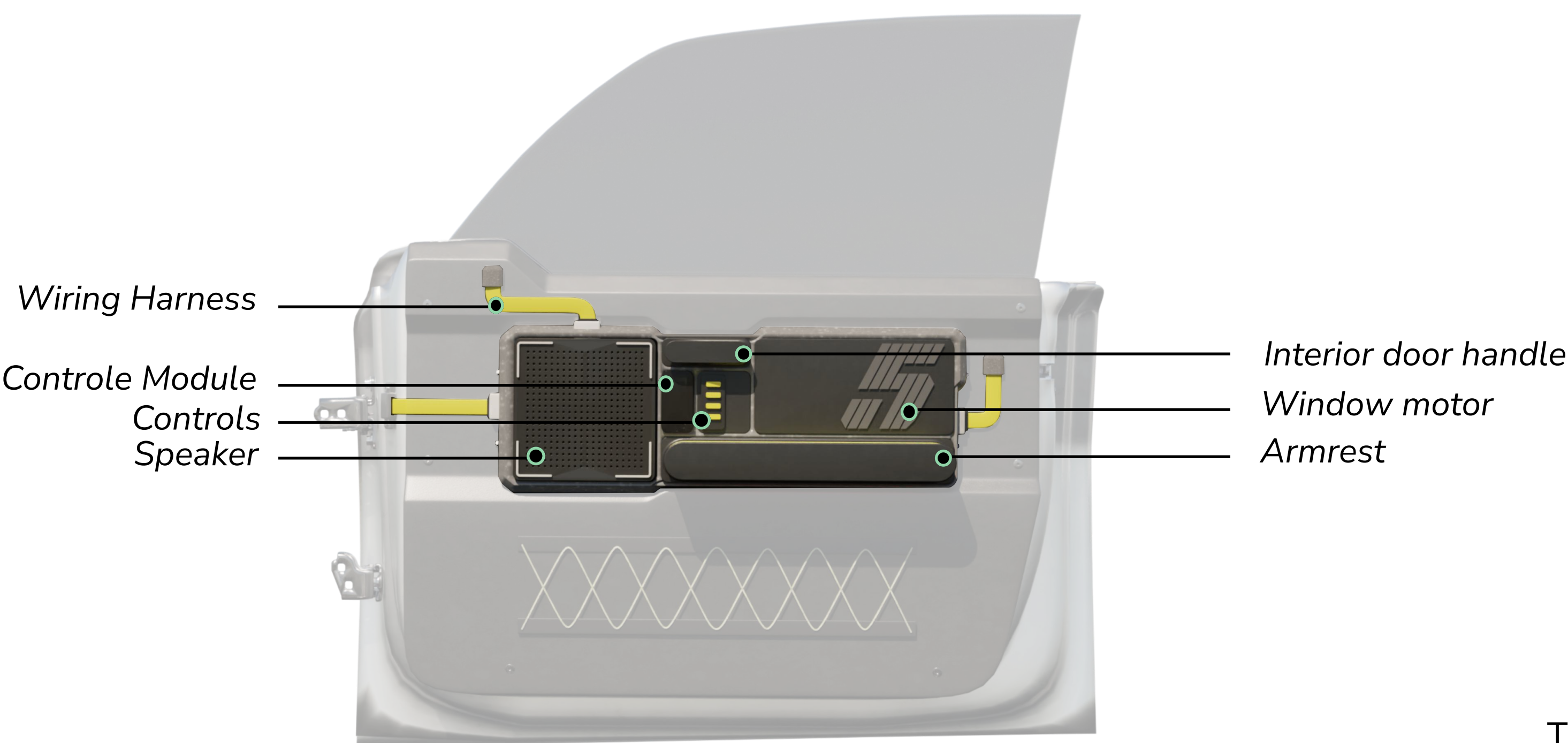


Extend lifetime of components

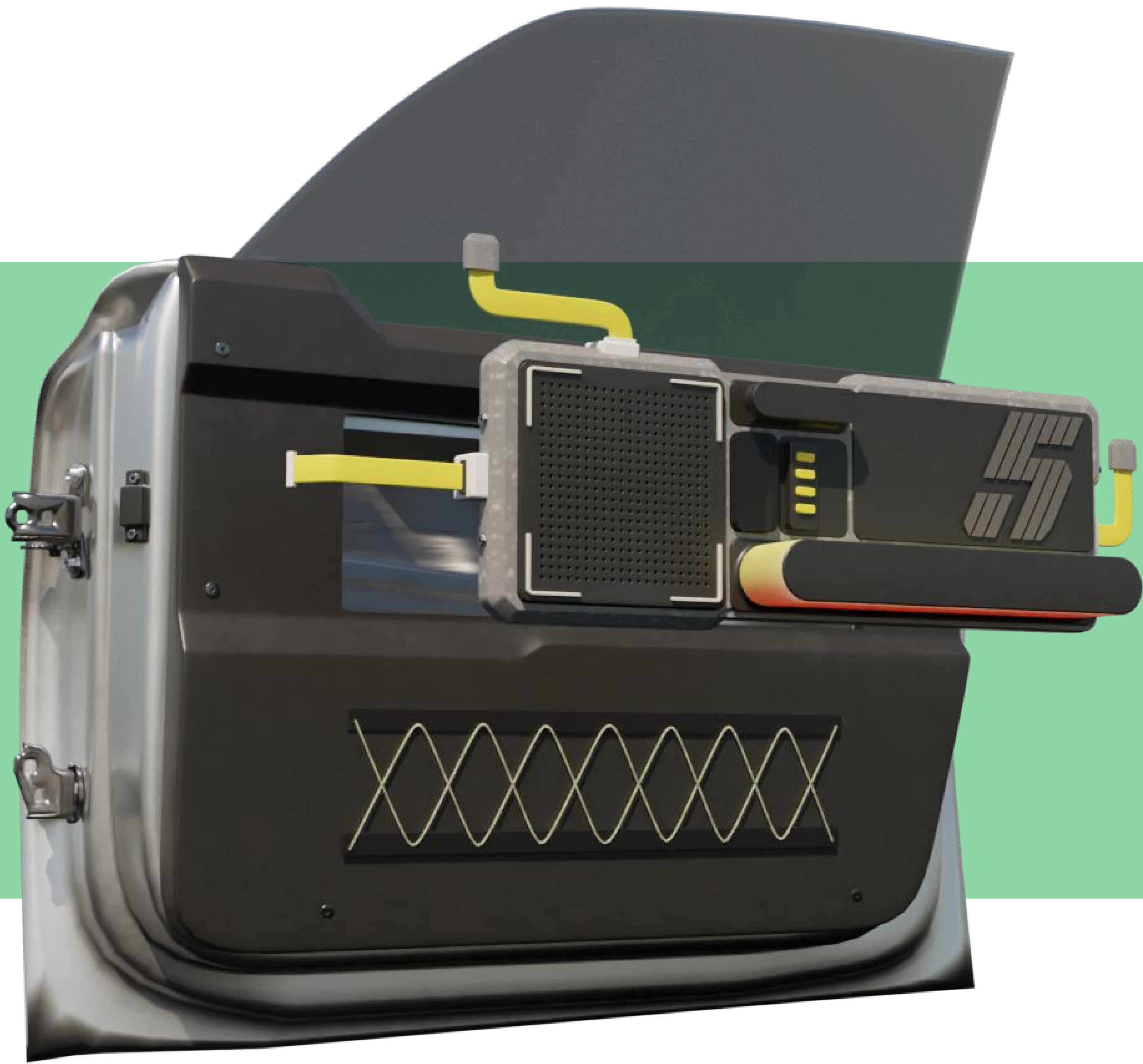
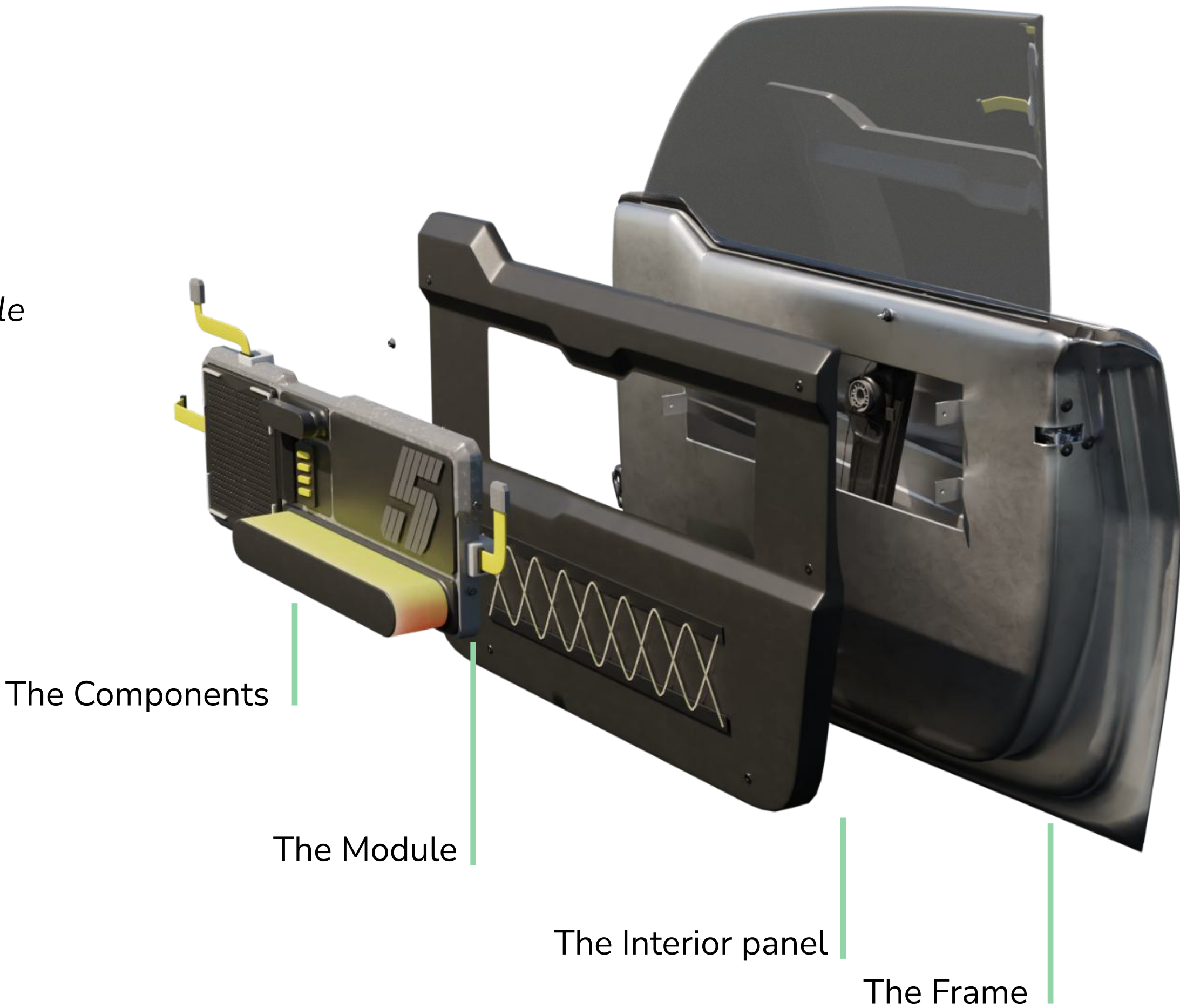
Close



Improve recycling process



'Cables are exposed and components are clumped and surfaced in a single module, allowing them to be reached and removed in a quick operation at its end of life.'



Lenne Hootsmans
A New Car Door Architecture for Remanufacturing and Recycling for Renault Group
21-07-2026
Integrated Product Design

Committee Chair: Prof. dr.ir C.A Bakker
Mentor: J.R. Alferink
Company Renault



Delft University of Technology

Faculty of Industrial Design Engineering