Press Release

Project summary

In response to the need to decrease transportation-related emissions and energy consumption, today, all major passenger car and other light-duty vehicle manufacturers are broadening their electric vehicle portfolio. The dependency of the present electrical traction motors on rare materials, such as rare earth permanent magnet materials, namely Neodymium-Iron-Boron magnets, is problematic from several viewpoints: they are imported and expensive, and there is a real risk for supply problems in the coming years. To strengthen European competitiveness, VOLTCAR ("Design, manufacturing, and validation of ecocycle electric traction motor") proposes highspeed, permanent magnet-assisted synchronous reluctance technology with a drastic reduction in the utilization of rare materials. During VOLTCAR, the motor prototype is perfected to meet the strictest performance requirements (power density, efficiency), sustainability criteria (recyclability, circularity, and low use of rare resources and copper), and the expectations of the automotive sector (cost, reliability, integrability). This primary goal is supported by introducing digital design and optimization methodologies that can assess the life cycle costs, energy consumption, and carbon footprint in the early phase, guiding the outcomes towards maximized sustainability with reduced use of rare materials and efficient recycling and repurposing patterns. The validity of the VOLTCAR motor prototypes, 50 kW and 120 kW motors, and the related technologies is proved according to the automotive standards, presenting an X-in-the-loop (XiL) experimentation environment. With this development, VOLTCAR will simultaneously lead to more green jobs in local SMEs throughout Europe to reduce unemployment.

Objectives

VOLTCAR's overall goal is to reduce the costs, energy consumption, and carbon footprint of future traction motors to enable the transformation towards greener transportation, especially in the light-duty segment.

The main objective of VOLTCAR is to create the most advanced next-generation electrical traction motor prototype capable of rapid industrialization. The VOLTCAR motor is designed to be easily manufacturable and recyclable at the end of its first life. To achieve this, VOLTCAR will:

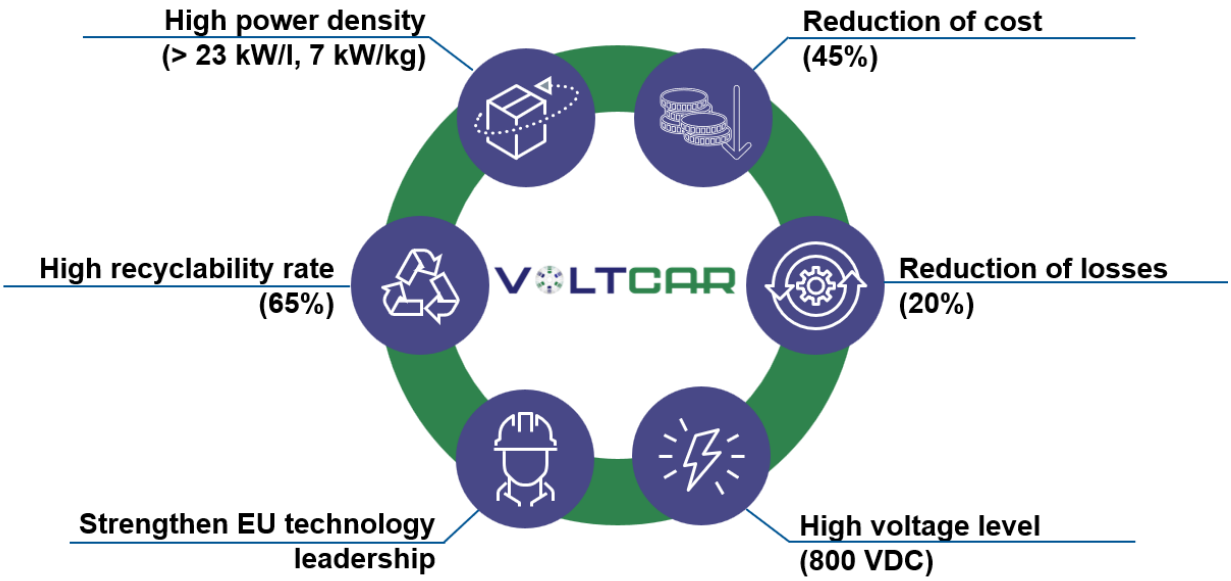
1) Study alternative architectures, namely permanent magnet-assisted synchronous reluctance motors
2) Develop and employ life cycle assessment and circularity-driven technologies for the traction motors
3) Digitalize the motor management from the design to manufacturing, operation, and recycling
4) Demonstrate the performance of the complete motor (VOLTCAR motor and gear) with an inverter in a virtual vehicle.

The longer-term objective of VOLTCAR is to support the integration of the motor and its subsystems with the power converters and gears for global performance optimization in vehicle use.

Methodology

VOLTCAR's methodology is built upon four interconnected innovation pathways:

- The '**Design & prototyping'** pathway is produces the VOLTCAR motor designs and their prototypes, which meet the set targets. This pathway also provides the needed subsystems like cooling and interfacing with the gear and the inverter hardware and control.
- The '**Ecodesign approach'** supports the 'Design & prototyping' pathway by analyzing different low-rare materials containing design choices, proposing structures that could enable easy assembly, disassembly, recycling, and repurposing. Further, this pathway also provides encapsulated magnet technologies to enable their dismantling intact and performs practical experimentation on removing the magnets from one of the VOLTCAR motor prototypes. For cases in which the repurposing of the magnets is not possible, we explore recycling the magnetic material as such without extracting the single elements.
- The '**Digitalized motor'** pathway introduces an over-the-life cycle digitalized motor to guarantee optimal choices in different phases of the life cycle, also at the end of the first life.
- The **'Validation'** pathway takes care of the virtual and actual testing of the VOLTCAR motor prototypes. Virtual testing is a key means to, e.g. cut costs, and real testing is a must for proving that the set targets have been met.



The consortium:

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1.	TEKNOLOGIAN TUTKIMUSKESKUS VTT OY	VTT	FINLAND
2.	ROBERT BOSCH GMBH	BOSCH	GERMANY
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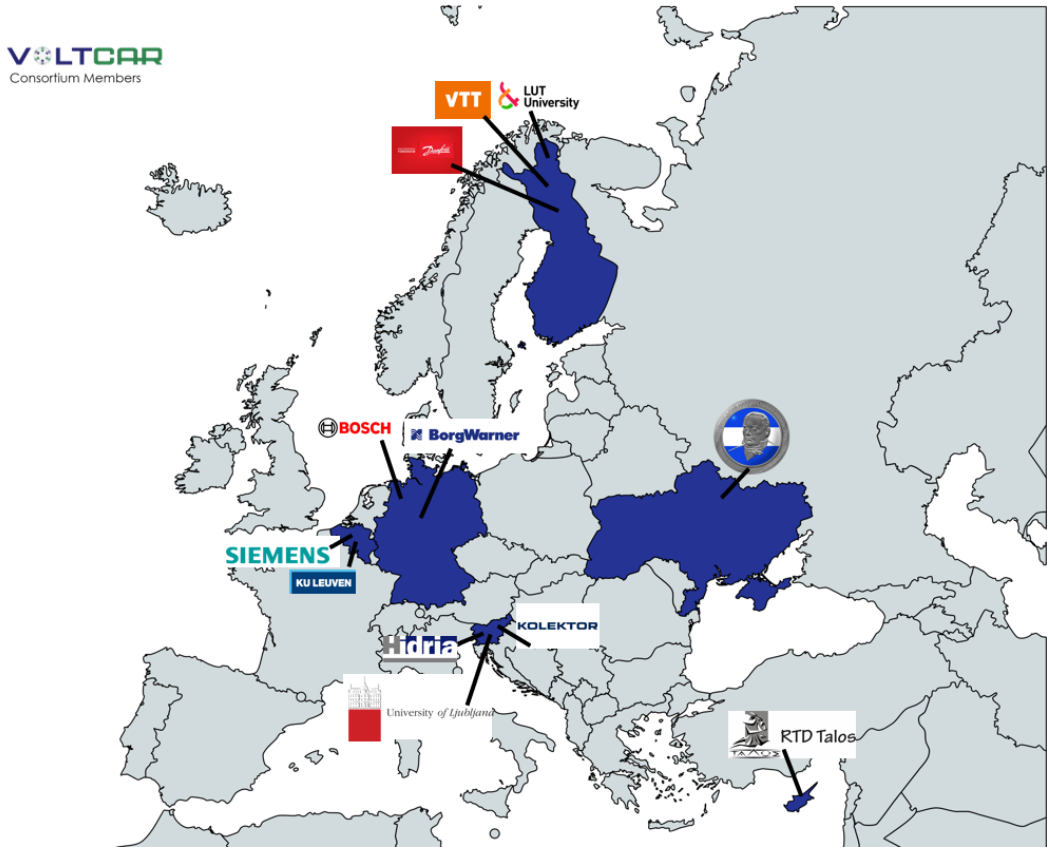

Project data:

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