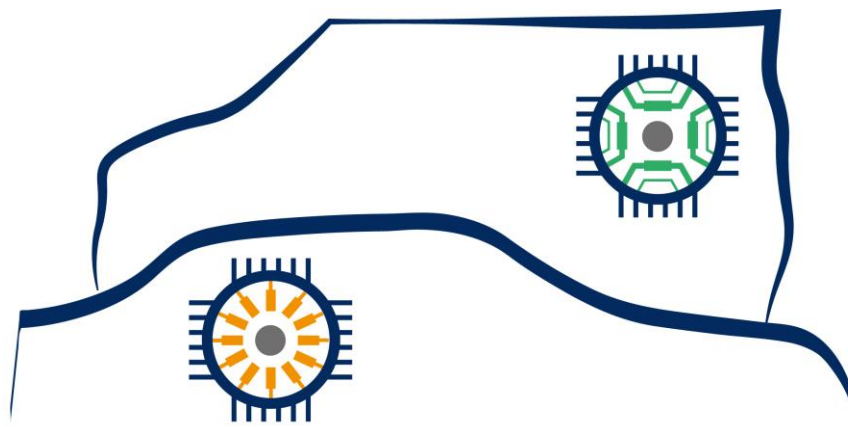




## Rare Earth Free e-Drives Featuring Low Cost Manufacturing



# ReFreeDrive

Collaborative Project  
Grant Agreement Number 770143

Start date of the project: 1<sup>st</sup> October 2017, Duration: 42 months

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**Title of the deliverable:** Third Progress Report

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<b>Participants(s):</b>	All project partners
<b>WP contributing to the deliverable:</b>	WP1, WP2, WP3, WP4, WP5, WP6, WP8, WP9
<b>Nature:</b>	PUBLIC
<b>Version:</b>	03



**Abstract:**

This report describes the achievements of the ReFreeDrive project, as well as a description of the fulfilment of the objectives of the different tasks. Deviations that have occurred in the course of the project have been listed and explained. The techno-economic evaluation of the entire project is also included.

Although the information is individualised for each work package, the interactions between them are also taken into account. All work package leaders have been involved in the drafting of this report.

## Executive Summary

This document reports the project progress during the period from M23 (August 2019) to M42 (March 2021). It reviews the technical achievements of the Work Packages (WPs) active during this period (WPs inside the red dashed box in Figure 1) and the work carried out until the project end. The main objective of this deliverable is to provide a summary of the work done so far and reflect the project current status from a global perspective:

- **WP5** was devoted to develop the Power Electronics (PE) and the control strategies needed for 75kW and 200kW power levels. In parallel, off-the-shelf solutions were sought for all other powertrain systems needed for the integration of the prototypes into a commercial vehicle, such as batteries, gearbox or auxiliaries. This last period of the project focused on the latter objective, analysing the integration strategy of the 200kW high power electric drive in a Jaguar Land Rover (JLR) vehicle (Task 5.4) and carrying out all the integration activities needed to allow the installation of the 75kW motors in a Mercedes Sprinter (Task 5.5)
- **WP6** concerned the manufacturing of the prototypes of the motors and power electronics for the two power ranges. In line with the two motor avenues explored within the project, Task 6.1 involved the manufacturing of the Induction Motors (IM) (die-cast and fabricated options), Task 6.2 involved the manufacturing of the Synchronous Reluctance (SynRel) motors, both pure and assisted by ferrite magnets, and finally Task 6.3 covered all aspect related with the manufacturing of the power electronics.
- **WP7** covered all testing steps needed to characterize the motors performance and ensure a proper operation of the motors developed within a real vehicle, demonstrating at the same time their suitability to meet expected market requirements through the accomplishment of the Key Performance Indicators (KPIs). Following an incremental level of components integration, Task 7.1 involved the testing of the motors and the power electronics either integrated or in standalone mode. Task 7.2 served as an intermediate integration step, where some of the powertrain components were added to the testing setup. Task 7.3 finalized the full integration of the motors with all powertrain systems into a commercial van and tested them on a circuit to validate it.
- **WP8** elaborated the exploitation strategy of the technological solutions developed within the project, for which an Intellectual Property Rights (IPR) plan and a commercialization strategy were defined (Task 8.4). A techno-economic analysis of all developed solutions as well as a technological watch of the Electric Vehicle (EV) market was performed (Task 8.1). This analysis was supported with a Life Cycle Analysis (LCA) of the different motor technologies for both power levels (Task 8.2), that assessed their environmental impact in comparison with the current benchmark motors, namely NdFeB Permanent Magnets (PM) motors.

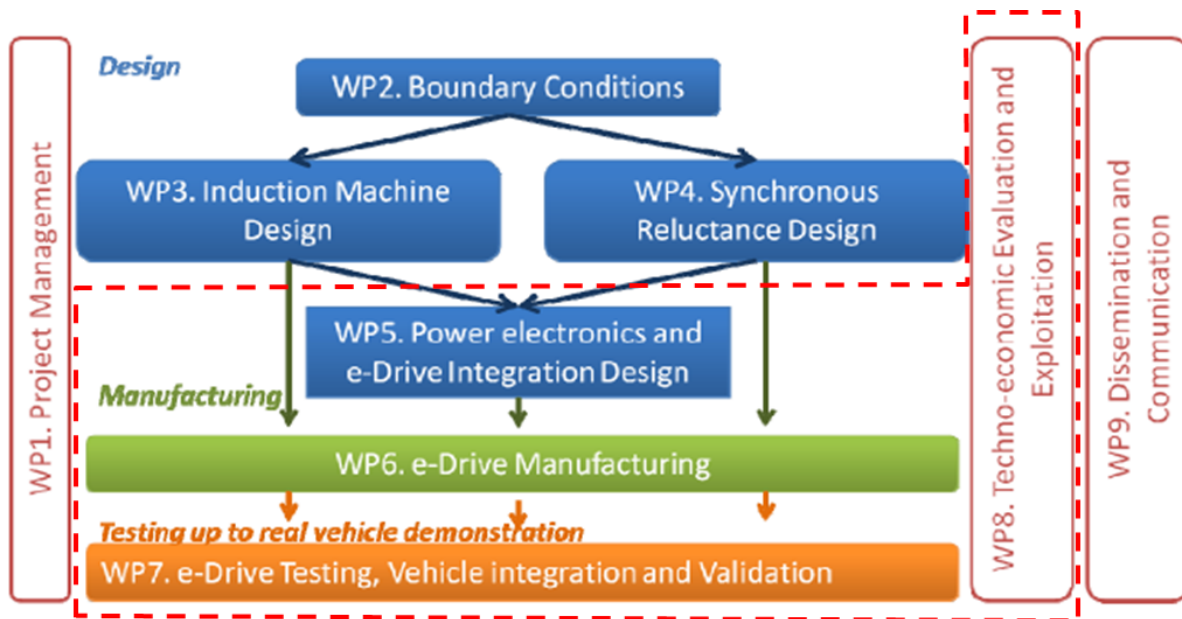


Figure 1. Scope of the Third Progress Report

This D1.3 deliverable has fully met its objectives. No deviations in content or impacts (either to the herein described tasks or to the overall project implementation) have been found in this deliverable compared with what was stated in the Grant Agreement (GA). There is a slight deviation on time, mainly caused by the nature of the document. Being D1.3 a summary of the activities carried out in the different project WPs, it is justified that the delays experienced by some WPs, namely WP6 and as a consequence also WP7 and WP8, impose a delay on D1.3 release date.