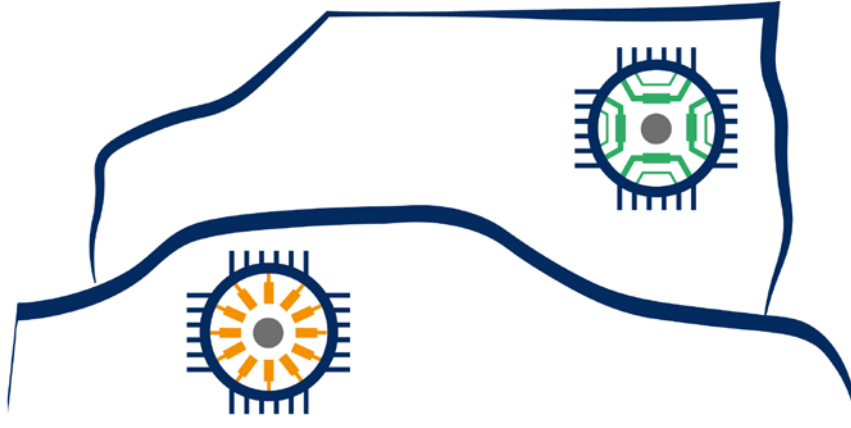




## Rare Earth Free e-Drives Featuring Low Cost Manufacturing



# ReFreeDrive

Collaborative Project  
Grant Agreement Number 770143

Start date of the project: 1<sup>st</sup> October 2017, Duration: 36 months

**Work Package no.:** 2  
**Title of the WP:** Boundary Conditions Definition  
**Deliverable no.:** 2.2  
**Title of the deliverable:** ReFreeDrive testing vehicles Driving Cycle

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## Abbreviations

**ARTEMIS:** Assessment and Reliability of Transport Emission Models and Inventory Systems.  
**BP:** British Petroleum  
**CADC:** Common Artemis Driving Cycle  
**CO:** Carbon monoxide  
**CST:** Customized Sequence Tests  
**DfT:** Department for Transport (UK)  
**ECE:** Economic Commission for Europe  
**EMPA:** Swiss Federal Laboratories for Materials Science and Technology  
**EPA:** Environmental Protection Agency (US)  
**ETC:** European Transient Cycle  
**EU:** European Union  
**EUDC:** European Extra Urban Driving Cycle  
**FHB:** Fachhochschule Biel  
**FTP:** Federal Test Procedure (US)  
**HGV:** Heavy Goods Vehicles.  
**IM:** Inspection and Maintenance  
**INRETS:** Institut National de Recherche sur les Transports et leur Sécurité (France)  
**LDV:** Light Duty Vehicles.  
**MTC:** AVL MTC Motortestcenter AB (Sweden)  
**NAEI:** National Atmospheric Emissions Inventory (UK)  
**NEDC** New European Driving Cycle  
**NOx:** oxides of nitrogen  
**OSCAR** Optimised Expert System for Conducting Environmental Assessment of Urban Road Traffic.  
**PM:** Particulate Matter  
**SDC:** Standard Driving Cycle  
**TNO** TNO Automotive (The Netherlands)  
**UNECE:** United Nations Economic Commission for Europe  
**VOC:** Volatile Organic Compounds  
**WLTC:** Worldwide harmonized Light vehicles Test Cycles  
**WLTP:** Worldwide Harmonised Light Vehicle Test Procedure

## Executive Summary

WP2 is defining the boundary conditions for the motor development and tests:

- Identifying measurable Motors' Key Performance Indicators (KPI) to correspond with the vehicles performances and main equipment's requirements (Driving Cycle definition) necessary for the development and layout definition of powertrain per application to correspond with the State of the Art.
- Listing vehicle-system's and all the functional subsystems' components needed to design and realize the appropriate powertrains to be integrated in the vehicles in order to respond to initial KPI and requirements.

Task 2.2 aims at setting a driving cycle in order to test and analyze the vehicle's and motor's performances.

Driving cycles have been produced to assess the performance of vehicles in various ways, also in vehicle simulations. More specifically, they will be used in propulsion system simulations to predict performance of motors, transmissions, electric drive systems, batteries, and other components.

Some driving cycles have been derived theoretically, whereas others are direct measurements of a driving pattern deemed representative.

D2.2 is divided in two main sections. Section 1 (Driving cycles quantity and type) summarizes the State of the Art of all available driving cycles to test and compare vehicle performances in real operational profiles. Section 2 shows the designed Driving Cycles planned for the bench and on road tests. **The bench test is needed to perform vehicle operations under reproducible conditions and the on-road/on-track test as the closest representation of the real conditions.** For the bench tests two different kinds of tests are scheduled: one based on standard driving cycle (SDC), and the other based on customized sequence tests (CST).

The other tests planned are for the powertrain integrated on the vehicle and performed on a real road or on track. Standard driving cycle is not applicable for the on-road tests and only the CST will be performed.