

ReFreeDrive

Project Overview

CIDAUT





Project Overview

General Figures

Title: Rare earth free e-Drives featuring low cost manufacturing

Acronym: ReFreeDrive

Grant Agreement No: 770143

Topic: GV-04-2017

Project Total Costs: 5,999,131.25€

Total EU Contribution: 5,999,131.25€

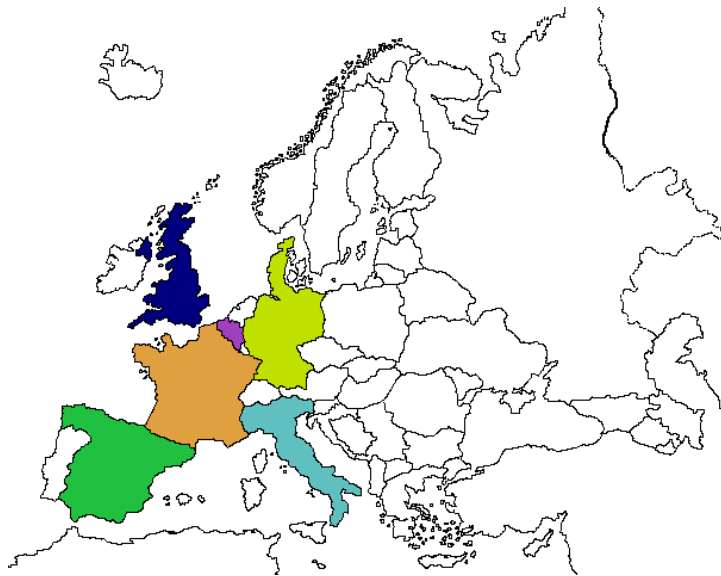




Project Overview

Project Partners and Locations

ReFreeDrive Consortium is composed of 13 partners in six European countries



1

SPAIN

Fundación Cidaut

1

GERMANY

MetallGiesserei
Breuckman

3

UNITED KINGDOM

European Copper Institute
Motor Design Limited
Jaguar Land Rover

1

BELGIUM

Aurubis

1

FRANCE

IFP Energies Nouvelles

6

ITALY

Università degli studi dell'Aquila
Centro Sviluppo Materiali
Tecnomatic
Mavel
R13 Technology
Privé





Project Overview

Project Objectives

- The main aim of this project is to develop **rare earth-free traction technologies** beyond their current state-of-art, with a strong focus on industrial feasibility for mass production, targeting lower costs with higher specific torque and power density
 - To explore, optimize and compare motor designs in two rare earth-free motor technologies: **copper rotor induction machines and synchronous reluctance machines**. As a result, four designs will be obtained for each of the two power range settings under study in this project
 - To design, prototype and test four high speed (maximum speed of 45.000 rpm) motors (one for each technology) that increase the specific torque by 30%, and reduce the motor losses by 50%, compared to the project benchmark (Tesla S60 motor)
 - ReFreeDrive electric powertrain to reach a cost reduction foreseen in at least 15%, against solutions with equal performance characteristics
 - To develop the power electronics needed for each power setting, increasing the power density by 50% compared to current system which are been using in the electric vehicles, by means of adoption of wide bandgap semiconductor technology, increasing efficiency and reducing the weight of the cooling system, but also, adopting of advanced gate driver and efficiency optimizer control strategies
 - To validate the motor technologies by obtaining an integrated powertrain, including all the powertrain systems (batteries, gear box, etc.) that will be tested in real driving conditions in the full electric vehicles customized by PRIVÉ (e.g. Iveco Daily, Mercedes Sprinter)





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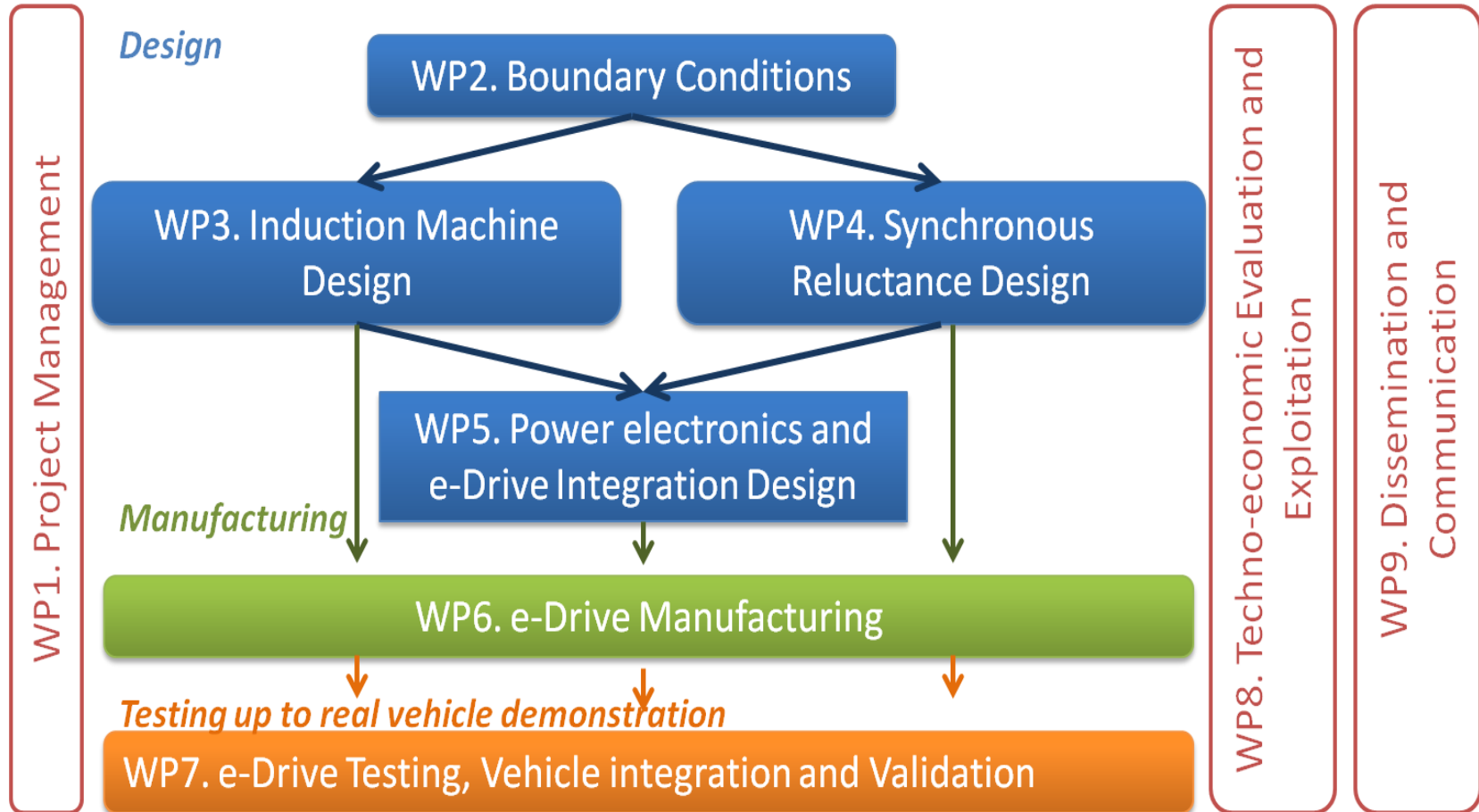
Project Expected Outcomes & Exploitation

- This project will develop new e-Drives for electric vehicles focusing on the design and development of prototypes for the 75kW and 200kW cases, of two different technologies (IM, SR). The electric powertrains to be developed within ReFreeDrive project will cover a broad power range, so as responding to the demand from the current and future market.
- Some of the most relevant results are listed here:
 - Integrated Induction Machine design with fabricated copper rotor and with die cast copper rotor
 - Integrated Synchronous Reluctance Machine design, Permanent magnet assisted and pure synchronous reluctance
 - Cooling system design for low cost high efficiency motors
 - Design of advanced control algorithms for ReFreeDrive motors
 - Design of advanced medium/high density electric drives integrated with the electric motor



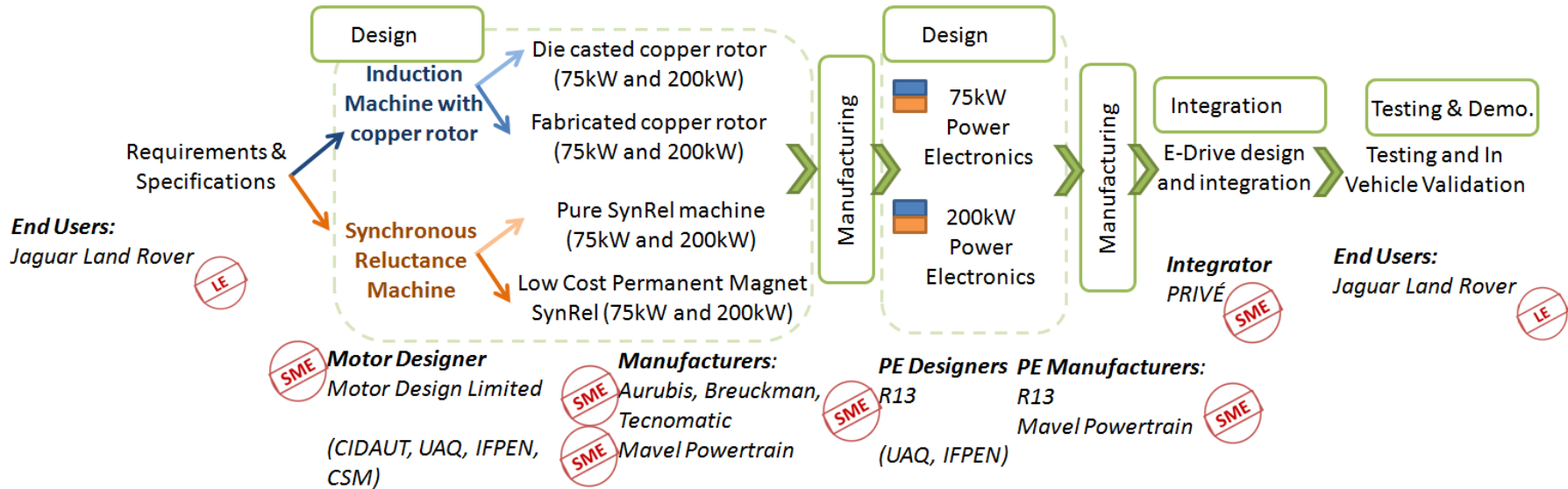
Project Overview

WP Structure



Project Overview

Pictures



- Induction Machines

