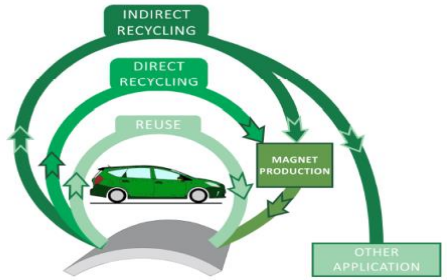
EU H2020
MSCA - ITN-ETN

Sept 2015 – Aout 2019

Afef Lebouc

DEMETER

UNE BELLE AVENTURE SCIENTIFIQUE AVEC LAURIC



European Training Network for the Design and Recycling of Rare-Earth Permanent Magnet Motors and Generators in Hybrid and Full Electric Vehicles (DEMETER)

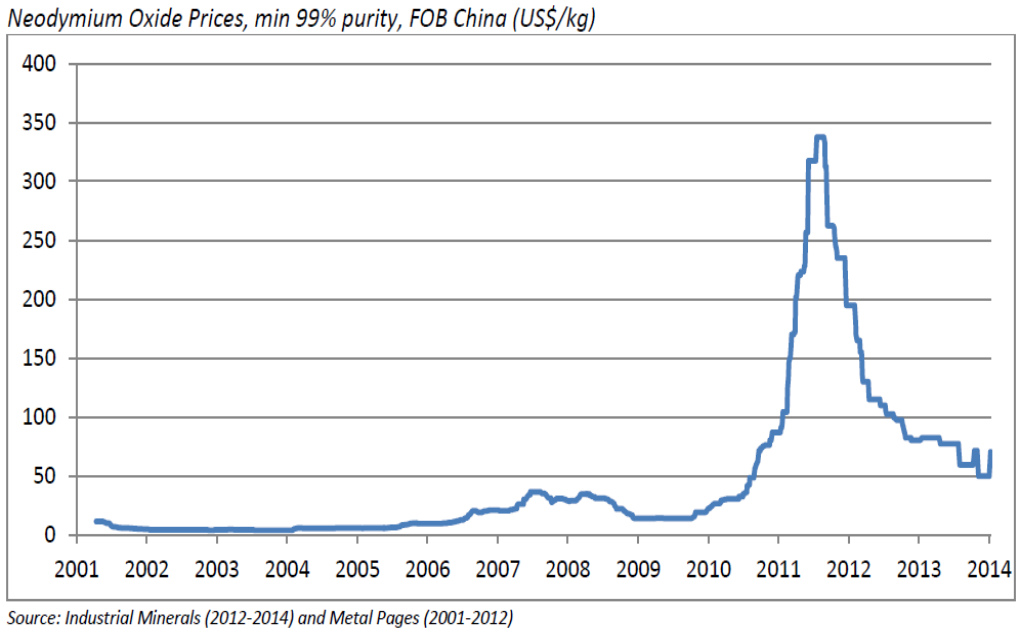
- **7 Beneficiaries**
  - KU Leuven: Coordinator
  - Institute Joseph Stefan (IJS – Slovenia)
  - University of Birmingham (UoB – UK)
  - G2Elab - Grenoble INP
  - Aalborg University (AAU – Denmark)
  - Magneti – Slovenia,
  - Valeo Electrical Systems

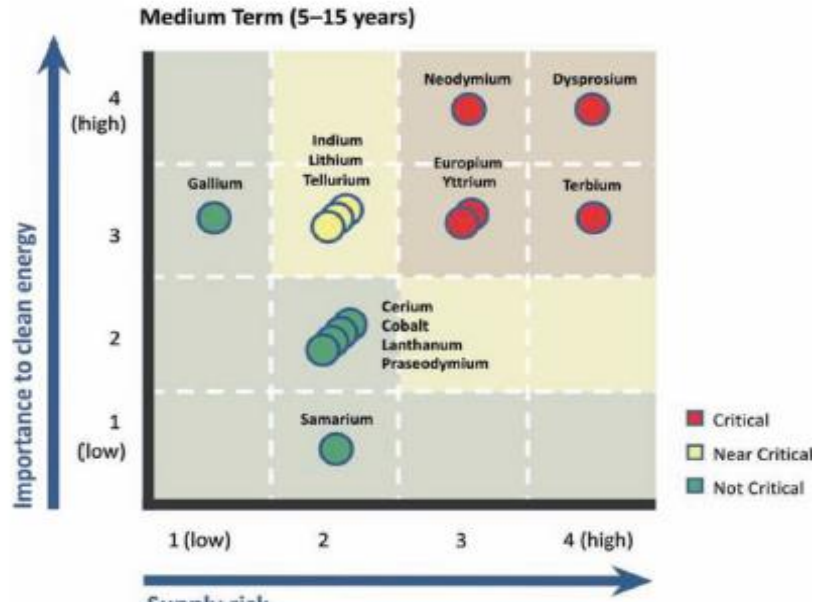
- **3 Partners**
  - Less Common Metals Limited (LCM – UK),
  - Granta Design Limited (Granta – UK),
  - CRISMAT-ENSICAEN

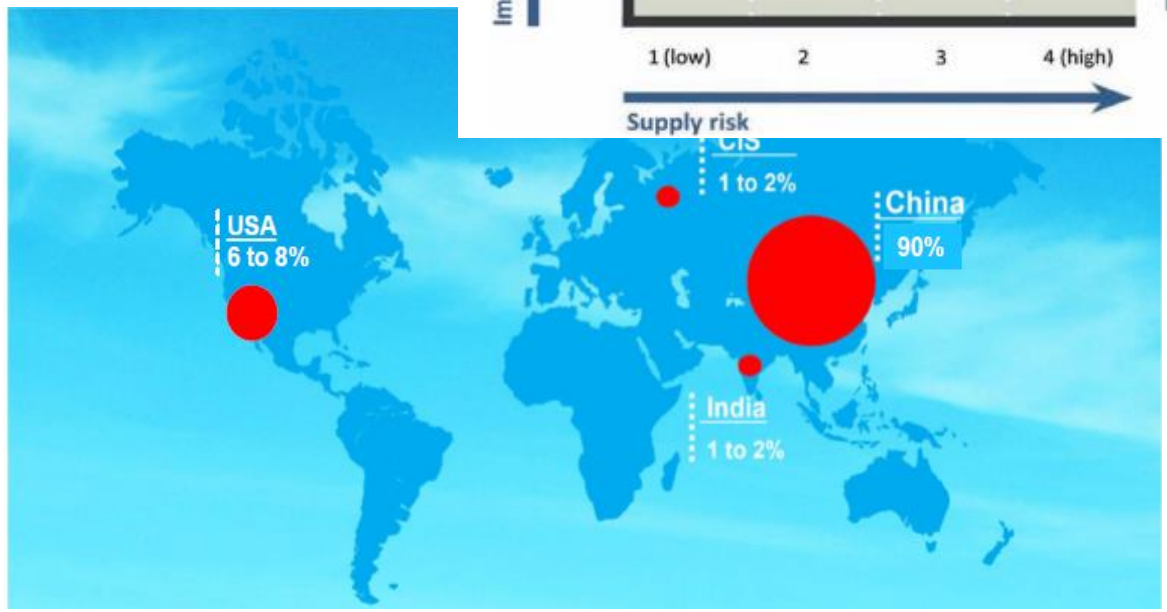
- **15 ESRs (PhDs)**
  - 8 Scientific & Soft skill training events
  - Planned few months secondments for each ESR

1 – MOTIVATION: RARE EARTH CRISIS & BALANCE PROBLEM

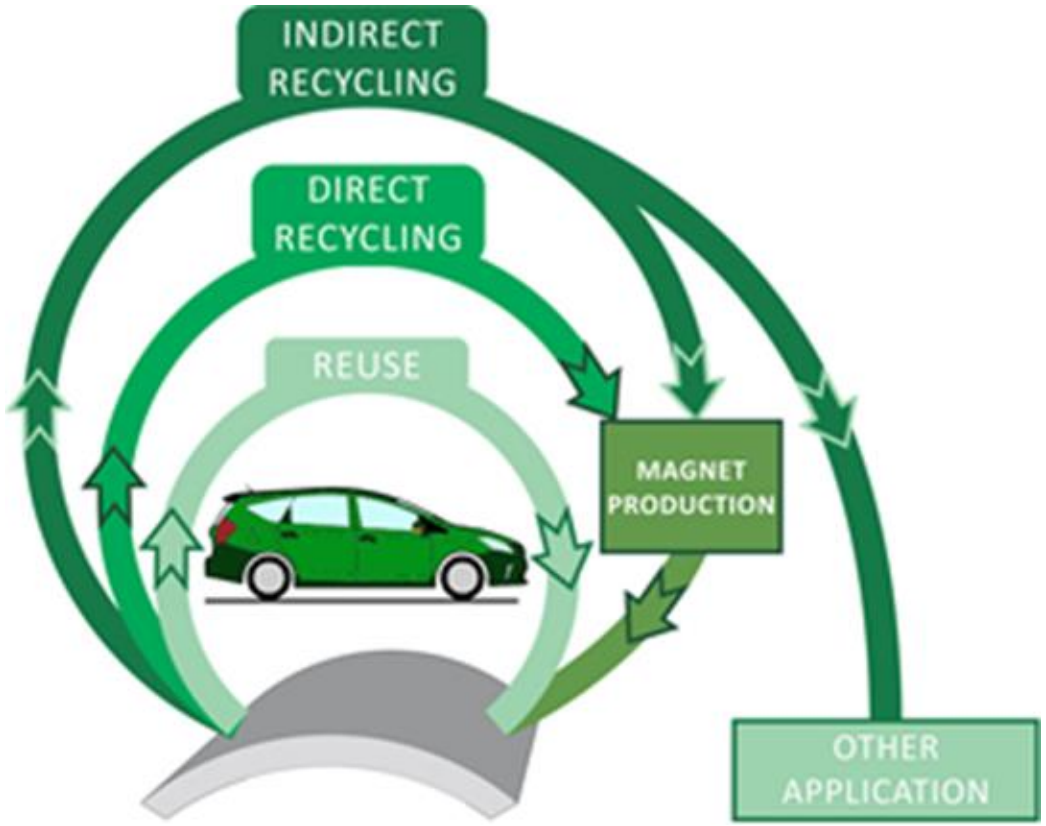
- **RE: Essential for permanent magnets (20%)**
  Nd, Pr, Sm (Tb,Dy)
- **RE Production & use dominated by China**
- **RE Critical raw materials: Nd,Dy,Eu,Tb,Y**

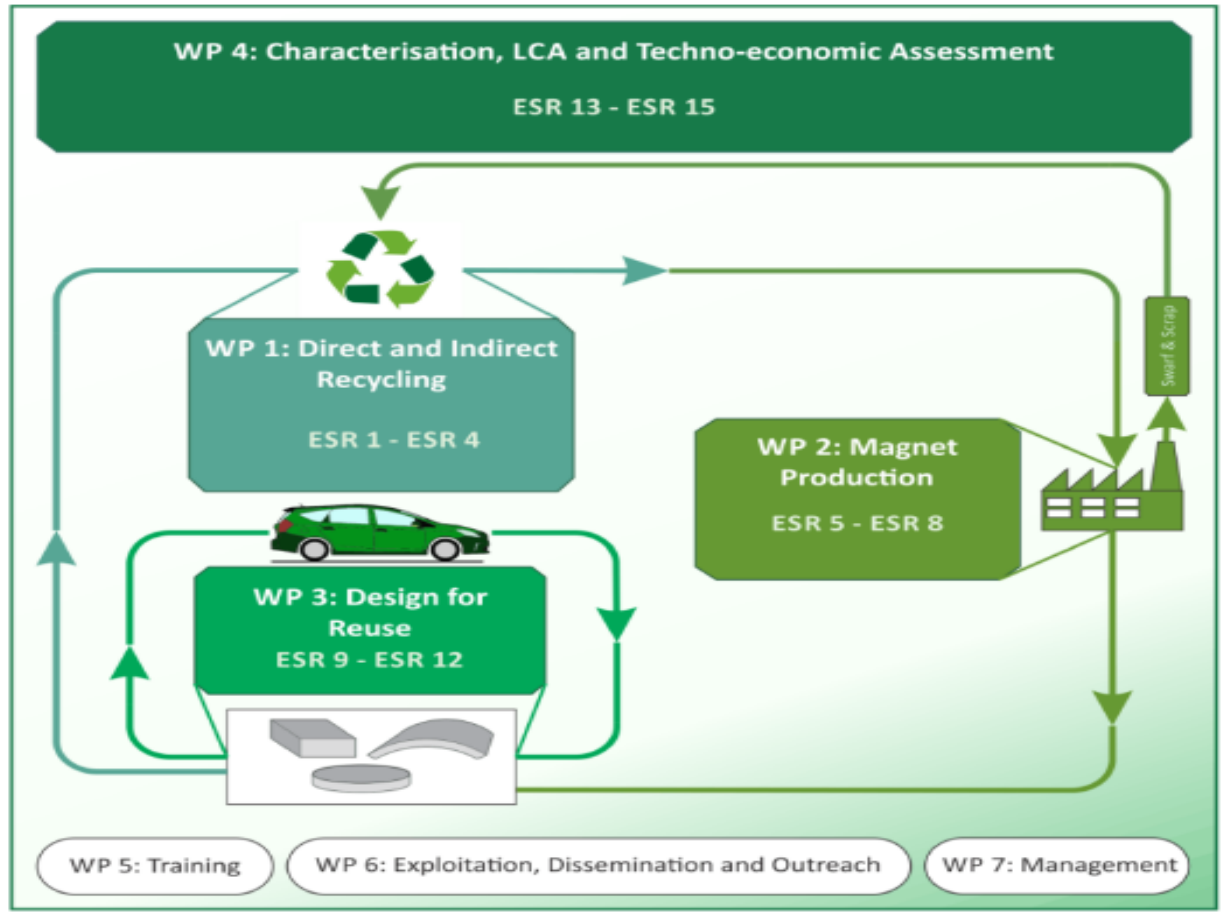






2 – OBJECTIF: TO CLOSE THE LOOP FOR RE-PM





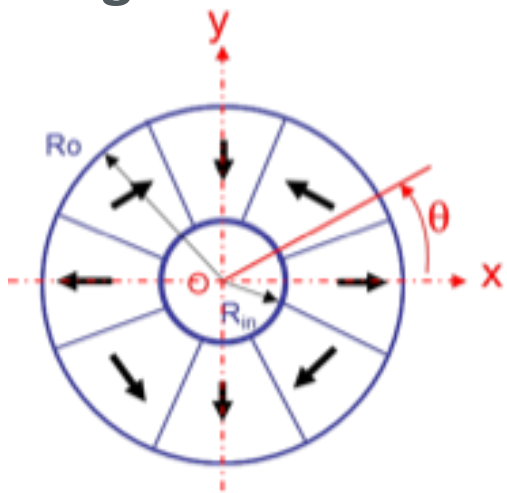
3 – WP3: Machine Design with Reuse and Recycle Concepts for automotive Application (Valeo, G2Elab, AAU)

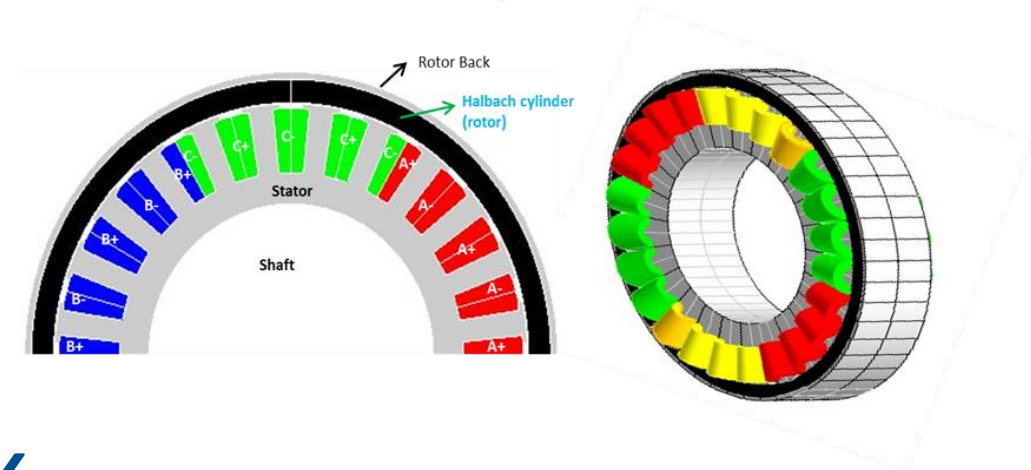
- 4 ESRs
  - Amit Jha: Design of Halbach external rotor machine for HEVs
  - Adolfo Garcia: Recycable electrical machine design with non traditional materials
  - Pranshu Upadhayay: Claw pole machine for HEVs
  - Ziwei Li:Electrical radial flux machine for HEVs

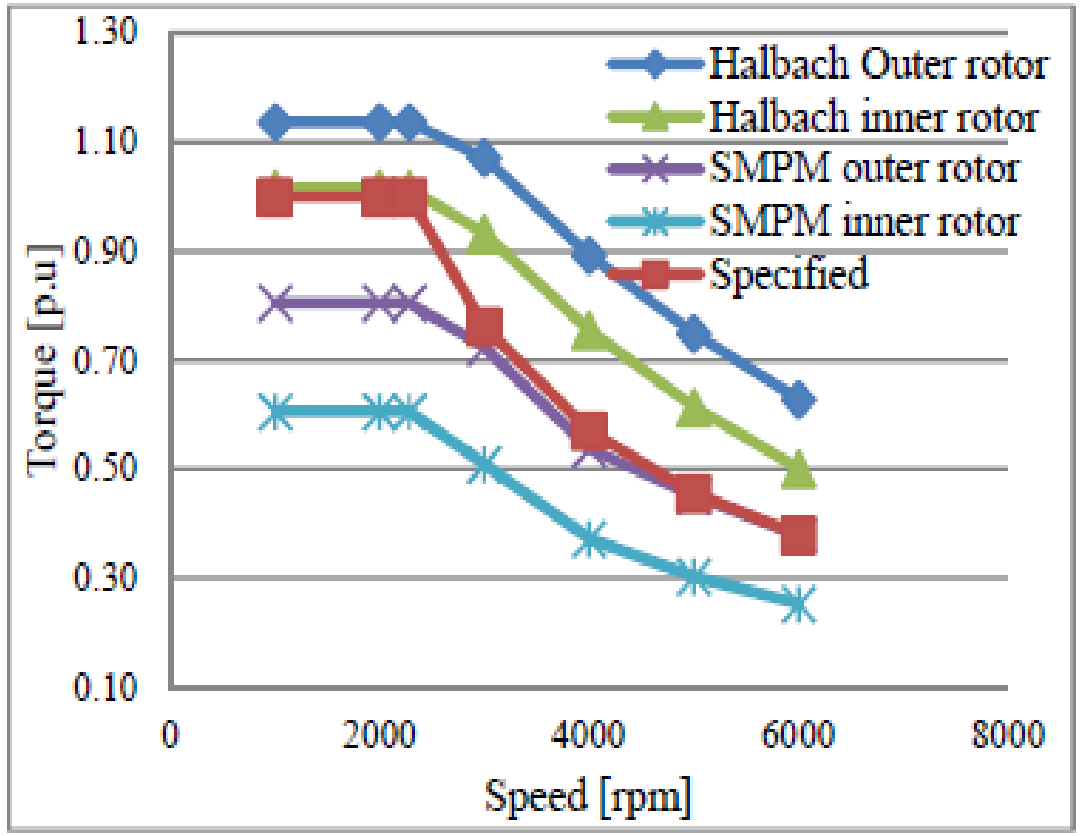
- ➢ Design & optimization using FEM & analytical approaches
- ➢ Impact of recycling magnets utilization
- ➢ Machines realization by Valeo
- ➢ Experimental test in terms of performances and magnet disassembly & reuse.

3 – WP3: Machine Design with Reuse and Recycle Concepts for automotive Application (Valeo, G2Elab, AAU)

- **Amit:** Design of Halbach external rotor machine for HEVs

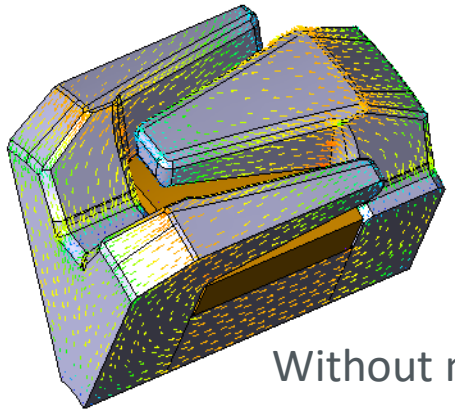




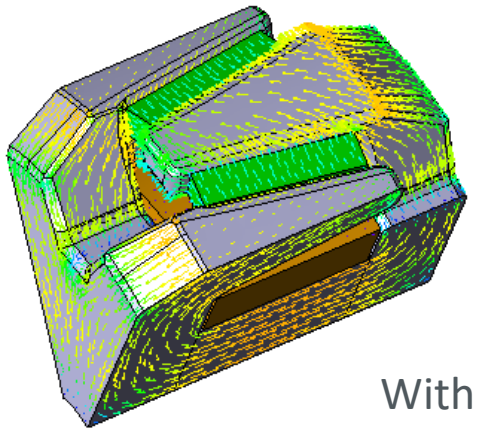


3 – WP3: Machine Design with Reuse and Recycle Concepts for automotive Application (Valeo, G2Elab, AAU)

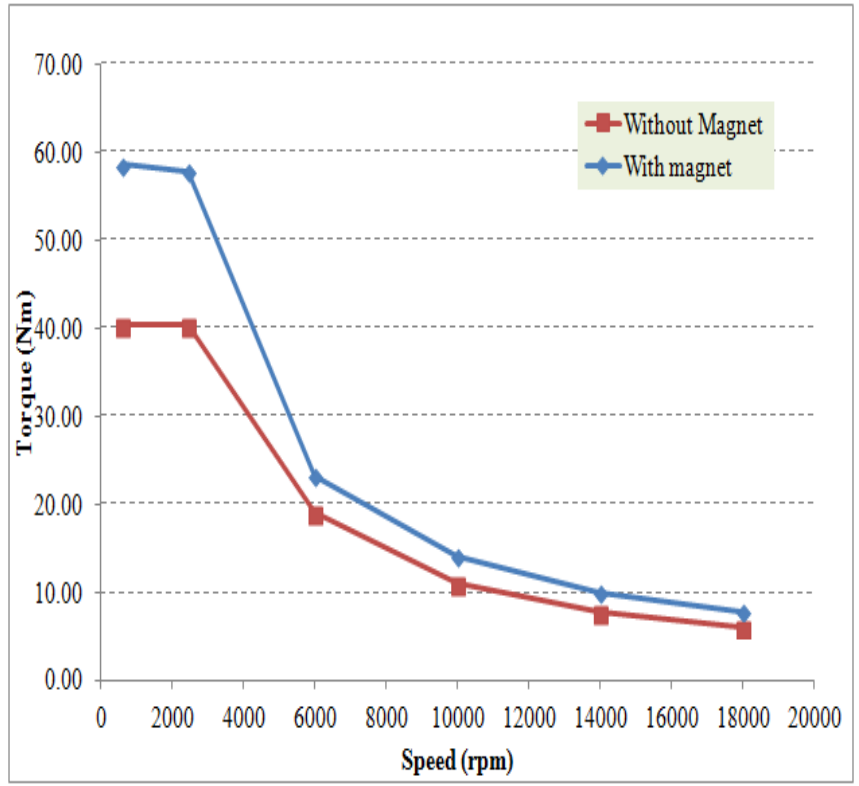
- **Pranshu:** Claw pole machine for HEVs

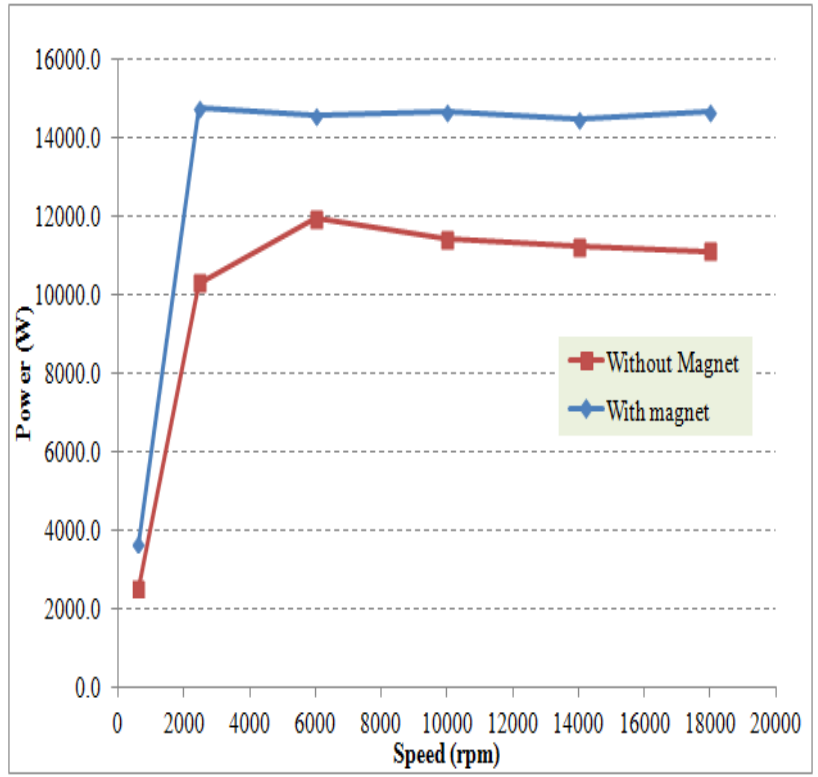


Without magnets



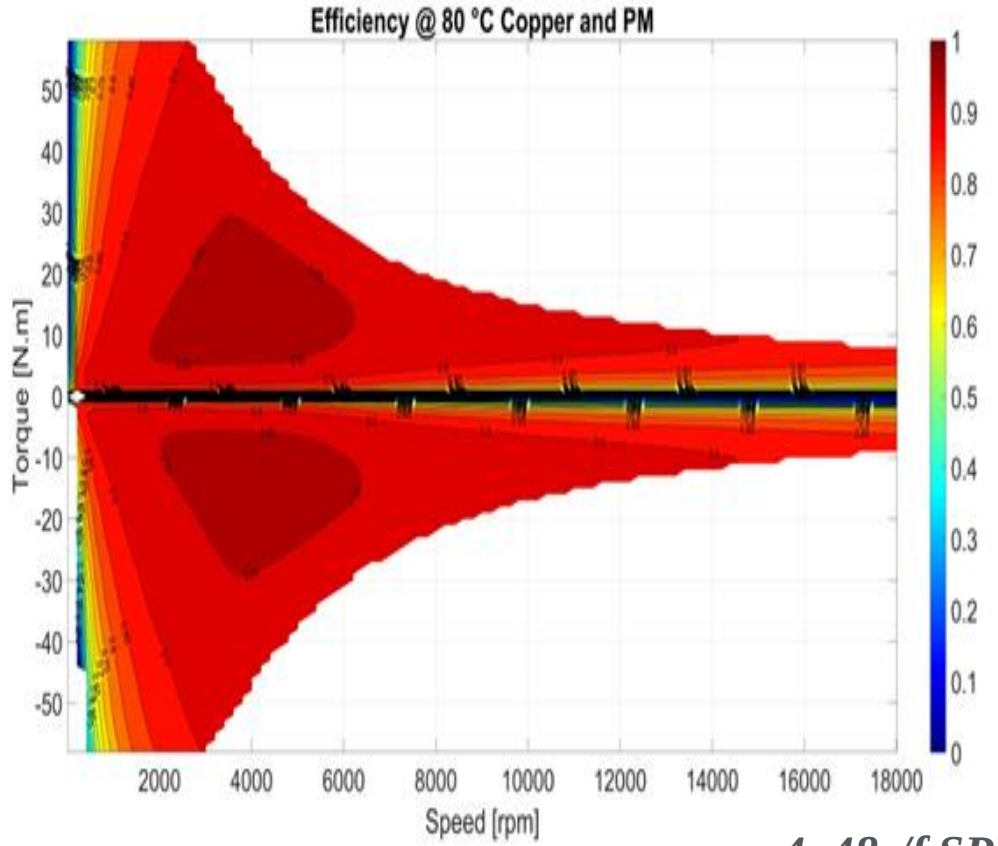
With magnets

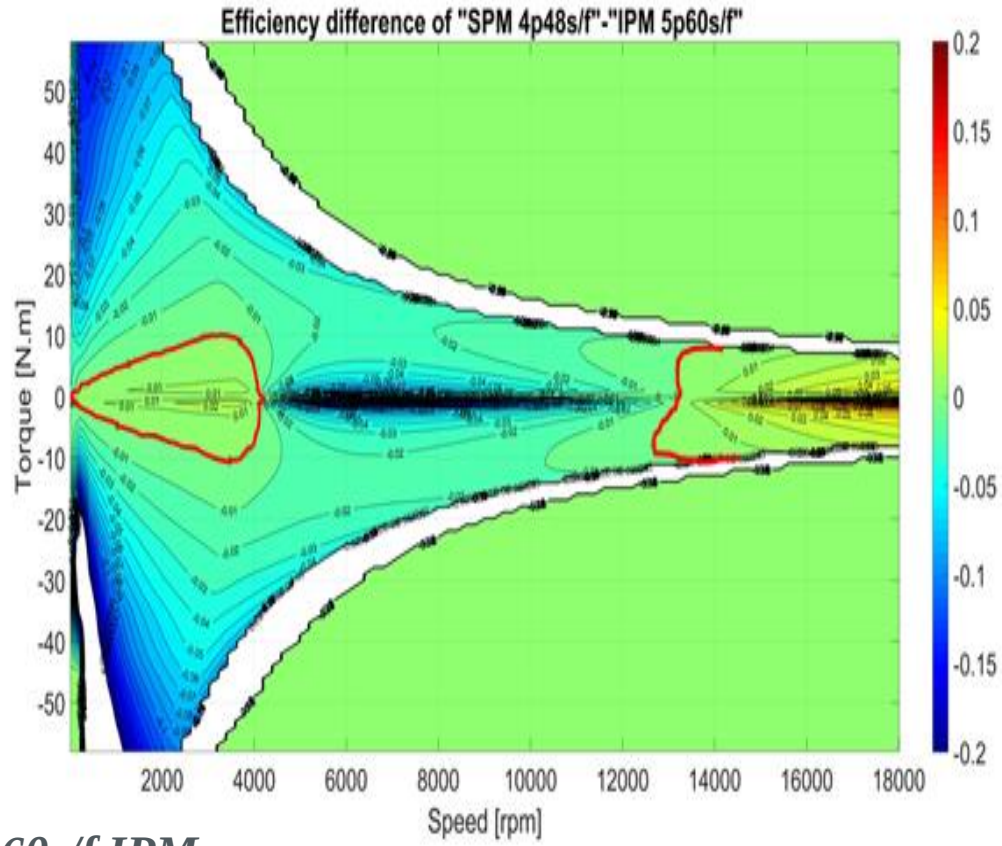




3 – WP3: Machine Design with Reuse and Recycle Concepts for automotive Application (Valeo, G2Elab, AAU)

- **Ziwei:** radial flux machine for HEVs

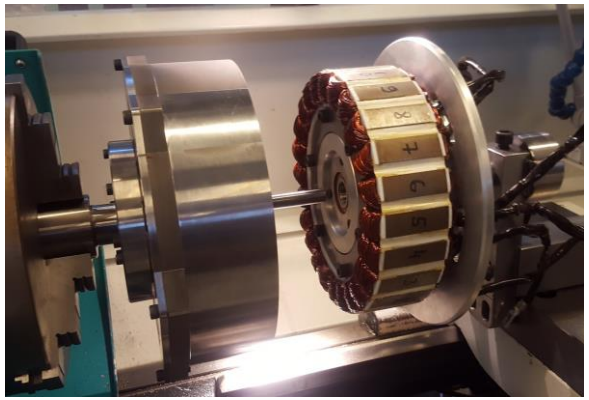




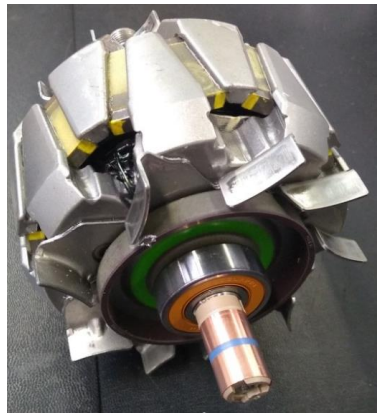
4p48s/f SPM versus 5p60s/f IPM

3 – WP3: Machine Design with Reuse and Recycle Concepts for automotive Application (Valeo, G2Elab, AAU)

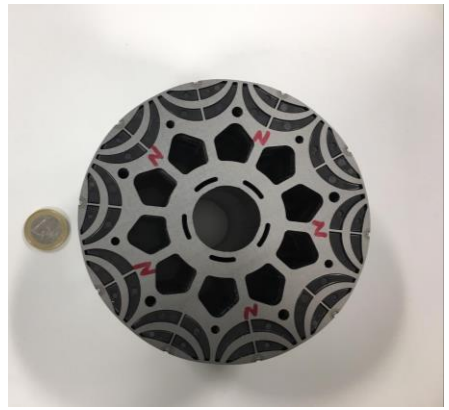
- **Final results and prototypes**



Amit



Pranshu



Ziwei

- ➢ Very good agreement between FEM and measured values
- ➢ Motors fulfils the electromagnetic performance requirement
- ➢ The design can be easily assembled and disassembled
- ➢ Proposal of a new Weighted Index of Recycling and Energy Concept , WIRE, to compare different designs

Merci LAURIC !
Merci à tous !

Afef Lebouc

DEMETER
UNE BELLE AVENTURE SCIENTIFIQUE MAIS AUSSI INTELLECTUELLE & CULTURELLE AVEC LAURIC