# ODIN

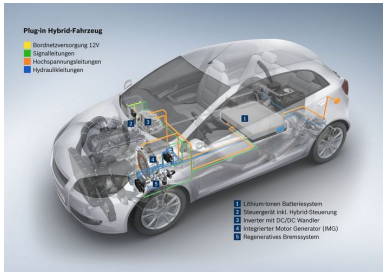
## Optimized electric Drivetrain by Integration

## European Green Car Initiative

## third Green Car Call (FP7-2012-ICT-GC)

## Objective 6.8

## ICT for the Fully Electric Vehicle

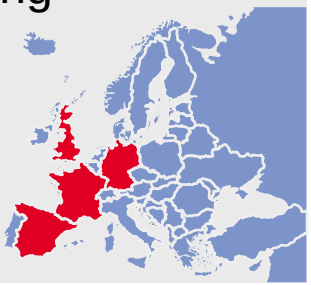



Projects Clustering Event, Brussels 11-12 July 2012
Dr-Ing. M. Braun, Robert Bosch GmbH

# ODIN

## Optimized electric Drivetrain by Integration

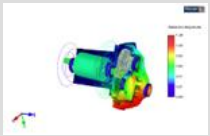
- Goal: electric vehicles with integrated and scalable **eDRIVE** (EM, INV, GEAR)
- Measures: high speed e-motor and integrated lubricant and cooling
- Focus on fully electric vehicles with large production rates
- EU-FP7-2012-ICT-GC founded project (5.6 Mio. € Funding)
- Duration 07/2012 – 06/2015
- Partner location and roles (leadership by Bosch):



| GKN Driveline | BOSCH / iSEA | FUCHS | CIE Automotive | Romax Technology | RENAULT |
|---|---|---|---|---|---|
| France | Germany | Germany | Spain | U.K. | France |
| gear | e-components | lubricant | casting | mechanics | demo car |

BOSCH

system development



# ODIN
## Benefits

| | |
|---|---|
| • partners | 7 Partners out of 5 EU countries (OEM and Tier-x) |
| • reduced cost | 50% compared to current electric power-train |
| • highly integrated | e-Motor, transmission and power electronics within one housing and integrated cooling |
| • reduced weight | >20% and Power-Train <10% of vehicle weight |
| • peak power | **50**-80 kW (fully electric) |
| • improved efficiency | drive-train losses reduced by 10% |
| • improved safety | distributed safety concept |
| • less magnets | 30 to 100% less rare earth magnets |
| • scalability | trade-off between minimal cost and variability |
| • competition | answer to hold against non EU competitors |

➔ The best solution for sustainable fully electric cars
- made in the EU with high volumes

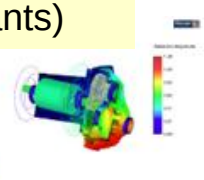
# ODIN

## Example: Required Development Cycle (WP2 – WP4)

### Challenges

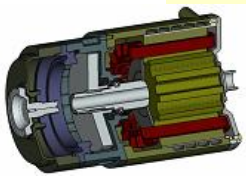
- Cooling
- Mechanic
- Electronic
- Trade off between
  - Gearbox
  - Power Electronics
  - E-Motor
- Lubricant
- Cost
- Compactness
- Efficiency
- Weight
- Acoustic
- Safety

**Simulation**
(all components, many variants)



WP2
WP3

**e-motor**
(high speed, oil cooling, bearing, noise)



WP2
WP3

Results and fluid circle

Duration of iteration appx. 4 months

WP2
WP3

**Power Electronics**
(high switching frequency, safety, oil cooling )

**Gearbox, Overall housing**
(highly integrated, high speed, oil cooling and lubrication, noise)

WP2
WP4

**➔ Define baseline and find best solution overall**