

EV Everywhere Workshop
July 24, 2012

ELECTRIC MOTORS AND CRITICAL MATERIALS

Electric Motors and Critical Materials

Breakout Session #1 – Discussion of Performance Targets and Barriers

Comments on the Achievability of the Targets

- The PHEV 40 and EV 300 targets are very challenging
- 5X reduction in motor costs is impossible
- System interdependence might create opportunities for advances
- Drive system efficiency targets are unrealistic (excepting AEV 100 targets)
- Need torque density as a useful addition to targets (specific operating ranges)

Barriers Interfering with Reaching the Targets

- Rare earth magnet costs
- Copper plus high-temperature insulation costs
- Temperature dependence of demagnetization
- Large-scale manufacturing capability rules out some materials and processes: need to develop expertise in electrical machine manufacturing
- Efficiency targets tied to the batteries and are too high
- Dialogue between EV, materials, and motor designers is missing
- Achieving high volume

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Breakout Session #2 – Discussion of Breakthroughs and Research Needs to Overcome Barriers and Reach Performance Targets

Technology Breakthroughs Needed

- Materials (hard magnetic materials, soft magnetic materials)
- Matching topologies to advanced materials for mass production
- Thermal management
- Noise mitigation

“Out-of-the-Box” Ideas (We like, but not sure how we’ll get there)

- High-temperature motors
- Silent switched-reluctance motors
- Advanced wire technologies (aluminum, superconductor)

Research Suggestions (Have an idea of how to get there)

- Integration of motor, power converter, and speed reducer
- Soft magnetic core material with high saturation capability and mechanical strength at high temperatures

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Breakout Session #3 – Discussion of Action Plans and Next Steps

Comments Regarding the Other Technical Areas Being Discussed

- Support the general push regarding system integration
- Temperature sensitivity/tolerance of components and connectors
- Integrated cooling systems is a good idea to investigate
- Standardization of components
- Systems integration

Next Steps for Reaching Targets (including roles for DOE and industry, e.g., lead or support)

- Exploring Pareto surfaces for setting goals should be done soon
- Facilitating improved industry-academia-national lab discussion
- Research on manufacturing process improvements
- Student challenges, workforce development
- Increased materials development funding