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

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