EV Everywhere Workshop
July 24, 2012

TRACTION DRIVE SYSTEM BREAKOUT GROUP

Breakout Session #1 – Discussion of Performance Targets and Barriers

Comments on the Achievability of the Targets

- 1 – What is the material cost floor to meet the $4/kW (AER300) & $15/kW (AER100)?
- 2 – Consolidation of power module technologies will help meet cost targets
- 3 – Don't overlook profit motive in value chain
- 4 – Today's HEV systems drive EV traction drive systems because of manufacturing base

Barriers Interfering with Reaching the Targets

- 1 – Thermal Management of integrated system (stand-alone dedicated cooling systems',
- 2 – Need standardized scaleable, modular building block components
- 3 – Raw material volatility → cost indexing is required
- 4 – Large impact of heating and cooling loads for cabin
- 5 – There is no U.S. supply chain for most stages of value chain in traction inverter and motor magnets

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

Technology Breakthroughs Needed

- 1 – USA capability in low-cost high-performance electrical steels
- 2 – Improve communication to allow remote control processing of traction inverter commands (must meet performance, safety, etc.) – reduces cost
- 3 – Shifting/variable ratio transmission can be used to enable motor efficiency improvements
- 4 – Reduce rare earth content

"Out-of-the-Box" Ideas

- 1 – Use car body as radiator heat transfer surface
- 2 - For 300 mile BEV, need truly fast charge → or maybe instead consider replacing the traditional rechargeable battery with a flow battery that can be "recharged" with a liquid recharge fluid/slurry → reuses current liquid distribution system
- 3 - Hybrid battery (power and energy) – Could be different battery chemistries or battery and ultracap in same pack

Research Suggestions

- 1 – "Hybrid Motor" concept – one for peak load (high power) one for base loads (high efficiency at road load power)
- 2 – Integrated PE with integrated inverter + OBC (onboard charger) + DC-DC converter → needs a common block (i.e. PEBB)
- 3 – In-depth model and simulation of traction drive system for NVH

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

Comments Regarding the Other Technical Areas Being Discussed

- 1 – Capacitors that meet the temperature and lifetime requirements
- 2 – Leapfrog SiC to go to WBG in the common modular battery boost building block

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

- 1 – To define a TDS topology require OEM to define ESS constraints, motor load, motor packaging constraints
- 2 – Define a common modular energy storage system and power electronic boost building block (e.g. , phase-leg, gate drivers, reliable and fast communications interface, etc.)