INDUSTRY ENGAGEMENT

NTRC

10 August 2016

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GENERAL MOTORS

TECHNOLOGY IMPLEMENTATION ROADMAP

USCAR EE Tech Team
- Cost Model
- Key Component Development
- Requirements

Key Suppliers
- Development plans
- Shortcomings

DOE Facilitation
- Labs Support
- FOAs

ELECTRIC MACHINE DEVELOPMENT OBJECTIVES

- HRE Free Net Shape Magnets
- Lower Loss Non-Oriented Electrical Steel
- Higher Conductivity copper wire
- Manufacturing Processes for High Performance Induction Rotors
  - Pure Aluminum, Low Porosity (squeeze casting)
  - Cast copper rotor

WBG DEVICE DEVELOPMENT OBJECTIVES

- Parallel multiple die per switch to achieve >300Arms phase current rating at 600Vdc
  - scale to higher power utilizing similar topology
- Elimination of free-wheeling diodes
- Target 30kHz maximum switching frequency
  - Boost Converter Bridges may push to 50 kHz initially
- Target design for operation at or above 200C
- Gate resistor Integration to balance parallel gate drive bias
- Eliminate wire bonding and soldering for power reliability at high power and thermal cycling reliability
  - Employ advances in sintering and high power packaging techniques
  - Lower power path resistance to reduce conduction losses
- Low module inductance to enable low switching losses
- Develop complimentary parts to implement WBG Power Module (PM) in automotive inverter
  - WBG Gate Drive Chips & Protection Circuits
- Deliver projected capital & product investments to achieve affordable WBG PM production cost