Advancing the Deployment of Electric Vehicles

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- Research and Development
- Deployment & Training
- Recovery Act Manufacturing
- EV Everywhere
Electric Drive Vehicle R&D

**Organizations**
- ARPA-e
- EERE Vehicle Technologies Program
- Office of Science

**Technologies**
- Batteries: Li-ion and beyond Li-ion technologies
- Power Electronics: wide bandgap devices, capacitors, electrical architectures, packaging, charging
- Electric Motors: Non-permanent and PM magnet motors, new magnetic and motor materials
- Traction Drive System
- Thermal management
- Vehicle Systems – HVAC, Wireless Charging

**Major Goals**
- By 2020, develop an electric drive system with a cost of $8/kW and efficiency of >94%
- Battery goal: Reduce EV battery production cost to $300/kWh by 2015 and $125/kWh by 2022 while also improving abuse tolerance and range

**Approximately Half of the EERE Vehicle Technologies FY12 and FY13 Budgets Support Electric Drive**
Battery Costs are Coming Down Quickly

Future Direction

- Cost reduction, durability, safety, and increased specific energy:
  - Innovative development efforts and manufacturing improvements with potential to reach cost goals.
  - Development of high voltage, high capacity cathodes and high voltage electrolytes.
  - Develop Silicon Composite & Metal alloy materials and cells.
  - Expand focus on beyond-Lithium-ion technology.

Also Must Meeting Other Critical Criteria:
- Cycle life
- Calendar Life
- Safety and Abuse Tolerance
The World’s Largest Documented Electric Drive Vehicle Demonstration

- Use data on 13,000 vehicles and 20,000 charging locations:
  - 130,000 PHEV/EV test miles and 5,000 charging events documented each day
  - Full details of every charging event and vehicle trip are captured
Training and Deployment

- 10 Recovery Act projects to educate auto technicians, 1st responders, undergraduate/graduate students, teachers and the public
- 7 Graduate Automotive Technology Education Centers of Excellence
- 15 university teams participating in EcoCAR 2: Plugging into the Future
- 16 EV/PHEV community readiness projects to develop strategies and overcome market barriers
Johnson Controls

Major Lithium Ion battery production

• 175,000 square foot renovated advanced battery facility in Holland, MI, opened August 11, 2011.
• First U.S. facility to produce complete lithium-ion battery cells and systems for hybrid and EVs

Other ARRA Battery Production Projects

• SAFT – Jacksonville, FL
• Exide – Columbus, GA
• GM – Brownstown, MI
• A123 – Romulus, MI
• EnerDel – Comfort, IN
• East Penn – Lyon Station, PA
• Dow Kokam – Midland, MI
• LGChem – Holland, MI
Chemetall Foote (Rockwood Lithium)
Expanding America’s lithium production

- Expansion of lithium production facilities in Silver Peak, NV and Kings Mountain, NC
- Major domestic supplier to the lithium battery industry
- Will significantly increase U.S. capacity to produce lithium, which is mostly imported from South America
- NC facility finished June 2012, NV facility to be completed in 2013

Other Advanced Battery Supplier Manufacturing ARRA Projects
- Celgard – Charlotte, NC; Aiken, SC
- Honeywell – Buffalo, NY; Metropolis, IL
- BASF Catalysts – Elyria, OH
- EnerG2 – Albany, OR
- Novolyte Technologies – Zachary, LA
- FutureFuel – Batesville, AR
- Pyrotek – Sanborn, NY
- H&T Waterbury – Waterbury, CT
- Toda – Battle Creek, MI
Magna E-Car
Electric Drive Component Manufacturing

- 50,000 sq ft new production facility in Grand Blanc Township, MI opened April 2012
- At full production, could assemble full EV drivetrains and support 100,000 vehicles
- Agreement with Ford to supply key components for the Focus EV

Other Electric Drive Component Manufacturing ARRA Projects
- GM – White Marsh, MD; Wixom, MI
- Delphi – Kokomo, IN
- Allison Transmission – Indianapolis, IN
- Ford – Sterling Heights, MI
- Remy – Anderson, IN
- UQM – Frederick, CO
A DOE Clean Energy Grand Challenge with the goal of enabling U.S. companies to produce electric vehicles that are as affordable and convenient for the average American family as today’s gas-powered vehicles within the next 10 years (by 2022).

- Midsize sedan, majority of miles driven on electricity,
- < 5 year payback
- Sufficient range and fast charge capability for widespread adoption

- EV-Everywhere Framing Document is available and open for comment.
- Five stakeholder workshops conducted June-September 2012
- Finalization of the Initiative this Fall
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