

High Energy Density Lithium Battery

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Technical Approach:

- Use a high energy density tin-based conversion reaction anode
- Use a conversion reaction cathode with over a capacity exceeding 300 mAh/g
- Use a phosphate-based intercalation cathode with an energy density exceeding 800 Wh/kg

Status:

- First year milestones completed
- Cycling of the anode and both cathodes vs Lithium metal successful

Technology:

- A Sn-Fe-C composite is showing promise of exhibiting a significantly greater volumetric capacity than carbon
- Two cathodes with high capacities are being studied:
 - The potentially very high capacity CuF_2 material, which will react by a conversion mechanism to form LiF and Cu
 - The intercalation cathode, VOPO_4 , which can react to form Li_2VOPO_4 .

Objectives:

- Develop the anode and cathode materials for high energy density cells for use in PHEVs and EVs with
 - Enhanced performance over current batteries
 - Reduced cost
- Specifically enable cells with an energy density exceeding 1 kWh/liter and Increase the gravimetric capacity of the anode

Deliverables: A low-cost Li battery that can attain 1 kWh/liter.

Funding:

Duration: 3 yrs, Start: 8/1/14, Total: \$1266K (DOE)

Milestones:

- **Q1:** Determine the optimum composition Li_xVOPO_4
- **Q2:** Demonstrate VOPO_4 rate capability
- **Q3:** Demonstrate 100 cycles of Sn_2Fe
- **Q4:** Demonstrate rate CuF_2 rate capability
- **Q4:** Go/No-Go: Demonstrate lithiation method. Success criteria: A cycling cell containing lithium in one of the intercalation or conversion electrodes must be achieved.