Overview of the Batteries for Advanced Transportation Technologies (BATT) Program

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BATT Program Mission

- The BATT program performs **fundamental research** in support of the DOE/EERE FreedomCAR and Vehicle Technologies Program to develop batteries for vehicular applications (EV, HEV, and Plug-in hybrid)
- Presently, the focus is on lithium-based systems (Li-ion and Li-metal)
- Consists of 28 PIs from various universities, national labs, and one company
- Program lead: Prof. John Newman, UC-Berkeley

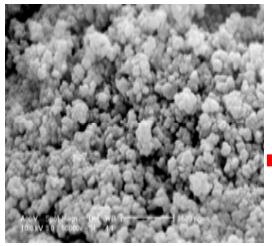
Critical Challenges

- Cost
- Life
- Abuse tolerance
- Performance (low-temperature operation, energy, and power)

Choice of application decides the critical problems to be solved:

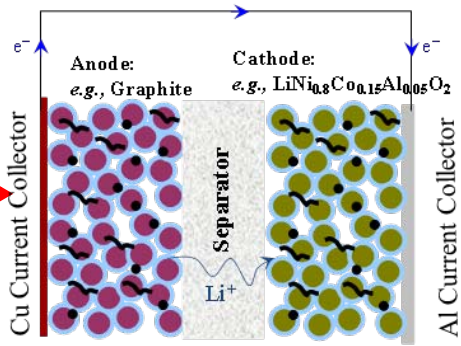
- EV: Need double the energy density of presently available Li batteries
- HEV: low-T operation, cost, and abuse tolerance
- Plug-in hybrid: life (especially calendar life), cost (related to energy)

Material Synthesis, Diagnostics, and Modeling Across Length Scales



10 nm-10 μm

Length Scales



100 μm-300μm

Structural Diagnostics

Electrochemical Diagnostics

Electrode Diagnostics

Electrochemical Analysis

Material Synthesis/ Modifications

New/Improved Material

Electrode/Battery Fabrication

Improved Chemistry

Structural Modeling

Electrode Modeling

BATT and the Battery Industry

- Block copolymer electrolytes for Li-metal batteries (Balsara) being commercialized by Seeo Inc.

- Advanced cathode materials (Manthiram) being commercialized by ActaCell

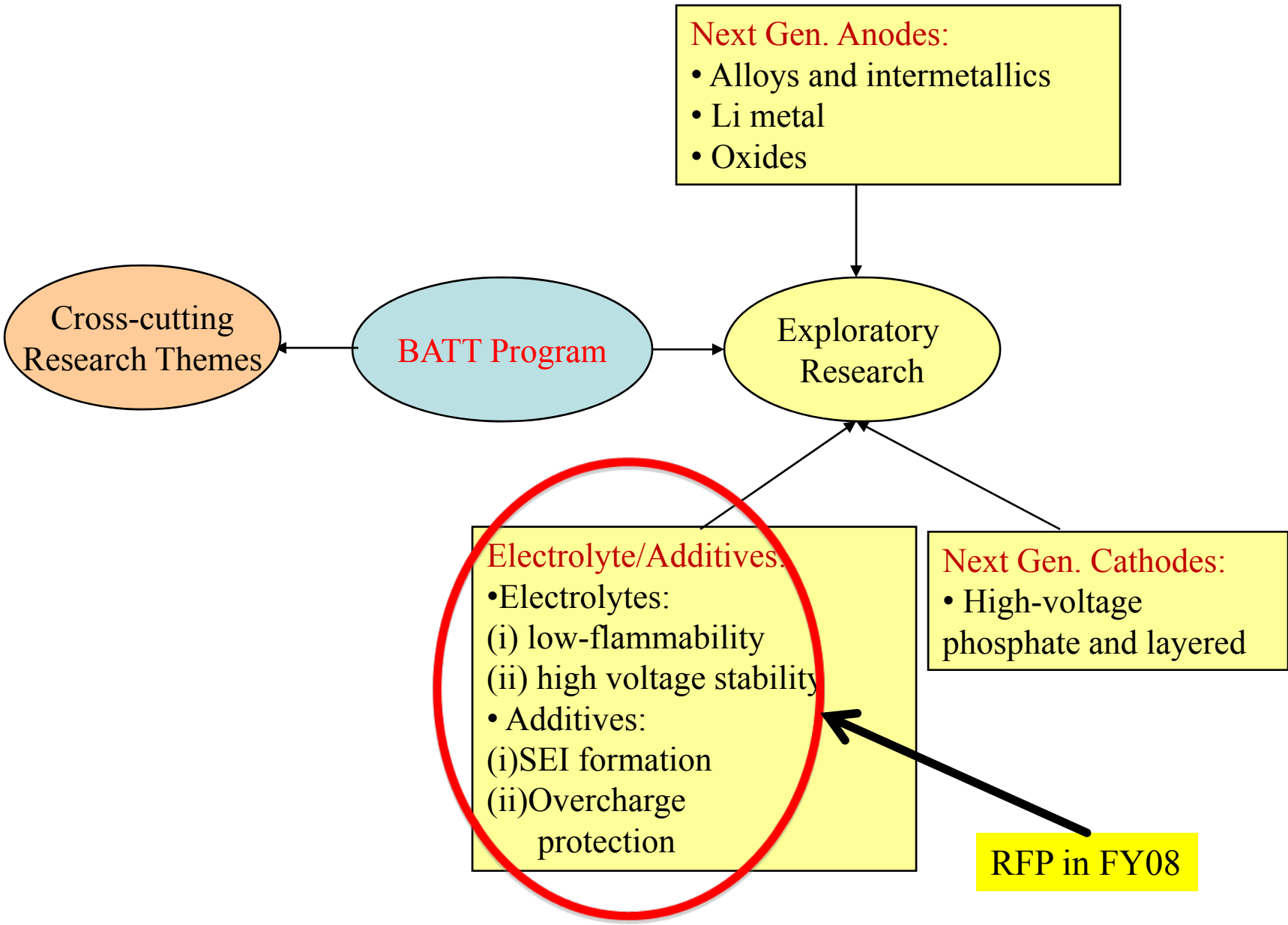
- Simulation method for materials design (Ceder), partly funded by BATT, used by CMC, Inc.

- Novel manufacturing technologies and computational simulations (Sastry), being used by Sakti3.

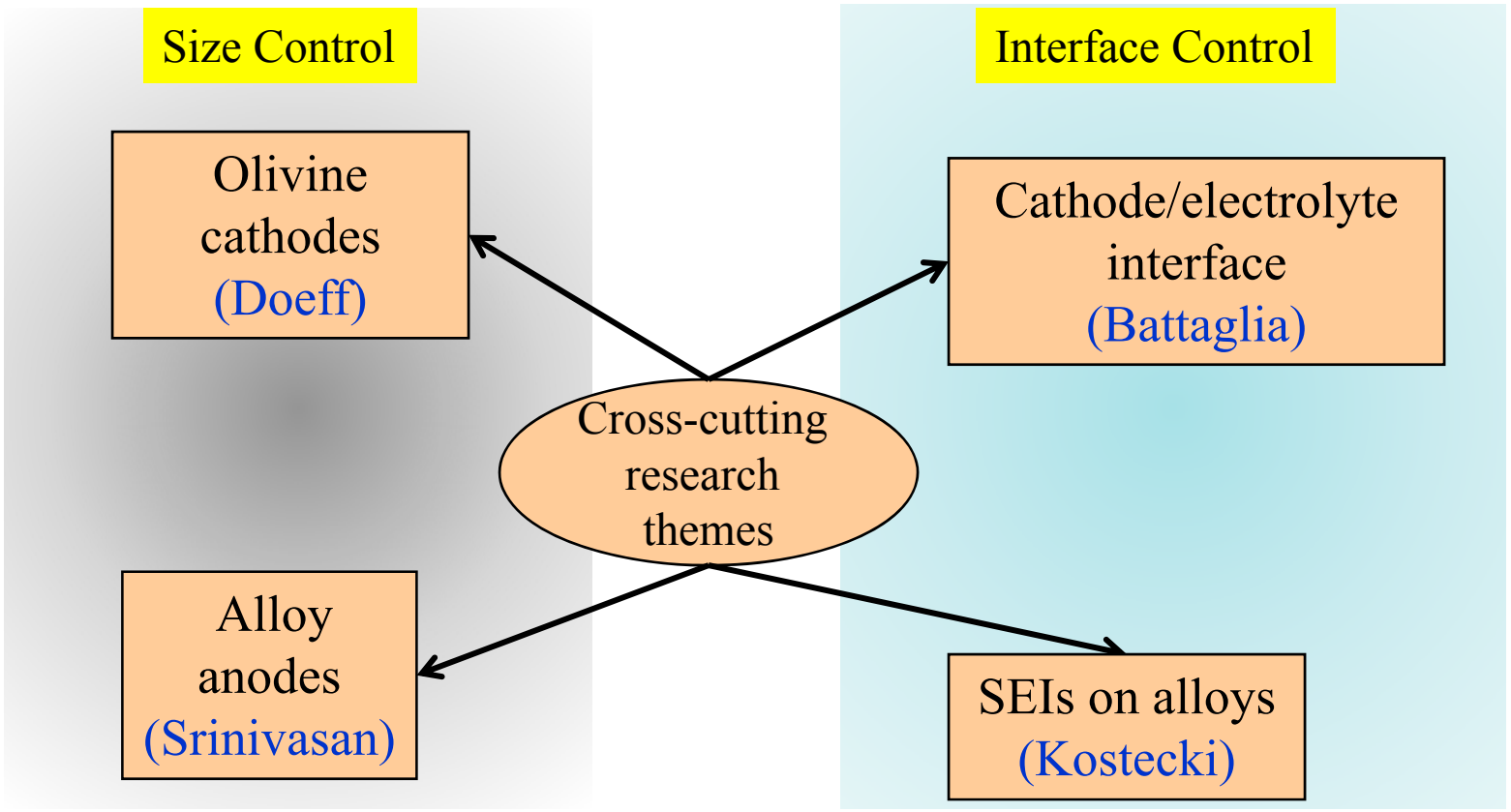
- Molecular dynamics code (Smith), developed with BATT funding, basis of company to simulate electrolyte properties.

- Numerous patents have resulted over the year, with some licensed to companies for commercialization.
  - High-rated $LiFePO_4$ material (MIT) licensed to two companies.
  - Tin-based anode materials (ANL) licensed to one company
  - Composite cathode materials (ANL) licensed to one materials company and one battery company

Emphasis of the BATT Program- FY09



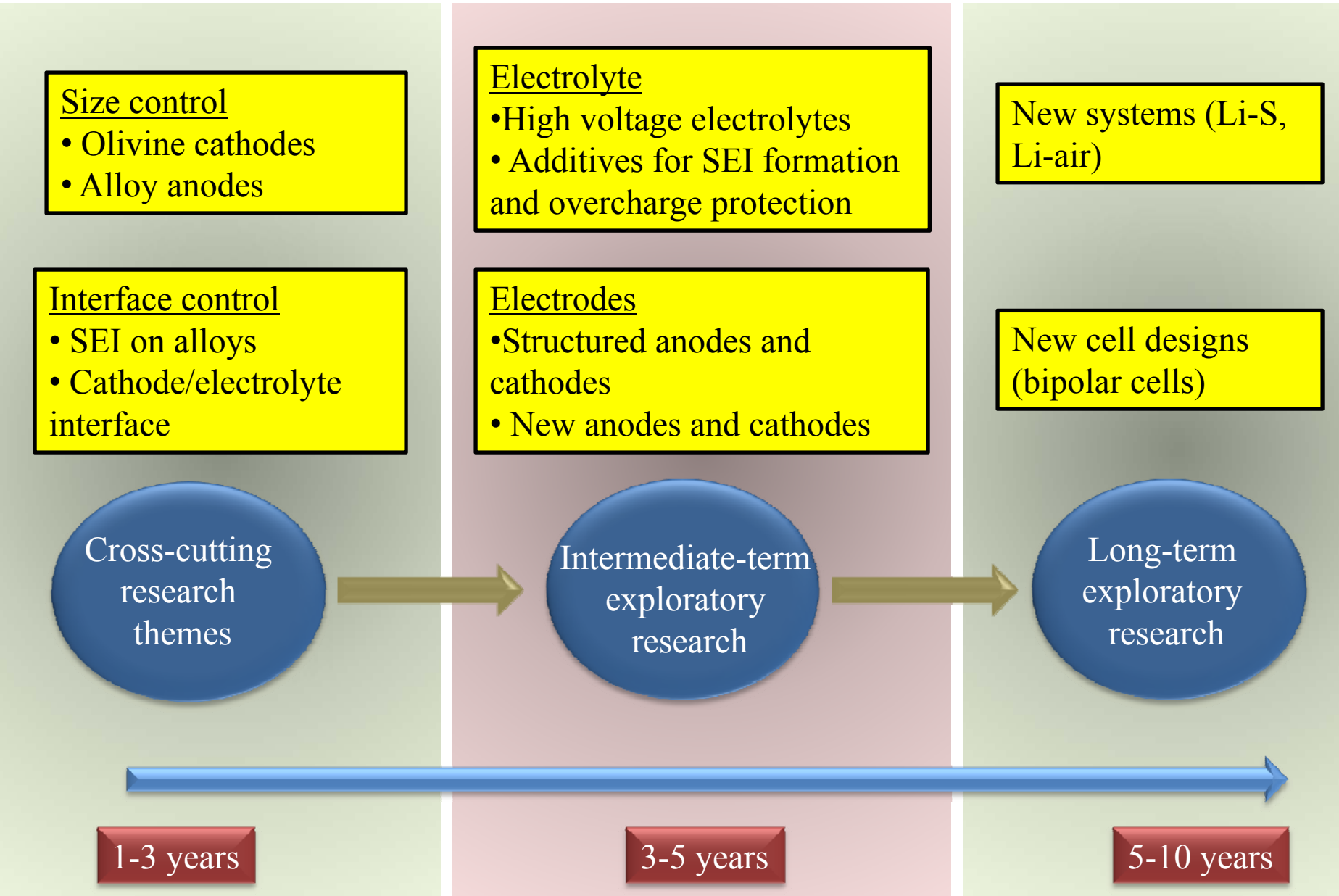
Focus Areas for FY09



- One PI has been asked to lead each area. PI is coordinating the research activities.

If successful, these topics will result in the development of a high-energy battery with enhanced safety and long life.

Structure of BATT in FY09-10



Acknowledgements

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  - Especially Frank McLarnon, Vince Battaglia, John Newman, and Susan Lauer

- DOE Office of Vehicle Technologies

For additional information see http://batt.lbl.gov