PROSPECTS FOR FUTURE POWER AND PLATFORM SAFETY

Presently the average PRIMARY BATTERY yields 25 to 40% of the Theoretical Energy Density

- This reduction is structural overhead (case, separators, supporting electrolyte)
- This reduction is electrochemical inefficiency vs. equilibrium potential

Presently the Average RECHARGEABLE BATTERY yields 10% to 20% of the Theoretical Energy Density

- This reduction is structural overhead (case, separators, supporting electrolyte)
- This reduction is electrochemical inefficiency during discharge vs. equilibrium potential
- Additional inefficiency from recharge losses (dispersal of reactants in the bulk volume)

VEHICLE energy packaging usually has a 30% to 60% overhead

- The AUV is doing very well if we get 10% of the Energy out we should by weight

PROSPECTS FOR FUTURE POWER AND PLATFORM SAFETY

Primary battery efficiency may be increased by 50% (to 60 to 70%)

- Requires extensive modeling and structural analysis at the electrode level
- Requires extensive use of nanophase electrochemical materials
  - § Corollary is the cathode is an energy dense solid reactant or reaction site for solution phase material

Secondary battery may be increased by 30 to 50 % (to a 35% efficiency)

- Requires extensive modeling and structural analysis at the electrode level
- Requires extensive use of nanophase electrochemical materials

AUV energy packaging can be increased

- Conformal energy supplies (no more square pegs in round holes)
- Pressure tolerant systems (no heavy wall structures)
- Integrated hull-section/power supply (no separate battery)

With respect to safety and handling

- The higher the energy densification, the greater the risk of cascading response

The higher the densification, the greater the need for thorough system integration