

Battery Innovation: Smarter, Less, Longer, and...Faster

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20+ Years From Invention to Market Deployement



Auto Industry is Committed to Bringing Battery Innovation to Production Faster



General Motors Presentation at Barclays Global Automotive Conference, Nov 2020





Data-Driven Approaches Accurately Predict Cycle Life and Should be Adopted Faster



Severson et al., Nature Energy, 2019

Rapid Identification of Better Fast-Charging Protocols with Machine Learning



Co-Optimization of Battery KPIs by ML-Enhanced Electrolyte Design

Machine learning can accelerate simultaneous optimization of performance, cost, and safety



100% Enhancement in Li-Metal Anode Fast Charge Performance Over 3 Months



CYCLE NUMBER

5 mA/cm² charging (40 min)

PHARMA

BATTERIES



Is the Data Meaningful? The Devil is in the Details



Solar Has Standardized Cell and Module Testing – Why Can't We?



What services should be provided?

- Set guidelines for evaluation
- Build and test commercially viable cells
- Evaluate components and cells standardize reporting

Incentives for Stakeholders

- Big Industry de-risk decision making on external innovation for next-gen products
- Startups & Small Businesses clear goalposts to raise capital and attract partners
- Academia mandated for all government financed R&D

Impact

- Trust building across the industry
- Apples-to-apples comparisons
- Enhanced tech transfer
- More venture dollars flowing into the space
- More efficient capital deployment



Greater Transparency with 3rd Party Validation Drives Smarter Deployment of Capital

VS.







Vertical Integration Drives Faster Battery Innovation – Will all OEMs go this Way?





Key Takeaways – Getting to Smarter, Less, and Longer Faster



Better Predictions

- Early life indicators
- Data-driven analysis

Better Gates

- Standardization
- Transparency
- 3rd Party Testing



- More trust
- Accelerated innovation
- Increased ROI