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General roadmap toward understanding of real life data

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Focused Areas Main List [1]

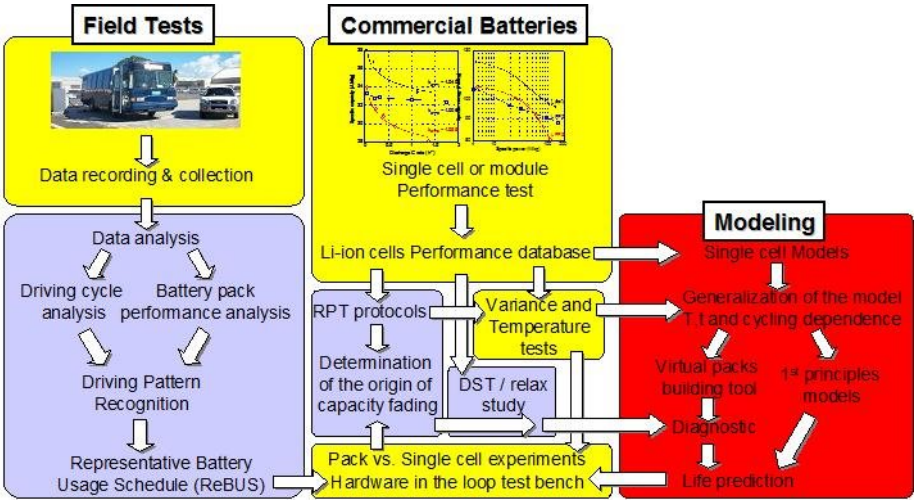
Other Areas: Driving Cycle Analysis [2] - Commercial Cell Evaluation: Understanding Degradation Mechanisms [3] - Cell Modeling [4] - Battery Pack Simulation [5]

To date, assessment and understanding of battery performance primarily rely on testing in the laboratory. Very limited effort has been put into field testing with detailed data collection and analysis. The reason that the field-testing approach was not favored is because such testing is costly and labor-intensive, and has virtually no control. On the other hand, the difficulties in conducting field testing and analysis hamper the development of suitable methodologies to gain experiences in real life for a practical understanding of battery performance. Thus, it is no surprise that experiences from field tests to date are mostly limited to statistical data in nature, presenting limited value for use in technical improvements of battery design or operation. In pursuing better understanding of battery performance in real life, we often come across three major challenges:

- Availability of adequate test protocols and analytic tools to understand the data collected in the laboratory for life prediction.
- Availability of viable battery modeling and simulation tools to extend our laboratory experiences to real-life duty cycles; therefore,we can predict battery performance and life in more complex and less controlled settings.
- Capability to develop suitable protocols and analysis techniques to allow us to gather and analyze data collected in real-life operating conditions to derive a battery?s performance characteristics in relation to its usage.

In our work, we propose a roadmap delineating how to address these challenges and to enhance more realistic understanding of battery performance in real life. Some of the critical steps involved are listed as follows:

- Collect relevant data in the field operation.
- Formulate a systematic approach to analyze duty cycles according to their operating conditions and usage.
- Analyze performance characteristics of the batteries.
- Derive correlation between duty cycles and performance characteristics.
- Develop a predictive model and simulation capability to allow prediction of battery performance and life based on duty cycles in real-life operation.



More details? 2 publications:

A Roadmap to Understand Battery Performance in Electric and Hybrid Vehicle Operation. [6]
M. Dubarry, V. Svoboda, R. Hwu and B.Y. Liaw, J. Power Sources, 174(2), p. 366 (2007).

Vehicle Evaluation, Battery Modeling, and Fleet-Testing Experiences in Hawaii: A Roadmap to Understanding Evaluation Data and Simulation.[7] M. Dubarry, N. Vuillaume, B. Y. Liaw and T. Quinn, Journal of Asian Electric Vehicles, 5(2), p. 1033 (2007).

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