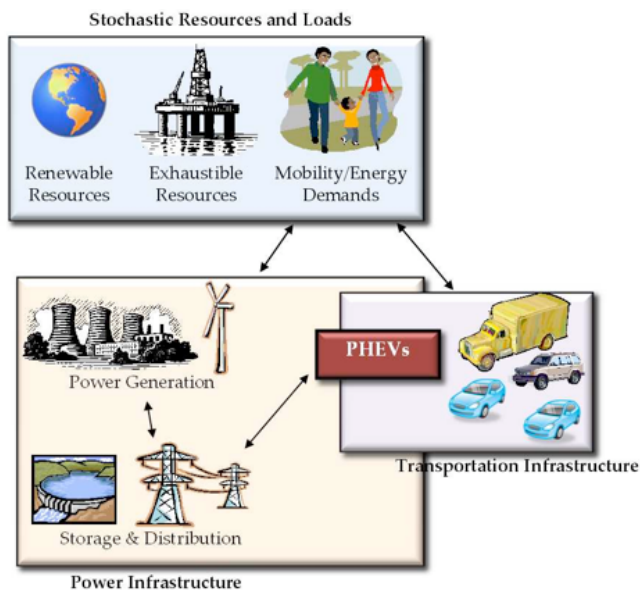


# Impact of battery health on vehicle-to-grid integration



**V2G systems use renewable resources to meet the combined energy demands of electric transportation and the grid**

## Objective:

Understanding the impact of battery health degradation on the degree to which smart grids and plug-in hybrid vehicles can use renewable energy.

## Approach:

- A high-fidelity model of lithium-ion batteries that simulates how they degrade over time.
- Simplifying this model to allow it to run faster while still accurately capturing the dynamics of health degradation.
- Once the model is validated experimentally, use it within a tool to optimally manage the operation of a hybrid vehicle's different motors and engines such that driver demands are met with maximum sustainability.

## Impact:

- Quantify the degree to which the aggressiveness of battery use affects the lifetime of an advanced battery (e.g., Lithium-ion).
- Optimize battery power management using power electronics, to maximize battery life.
- Maximize the ability of advanced batteries to absorb renewable energy (e.g., wind) when available and release it when needed, without compromising battery life.
- Maximize battery life, and therefore minimize recycling, over the lifetime of a plug-in hybrid vehicle or smart grid system.

## Contact:

**Hosam K. Fathy**  
Mechanical Engineering  
[hfathy@umich.edu](mailto:hfathy@umich.edu)

(734)936-5295



[me-web2.engin.umich.edu/zope/pubdir/bio?uniqname=hfathy](mailto:me-web2.engin.umich.edu/zope/pubdir/bio?uniqname=hfathy)