Electric Vehicle Range Extension

Team 2: Seth Rejda, Luke Marshall, Hafs Sakka, Taofeek Akintola, Khaled Farhat

Aim: To increase the range of an electric vehicle by 15% through non-traditional power adders while minimizing the reduction in acceleration and top speed.

Motivation

- Rapidly rising costs of clean fossil fuels
- Increasing use of mass transportation
- Need for renewable energy integration

Goals & Constraints

Goals

- Document current vehicle performance
- Research/install an additional power source
- Redesign/finalize overall system circuitry
- Test/document vehicle range increase

Constraints

- Cannot increase onboard fuel supply
- Vehicle must be able to hold 4 people
- Can't reduce top speed by more than 10%
- Can't reduce acceleration by more than 10%

Acknowledgements

Team 2 would like to send a special thanks to Dr. Michael Hays of Cummins, Inc and to Dr. Seungyong Hahn and Dr. Chiang Shih of Florida State University.

Range & Performance

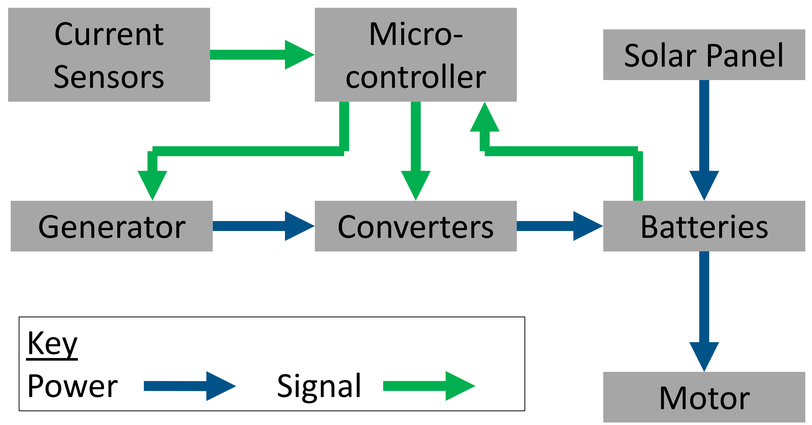
Benchmark

- Range: 98.6 miles
- Speed
  - Battery: 25mph
  - Generator: 8mph

Final System

- Range: 129.1 miles
  - **30.9% increase**
- Speed
  - Hybrid: 25mph
  - **0% decrease**

System Diagram



Power Generation Design

Cummins QG2800 Electric Generator

- Controlled output of 2170W is supplied to batteries in tandem with all power sources
- Eliminates separated performance loss
- Boosts efficiency and range by 22.3%

Photovoltaic Roof Replacement Kit

- Supplies batteries with up to 280W output
- Increases range by up to 8.6%

Specific Source Outputs

	Benchmark		Final System	
Source	Energy (MJ)	Miles	Energy (MJ)	Miles
Battery	17.6	24.8	17.6	24.8
Generator	52.4	73.8	68.0	95.8
Solar	0.0	0.0	6.0	8.5
Total	**70.0**	**98.6**	**91.6**	**129.1**

Future Work

- Install more non- traditional power sources
- Replace existing lead/acid batteries
- Replace frame with ultra-light materials
- Add more user interface capabilities