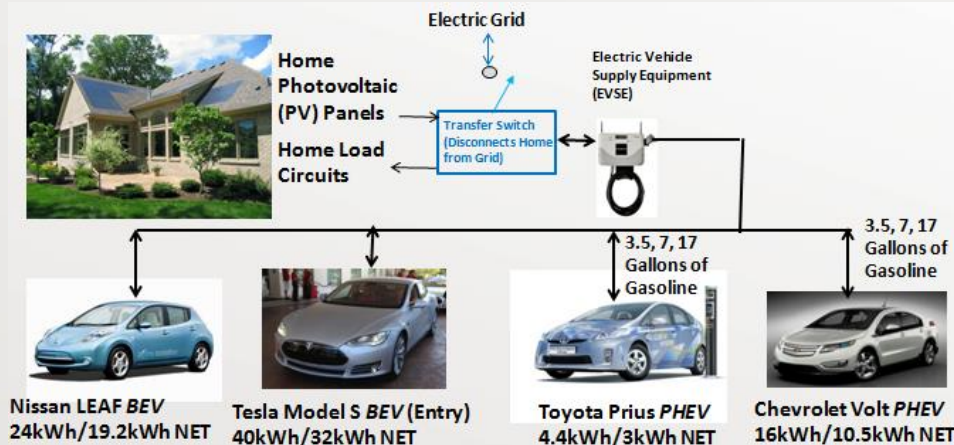


# Vehicle-to-Home Microgrid Research

Dave Tuttle & Dr. Ross Baldick (advisor)  
Electrical & Computer Engineering

## Research Interests:

- integration of Renewable generation with the Grid
- Integration of PEVs & the Grid
- Alternative Fuels & Powertrains (such as Electric Drive)



## New/Unique Value of PEVs

### -Useful New Microgrid Function for PHEVs & BEVs combined w/rooftop PV

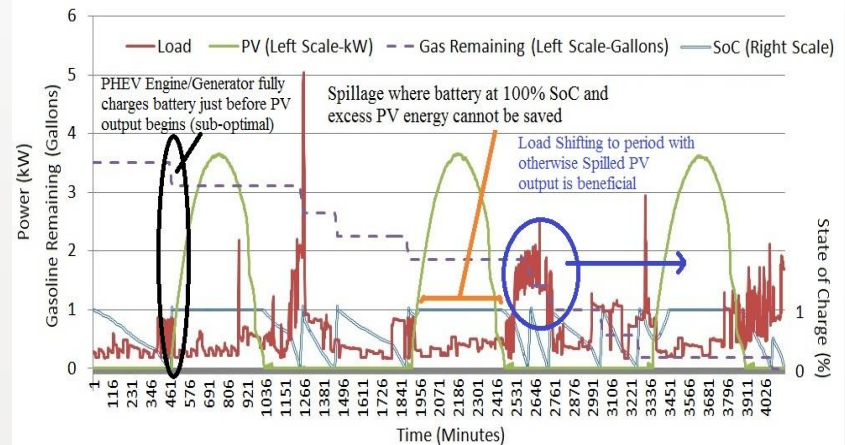
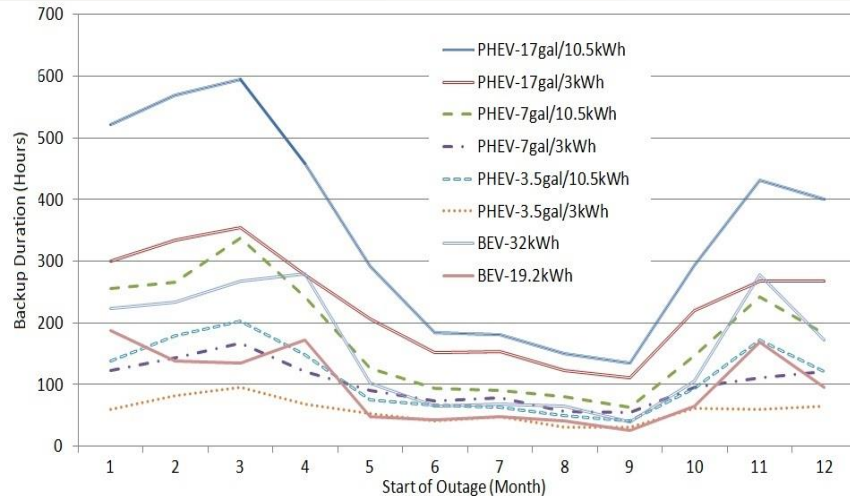
- PEV based battery energy storage for the home
- with better economics given dual use of PEV battery
- Backup Generator: Understand efficiency potential (kWh output per gallon of gas)

## Grid Resilience

### - Outage Ride-Through for a residential application

- Potential backup far longer than most Utility's SAIDI (System Average Interruption Duration Index)
- Leverage existing equipment (PEVs, PV) to improve economics
- Cost borne only by those homeowners who value outage ride-through

# Substantial BEV & PHEV Backup Duration



## Compelling Micro-Grid Residential Backup function

- Significant backup-power durations even under most demanding loads
  - Late Summer afternoon with 100+ degree Ambient and heavy HVAC load
  - Without any behavior modification
- PEV Storage synergistic with residential rooftop Photovoltaic panels to extend backup duration

## Can Further Increase Backup Duration via:

- Load shifting (manually or automatically with HEMS+Smart Devices)
- Larger PEV battery (e.g. Tesla Model S 65 or 85kWh)
- Selective load curtailment (e.g. thermostat temperature increase)
- Optimized PHEV engine/Control algorithm