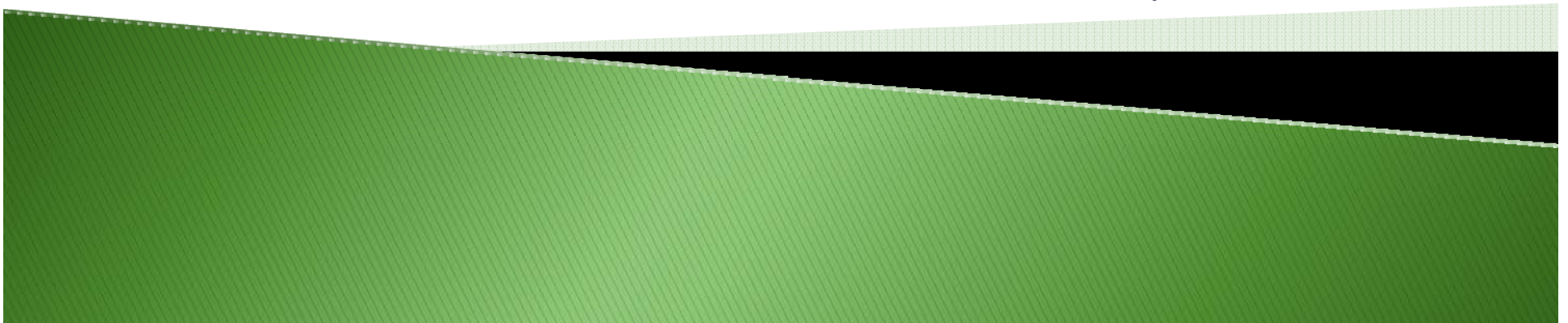


# FPSC Staff Workshop on Electric Vehicle Charging Stations

Gulf Power Company

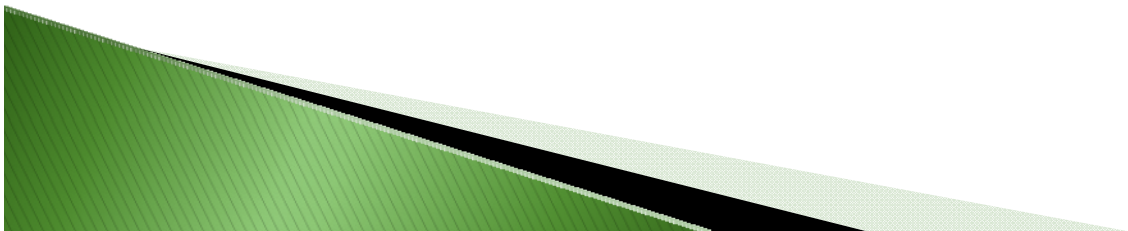
Bob McGee

September 6, 2012



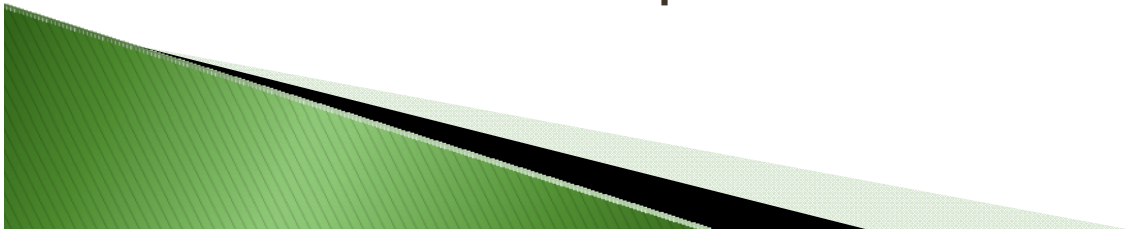
# Overview for Gulf Power

- ▶ Current status & Forecast
- ▶ PHEV Research
- ▶ Pilot



# Current Status & Forecast

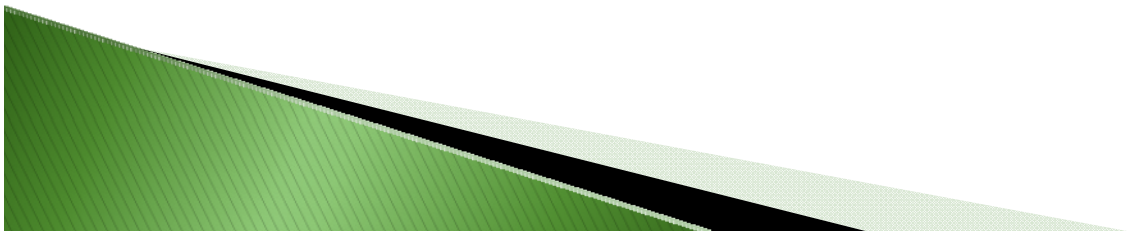
- ▶ Number of EV/PHEVs in Gulf's service area:
  - Approximately 30 Volt/Leaf registrations
    - Source = Florida DOT (new source since June 1 filing)
  - Forecast to reach nearly 10,000 by 2021
    - Source = Pike Research and local/state population ratio
- ▶ Number of Charging stations in Gulf's service area:
  - Approximately 8 (three of which are at customer's homes)
    - Source = market intelligence
  - Not enough data to forecast charging stations yet
- ▶ No material impact on load in the near term



# Research Objective

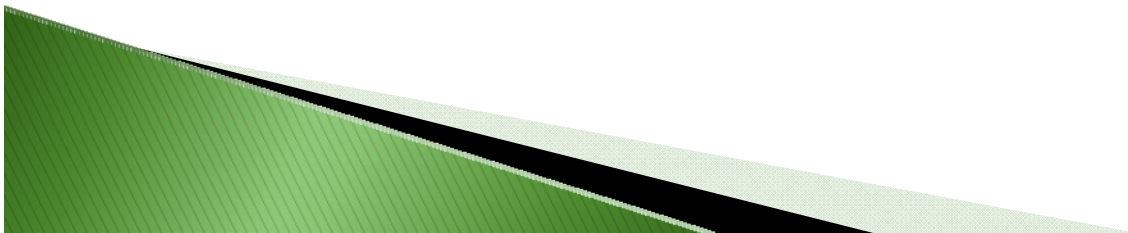
Obtain experience with and data on PHEV energy flows, operational characteristics, costs, and effects on the grid when charged using Energy Select.

*ENERGY*  
*select*<sup>®</sup>  
an earthcents program

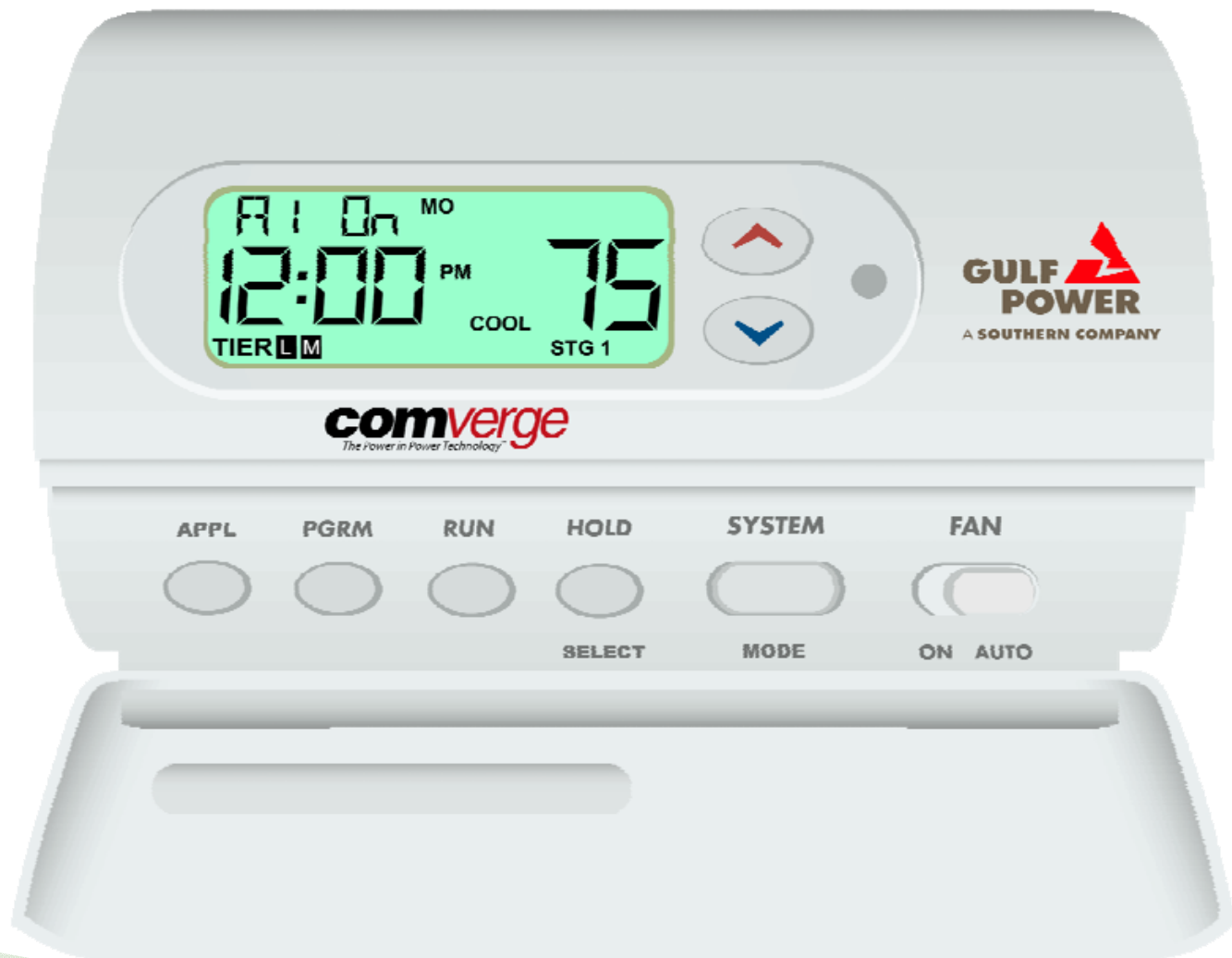


# What is Energy *SELECT*?

- ▶ **Energy *SELECT*** is a residential advanced energy management system that gives customers control over their energy purchases by allowing them to program their central heating and cooling system, electric water heater, PHEV, and their pool pump to automatically respond to varying prices.



# Energy *SELECT* Thermostat



# Load Control Relay (LCR)

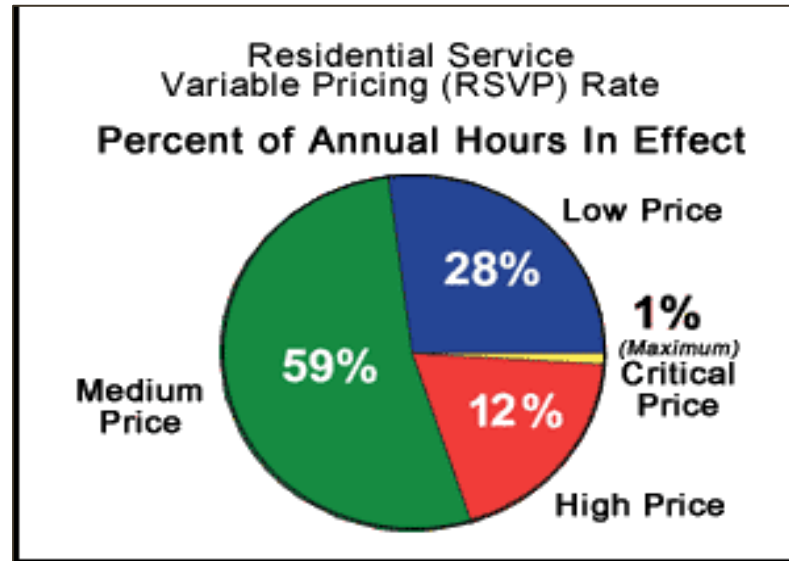
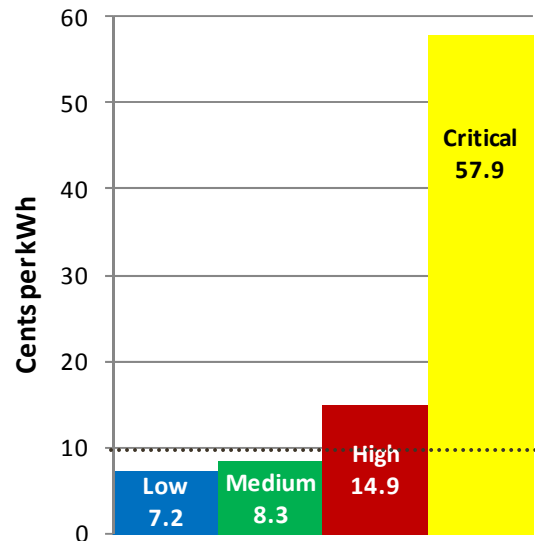


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# Rate (RSVP)

## Price Per kWh\*

LOW	7.2 cents
MEDIUM	8.3 cents
HIGH	14.9 cents
CRITICAL	57.9 cents



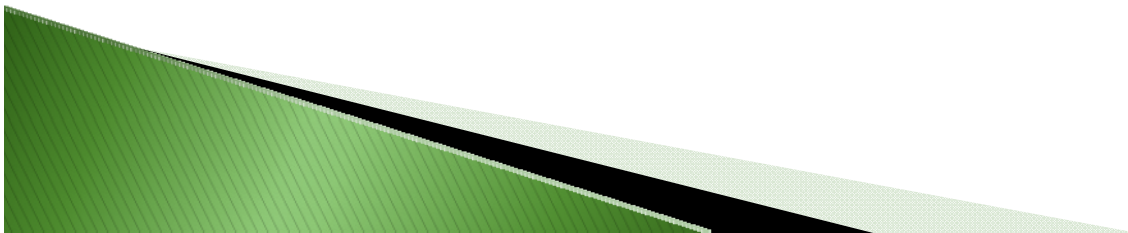
Standard Residential Rate = 9.9 cents/kWh

“Applicable as an alternative to Rate Schedule RS for service used for domestic purposes *and electric vehicle charging* at an individually metered dwelling unit...”



# The Research Project

- ▶ Base 2009 Toyota Prius Hybrid
- ▶ Converted to a “Plug-in” Hybrid
  - Added a 5kWh Lithium Ion battery pack to augment stock 3kWh NMH battery pack



# The Research Project



# The Research Project

- ▶ Added a V2green data collection, GPS and communication system
  - Records data from Prius CANBus, Hymotion battery pack and GPS
  - Communicates via cell phone to central computers in Virginia
  - Data accessible via website
- ▶ Joined with 200 other Prius PHEVs in Idaho National Labs (INL) study

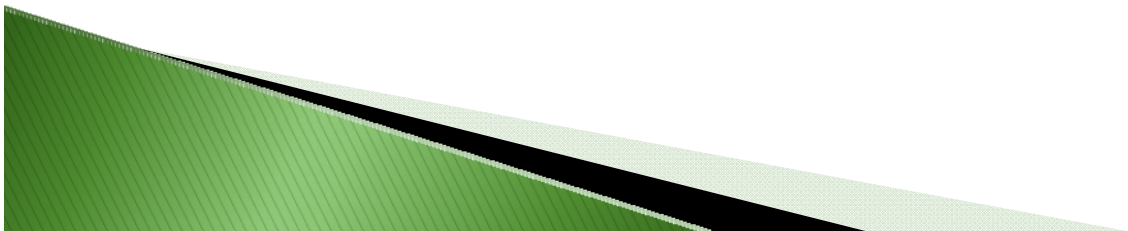


# In-garage Charging



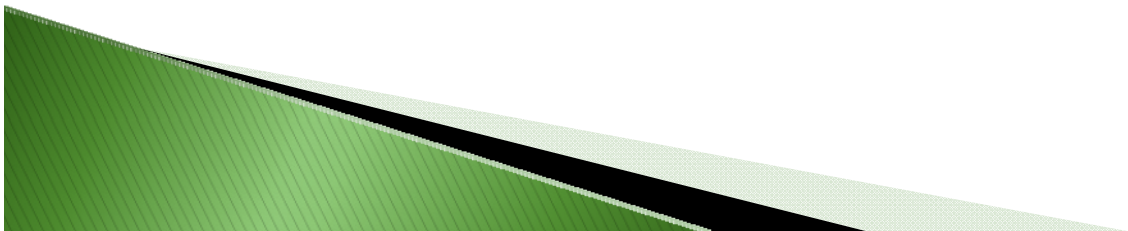
# The Research Project

- ▶ Extensive data gathering
  - gasoline consumption (grams)
  - electricity consumption (Wh)
  - battery state of charge (SOC%)
  - distance (meters)
  - start and stop time
  - temperature
  - A/C charging electricity in (Wh)
  - location



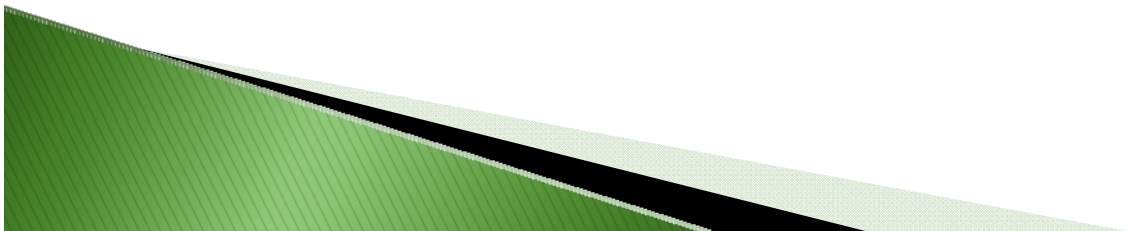
# Results

- ▶ Two driving modes will be shown:
  - The first, a driver with a shorter commute (7 miles one-way), called “Short-commute”. These results are from the period of 11/16/09 to 12/17/09.
  - The second, a driver with a commute from a more rural area (26 miles one-way), called “Long-commute”. These results are from the month of June 2010.



# Short-commute Results

- ▶ Trips with no battery charge at start of trip
  - Just the Hybrid without the plug-in benefit
  - 11 trips, 66 miles
  - mileage = 45 mpg
  - Cost per mile = 5.6¢
    - Gasoline was \$2.559/gallon at fill-up





# Short-commute Results

- ▶ Trips with some battery charge at start of trip (benefit from plug-in feature)
  - 72 trips, 385 miles
  - Average mileage = 90 mpg
  - Maximum mileage = 358 mpg
  - Cost per mile (electricity and gasoline) = 4.6¢
  - mpg equivalent based on total cost (electricity and gasoline) = 56 mpg

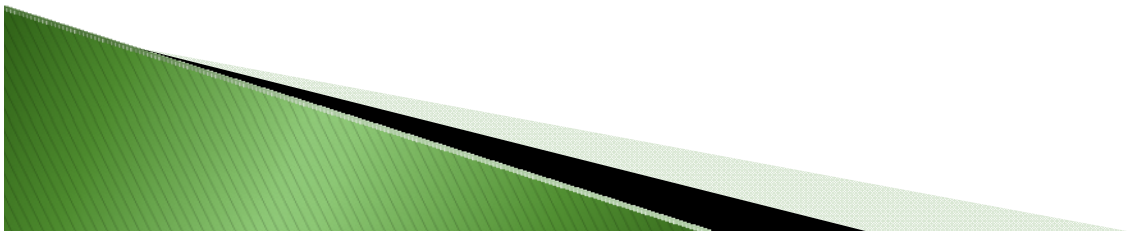


mpg-eq-c



# Long-commute Results

- ▶ Trips with no battery charge at start of trip
  - Just the Hybrid without the plug-in benefit
  - 14 trips, 401 miles
  - mileage = 46 mpg
  - Cost per mile = 5.9¢
    - Gasoline was \$2.700/gallon at fill-up



# Long-commute Results

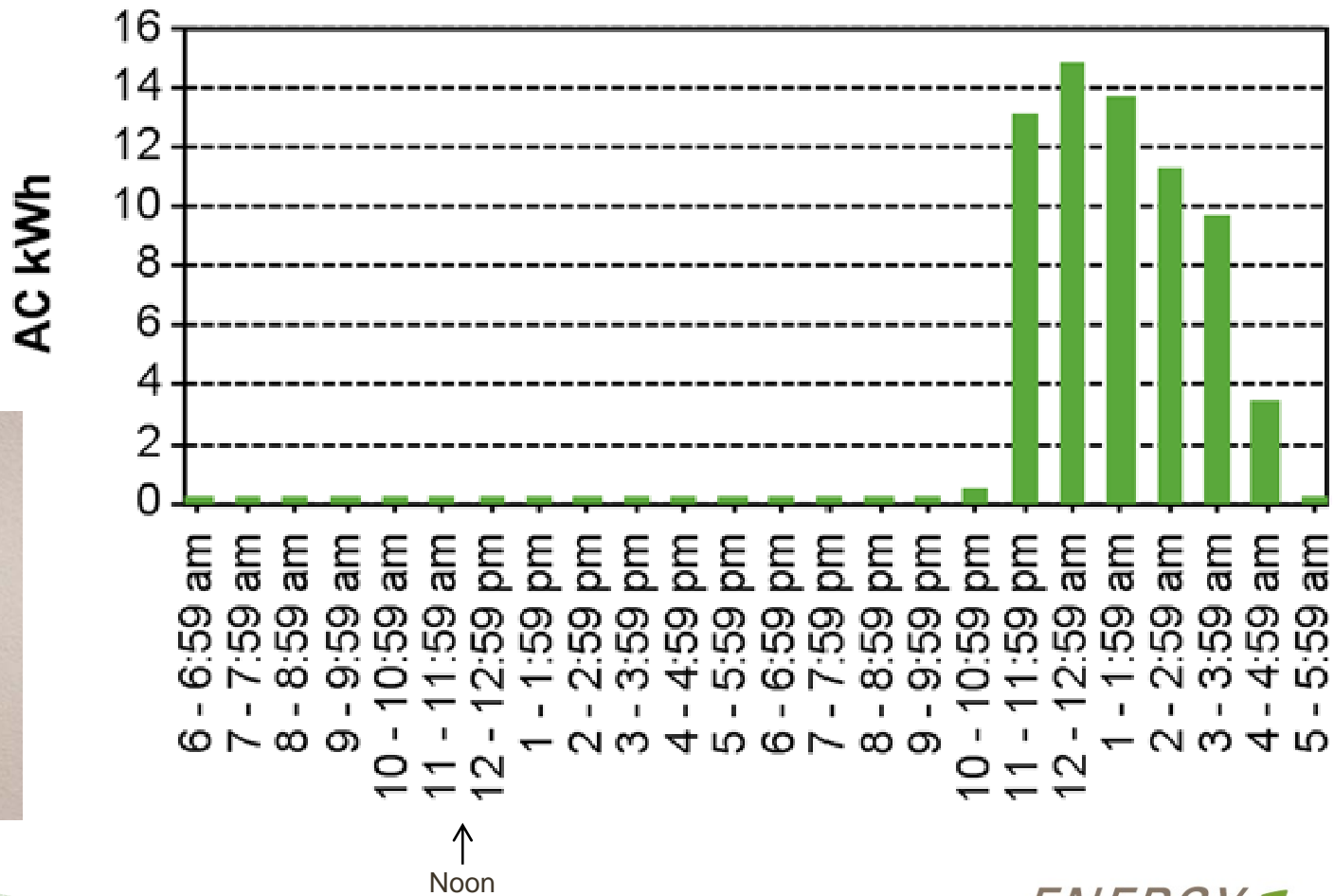
- ▶ Trips with some battery charge at start of trip (benefit from plug-in feature)
  - 72 trips, 1316 miles
  - Average mileage = 68 mpg
  - Cost per mile (electricity and gasoline) = 5.0¢
  - mpg equivalent based on total cost (electricity and gasoline) = 53 mpg



mpg-eq-c

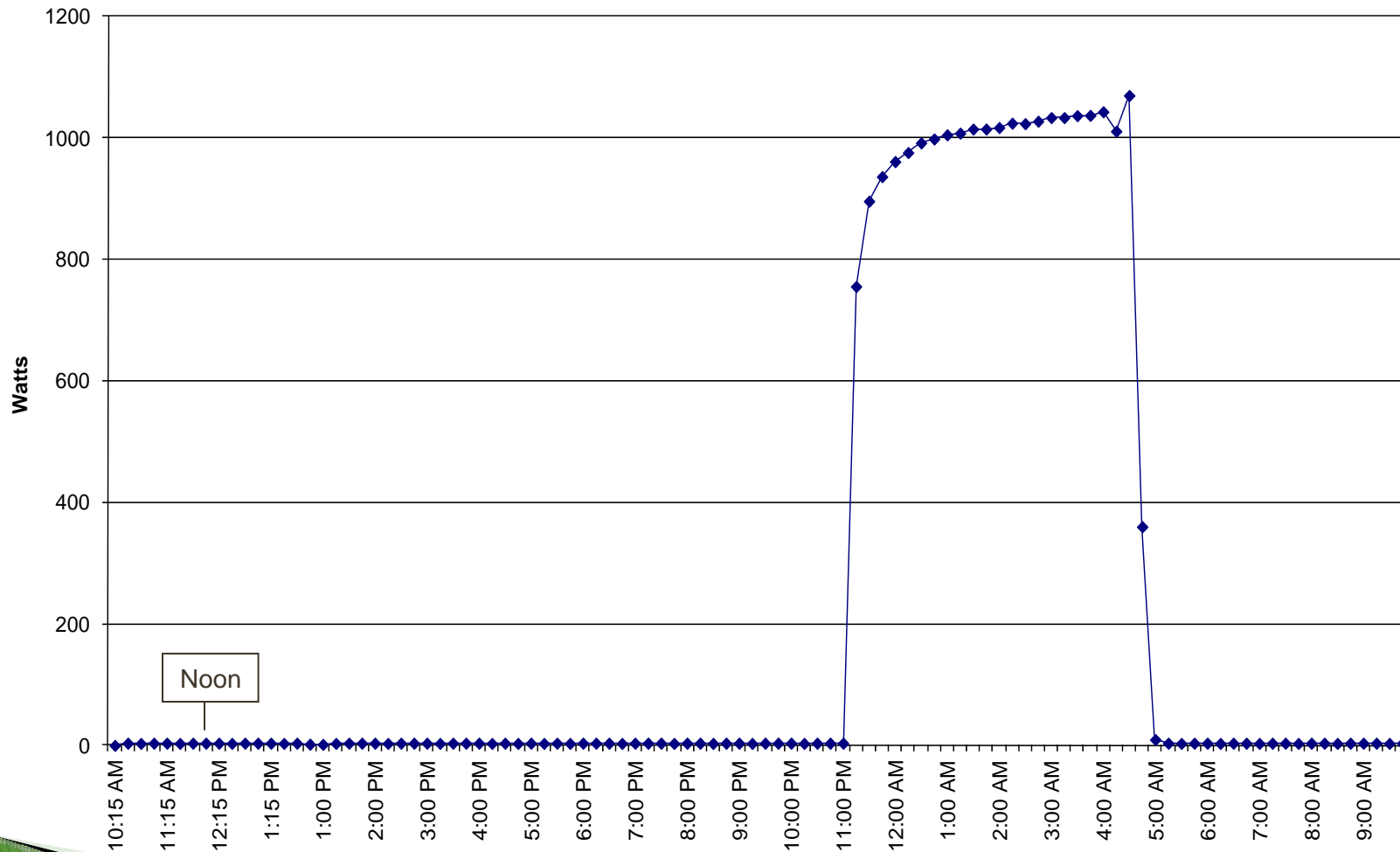
# Charging Times

## Time of Day When Charging - This Month



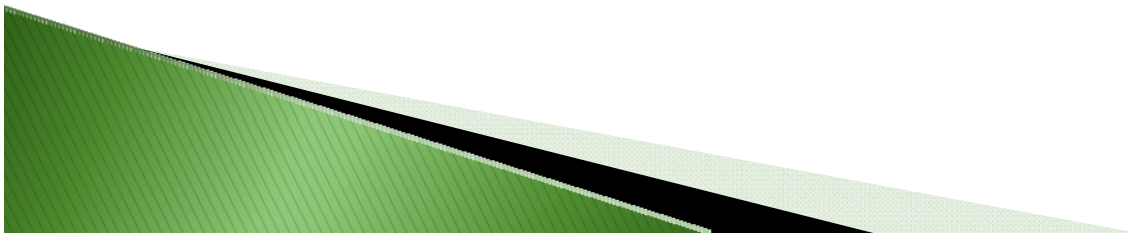
- RSVP low tier price was in effect from 11:00 p.m. until 5:00 a.m.
- 5.6 kWh charge was completed overnight during off-peak hours at 120 volts
- Charging placed a 1 kW demand on the electrical grid

Prius PHEV Charging Demand



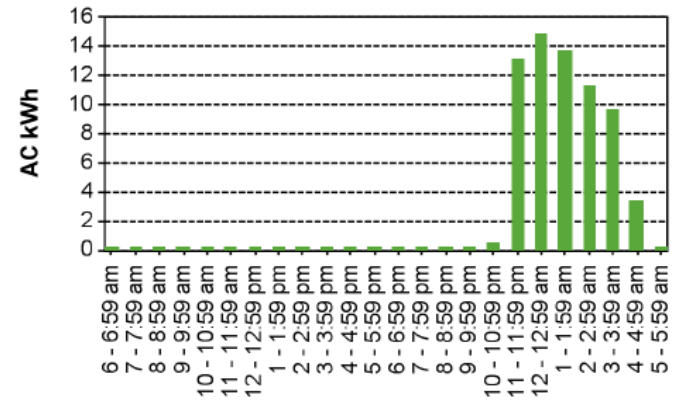
# Pilot to incent Energy Select charging of Electric Vehicles

- ▶ Approved in 2010 DSM Plan
- ▶ \$1,000 rebate for purchased electric vehicle charged by Energy Select
- ▶ Current participation = 1 customer





Time of Day When Charging - This Month



# Questions?



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