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COMMISSION
CLERK



120000-07

June 1, 2012

Benjamin Crawford
Division of Regulatory Analysis
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Dear Mr. Crawford:

Attached is Gulf Power Company's response to the Commission Staff's
First Data Request concerning the Electric Vehicle Charging Station Study.

Sincerely,

wb

Attachments

cc: Florida Public Service Commission
Charles Murphy, Office of General Counsel
Ann Cole, Office of the Commission Clerk
Beggs & Lane
Jeffrey A. Stone, Esq.



DOCUMENT NUMBER DATE

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Background and Present Situation

1. How many Plug-in Hybrid Electric Vehicle (PHEV) charging stations are currently located in the utility's service territory?
 - a. How many charging stations are "Public Chargers," e.g. available to the general public?
 - b. Does this include charging available to RV parks, rest areas, and campgrounds?
 - c. How many are in-home, private charging stations?
 - d. How many charging stations are "Private," e.g. not available to the general public, excluding in-home charging?
 - e. How many charging stations are owned by the utility?

RESPONSE:

Gulf is aware of eight PHEV or EV charging stations currently located in its service area.

- a. None.
- b. No.
- c. Gulf is aware of three charging stations installed at customers' homes.
- d. Gulf is aware of two charging stations installed at local automobile dealerships.
- e. Gulf owns three charging stations which are located on its property.

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2. Please complete the table below describing the projected number of PHEV charging stations that are anticipated to be located in utility's service territory.

Number of Projected PHEV Charging Stations

	Level 1	Level 2	Level 2+	Level 3	Level 4	Total
2012						
2013						
2014						
2015						
2016						
2017						
2018						
2019						
2020						
2021						

Note: PHEV Charging Station Energy Specifications:

- Level 1 - 1.1 kW, 15 amp, 110 V (< 15 amps delivered)
 Restricted to at home only, overnight full charge
 9 pm to 9 am, randomized start, full plug-in PHEV charge
- Level 2 - 3.3 kW, 15 amp, 220 V
 Restricted to home and work
 Charge anytime, charge until full
 Effectively two plug-in PHEV charges per day
- Level 2+ 6.6 kW, 30 amp, 220V
 Unrestricted location; wherever you park
 Charge anytime; charge until full
 Several plug-in PHEV charges per day
- Level 3 50 kW, 100 amp, ~400V
 Refueling station concept for PHEVs
 Charge anytime; charge until full
 Up to hundreds of charges per day
- Level 4 Not currently defined
 Will use DC Technology

RESPONSE:

Although Gulf Power has not developed projections of the number of PHEV or EV charging stations in its service area, Gulf has developed projections of the number of PHEVs and EVs in its service area – see response to Item No. 6.

3. Please describe the impact PHEV charging stations had on the utility's load in 2011. Please include contribution to peak demand, a typical hourly profile for load from PHEV charging stations, and a typical hourly profile for the electric system as a whole for comparison purposes, for each month of 2011.

Please provide this information for:

- a. In-home charging stations.
- b. Other private charging stations
- c. Public charging stations.

RESPONSE:

PHEV and EV charging had no material impact on Gulf Power's electrical load in 2011 because there were so few charging stations in Gulf Power's service area – see response to Item No. 1.

A PHEV charging load profile is provided in response to Item No. 7.

4. Has the utility estimated the number of PHEVs in Florida at present, both in its service territory and statewide?

RESPONSE:

Gulf Power is aware of eight PHEVs or EVs in its service area at the present time but has not estimated the number of PHEVs or EVs in Florida at present.

5. Has the utility estimated the number of PHEVs that are expected to be in use in Florida through 2021?

If yes, please provide and include source of estimates and how derived.

RESPONSE:

See response to Item No. 6.

6. Has the utility estimated the number of PHEVs that are expected to be in use in its service territory through 2021?

If yes, please provide and include source of estimates and how derived.

If yes, please complete the table below describing the projected number of PHEVs in Utility's service territory through 2021.

	Number of PHEVs
2012	
2013	
2014	
2015	
2016	
2017	
2018	
2019	
2020	
2021	

RESPONSE:

Yes. The number of PHEVs and EVs in Gulf Power's service area was estimated using the following method:

Gulf first estimated electric vehicle sales in the company's service area by multiplying projected plug-in electric vehicle sales in Florida times a ratio of projected population in Gulf's service area to the projected population in Florida. Projections of population were obtained from Moody's Analytics. The source for plug-in electric vehicle sales in Florida through 2017 was a purchased study published by Pike Research in the 1st quarter of 2011 entitled "Electric Vehicle Geographic Forecasts."

Beyond 2017, plug-in electric vehicle sales in Florida were projected using average growth in the 2011 through 2017 Pike data for penetration rate and total light duty vehicle sales. Gulf assumed linear growth in the penetration of plug-in electric vehicle sales until reaching the maximum penetration of 5% in 2023. The number of incremental plug-in electric vehicle sales in Florida was calculated as the total projected number of all light duty vehicle sales times the electric vehicle penetration rate.

Note that Gulf's projections of the total number of PHEVs and EVs in its service area in any given year are a result of a starting point of zero plus accumulated annual PHEV/EV sales projections less retirements after an expected life of ten years.

Estimate of PHEVs and EVs in Gulf's service area:

	Number of PHEVs
2012	380
2013	895
2014	1,553
2015	2,326
2016	3,220
2017	4,201
2018	5,342
2019	6,646
2020	8,117
2021	9,654

7. Explain how load management or rate design tools may mitigate the demand impacts of PHEV charging on peak demand.

Please describe any load management programs the utility currently offers.

RESPONSE:

Gulf Power has implemented the *EnergySelect* Electric Vehicle Pilot Program through the DSM Plan approved by the Florida Public Service Commission in Order No. PSC-11-0114-PAA-EG. This pilot is designed to encourage and enable residential customers who purchase electric vehicles to charge those vehicles during off-peak hours. The pilot incorporates Gulf's already established *EnergySelect* program which utilizes in-home load control relays, advanced metering, on-line web based programming and a time-of-use critical peak pricing rate (rate schedule RSVP) to encourage electric vehicle owners to charge their vehicles during off-peak (low cost) hours. For example, Gulf's current RSVP low tier price, in effect from 11:00 p.m. until 6:00 a.m., is 8.16 cents per kWh, which is about half of the high tier price of 15.91 cents per kWh in effect from 1:00 p.m. until 6:00 p.m. week days and 25% less than Gulf's standard residential rate (rate schedule RS, 10.84 cents per kWh for all hours). Given the convenience of overnight charging (essentially re-fueling while you sleep), the automated control available through *EnergySelect* hardware (load control relays programmed on-line to respond to price tiers according to the customer's needs), and the significant savings available in off-peak periods, there is much incentive for electric vehicle owners to utilize *EnergySelect* to charge their vehicles during off-peak hours.

An example of how this load management and rate design tool can mitigate the impact of electric vehicle charging on peak demand can be seen in Figures 1 and 2 below.

Figure 1 is a graph of all electrical charging for a Toyota Prius PHEV during the month of January 2010. During January 2010, this vehicle was driven in a short-distance commuter mode for a total of 110 trips over 562 miles and was recharged at the commuter's residence using *EnergySelect*.

Figure 1

Time of Day When Charging - This Month

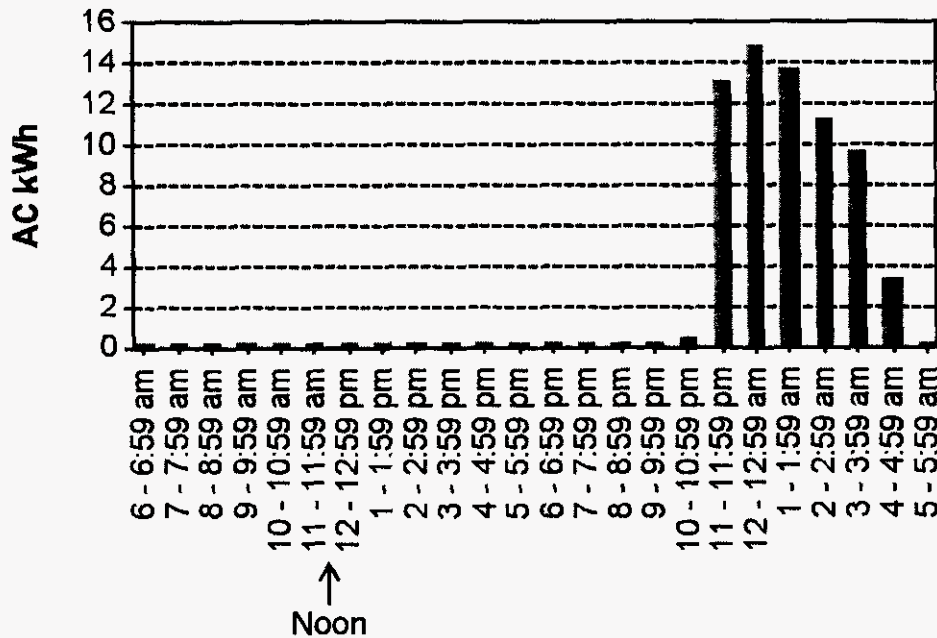
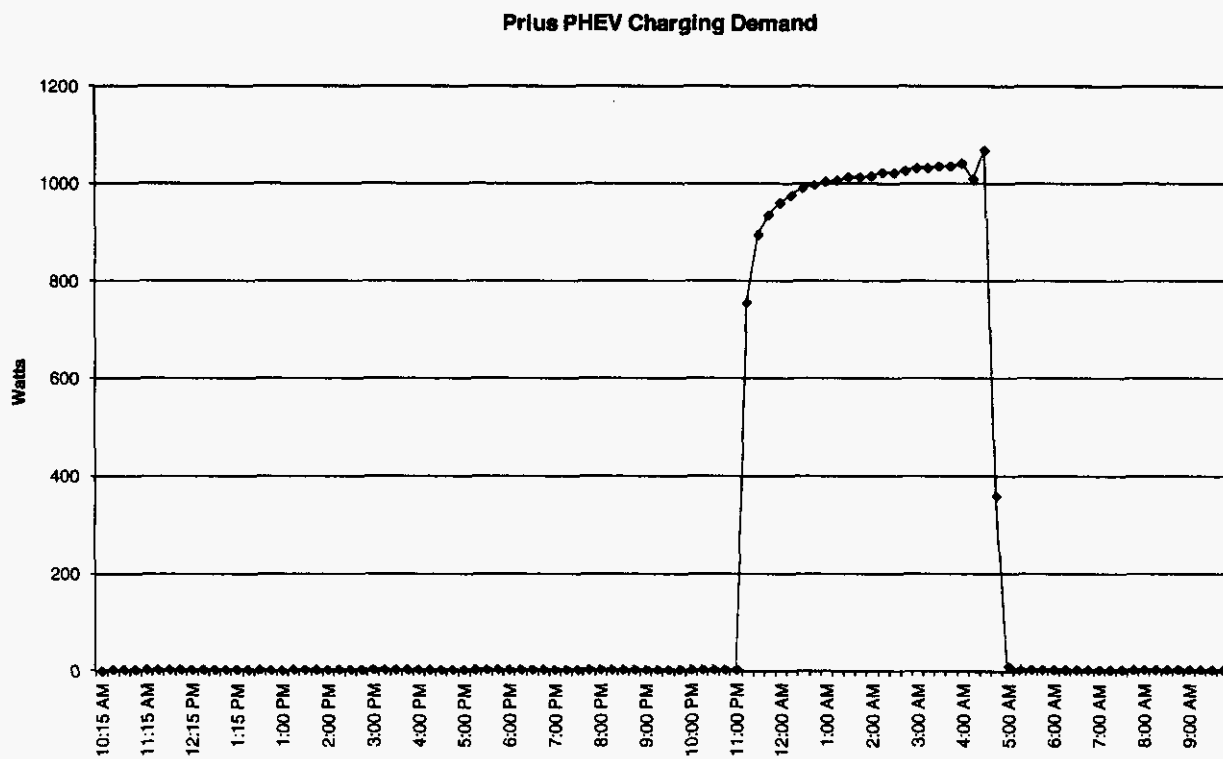


Figure 2 is a 15 minute interval load shape of this same Toyota Prius PHEV's charging demand on a particular day. Note that this load profile was recorded in the winter months, when the RSVP low tier price was in effect from 11:00 p.m. until 5:00 a.m. Also note that this 5.6 kWh charge, completed overnight during off-peak hours at 120 volts, placed a 1 kW demand on the electrical grid.

Figure 2



8. Does utility currently plan to offer to its customers programs designed specifically for PHEVs?

If yes, please describe these programs including participation and peak reduction.

If no, does utility have plans to offer any programs designed for PHEVs?

RESPONSE:

Gulf Power has implemented the *EnergySelect* Electric Vehicle Pilot Program mentioned in response to Item No. 7 and described fully in Gulf's 2010 Demand-Side Management Plan and Program Standards, Docket 100154-EG. Results of this pilot will be evaluated and used to help determine any future program offerings.

9. What type of additional policies and processes does the utility currently have in place to manage the addition of charging facilities to the system?

RESPONSE:

Gulf Power does not currently have in place any specific policies or processes related to PHEV/EV charging. Gulf continues to monitor technology developments and the PHEV/EV market to determine if specific policies and processes related to PHEV/EV charging would be necessary.

10. Based on the utility's experiences, what challenges do PHEVs present to utility and grid operation?

RESPONSE:

Gulf is currently not aware of any grid operation challenges presented by PHEVs or EVs.

Generation and Transmission

11. What additional generation or transmission assets will the utility require if 1 percent of vehicles in the utility's service area are replaced with PHEVs for each year through 2021?
- a. What if the figure reaches 5 percent, 10 percent, 25 percent, or 50 percent?
 - b. What are the costs of these additional generation assets expected to be?
 - c. What effect will these additional costs have on the general body of ratepayers?

RESPONSE:

Gulf does not have data on the total number of existing vehicles in Gulf's service area. Such data is necessary to complete the requested hypothetical analysis.

12. Has the utility adjusted its load forecast to account for additional load from PHEVs?

If yes, please describe the basis for the projected load adjustment and provide resources relied upon for this adjustment.

If yes, please complete the table below summarizing the incremental projected load from PHEVs.

	Summer MW	Winter MW	GWH
2012			
2013			
2014			
2015			
2016			
2017			
2018			
2019			
2020			
2021			

RESPONSE:

Yes, adjustments were made to the residential energy forecasts to reflect estimated plug-in electric vehicle loads. All charging was assumed to occur off-peak; therefore, no adjustments were made to the peak demand forecast. All plug-in electric vehicle charging was assumed to occur in the residential class because of the ease and convenience of overnight home charging.

The number of PHEVs and EVs in Gulf Power's service area was estimated using the method and sources described in Item No. 6. Gulf assumed the energy consumed by each vehicle would be 10 kWh per day, based on the average useful battery capacity of 3 different plug-in electric vehicles available or soon to be available in the market: Nissan Leaf, Toyota Prius plug-in hybrid, and Chevy Volt. The impact of plug-in electric vehicles on energy consumption is the cumulative number of plug-in electric vehicles multiplied by the energy consumed per vehicle.

The annual adjustments made to the residential energy forecast for plug-in electric vehicle loads, which are incorporated in Gulf's 2012 Ten Year Site Plan, are as follows:

	Summer MW	Winter MW	GWB
2012	0	0	1.4
2013	0	0	3.3
2014	0	0	5.7
2015	0	0	8.5
2016	0	0	11.8
2017	0	0	15.3
2018	0	0	19.5
2019	0	0	24.3
2020	0	0	29.6
2021	0	0	35.2

13. Is the utility's existing electric generation system adequate to accommodate the PHEV demand based on the estimated number of PHEVs expected to be in use through 2021?

Please explain.

RESPONSE:

Yes.

PHEV and EV charging is expected to have no material impact on Gulf Power's electrical load through 2021 because so few vehicles, less than 10,000, are expected in Gulf Power's service area by that year – see response to Item No. 6.

14. Is the utility's existing electric transmission system adequate to accommodate the PHEV demand based on the estimated number of PHEVs expected to be in use through 2021?

Please explain.

RESPONSE:

Yes.

PHEV and EV charging is expected to have no material impact on Gulf Power's electrical load through 2021 because so few vehicles, less than 10,000, are expected in Gulf Power's service area by that year – see response to Item No. 6.

15. Has the utility performed any analysis or prepared any studies examining the magnitude and nature of PHEV charging, especially regarding whether different levels (as delineated in question 2) of charging are more or less likely to occur at specific times of day?

If yes, please provide the analysis or study and describe the results.

RESPONSE:

Gulf Power has not performed such a study. Because there are so few charging stations in Gulf's service area (see response to Item No. 1) such a study would not produce meaningful results.

16. Has the utility performed any analysis or prepared any studies related to the potential impacts of PHEV charging on its transmission system?

If yes, please provide the analysis or study and describe the results.

RESPONSE:

No. See response to Item No. 14.

17. Has the utility performed an analysis or prepared any studies related to the potential impacts of PHEV charging on its generation system?

If yes, please provide the analysis or study and describe the results.

RESPONSE:

No. See response to Item No. 13.

Distribution

18. What improvements will be required for the utility's distribution network if 1 percent of existing vehicles are replaced with PHEVs for each year through 2021?
- a. What if the figure reaches 5 percent, 10 percent, 25 percent, or 50 percent?
 - b. What will the costs of these distribution improvements be?
 - c. Does the utility believe that a Contribution in Aid of Construction would be appropriate?

RESPONSE:

Gulf does not have data on the total number of existing vehicles in Gulf's service area. Such data is necessary to complete the requested hypothetical analysis.

19. To what extent will "clusters" of PHEVs in the same geographic area cause localized distribution problems, especially in residential areas?
- a. Explain how many PHEVs on a single residential transformer will necessitate upgrades to the utility's distribution network.
 - b. Describe the methods to minimize any additional costs for distribution upgrades.

RESPONSE:

Gulf does not have experience with the hypothetical situation described in this question. However, Gulf expects that the 1 to 3 kW loads of PHEV/EV chargers will not present problems significantly different than existing loads customers use in their households every day.

20. What effect will quick-charge stations (Level 3 or above) have on the utility's distribution network?
- a. Will this effect vary in urban, suburban, or rural areas? If so, how?

RESPONSE:

Gulf does not have the data necessary to respond to this question.

21. Has the utility performed any analysis or prepared any studies related to the potential impacts of PHEV charging on its distribution system?

If yes, please provide the analysis or study and describe the results.

RESPONSE:

No. See response to Item No. 22.

22. Is the utility's existing electric distribution system adequate to accommodate the PHEV demand based on the estimated number of PHEVs expected to be in use through 2021?

Please explain.

RESPONSE:

Yes.

PHEV and EV charging is expected to have no material impact on Gulf Power's electrical load through 2021 because so few vehicles, less than 10,000, are expected in our service area by that year – see response to Item No. 6.

Off-grid Solar Charging

23. Provide the location and describe the utility and non-utility off-grid solar PHEV charging stations in operation in the utility's service area.

RESPONSE:

Gulf Power is not aware of any off-grid solar PHEV or EV charging stations in operation in its service area.

24. How many utility and non-utility off-grid solar photovoltaic PHEV charging stations are planned to be installed in the utility's service area?

RESPONSE:

Gulf Power is not aware of any off-grid solar PHEV or EV charging stations planned to be installed in its service area.

25. How does the production cycle of solar photovoltaic align with the load profile of PHEV charging demand?

RESPONSE:

Although Gulf has adequate data on solar photovoltaic generation, Gulf does not have data on aggregate PHEV/EV charging demand and therefore cannot perform the requested analysis.

26. Explain the extent to which solar photovoltaics can meet the energy requirements of PHEVs?

RESPONSE:

The extent to which solar photovoltaics can meet the energy requirements of a PHEV or EV depends on several variables, including the size of the photovoltaic array, the voltage level of the charger, the customer's willingness to plug the vehicle into the solar array during PV generation hours (mid-day), the customer's daily need for kWh (which is dependent on the customer's usage pattern of the vehicle), the weather (cloud cover, rain, haze, etc.), the season (number of daylight hours), etc.

27. Please estimate the load and number of solar photovoltaic panels needed for Level 1, Level 2, Level 2+, and Level 3 charging stations.

RESPONSE:

Gulf does not have the information necessary to respond to this question – see response to Item No. 26.