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September 6, 2013

California Energy Commission
Docket Office, MS-4
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Re: *Southern California Edison Company's Comments on the California Energy Commission Docket No. 13-IEPR-1L Joint Lead Commissioner Workshop on Inputs and Methods for Transportation Energy Demand Forecasts*

To Whom It May Concern:

On August 21, as part of the California Energy Commission's (Energy Commission's) 2013 Integrated Energy Policy Report (2013 IEPR) process, the Energy Commission held a Joint Lead Commissioner Workshop on Transportation Energy Demand Forecasts (the Workshop). Southern California Edison (SCE) participated in the Workshop and appreciates the opportunity to provide these written comments, which address several questions that Commissioner McAllister asked at the Workshop, and make recommendations to support the proliferation of the electrification of transportation in California.

A. Recommendations to Support Electrification of Transportation

Transportation energy demand is an important matter of statewide concern. First, electricity has historically been, and remains, the lowest cost fuel per mile. Second, Californians are leaders in electrified transportation, purchasing a third of all plug-in electric vehicles (PEVs) sold nationally.[1] Third and finally, California has advanced numerous ambitious air pollution and greenhouse gas (GHG) reduction goals.[2] A daunting transformation in transportation technology is required to fully realize these goals and support the proliferation of electric vehicles in California. SCE therefore recommends the following actions.

In the past, enhancements of air quality through the reduction of air pollutants and the reduction of GHG have been approached as two separate goals. These goals, however, are inextricably linked. In order to provide vehicle manufacturers (light, medium, and heavy-duty)

[1] As reported by the California Plug-in Electric Vehicle Collaborative as of 8/6/13 (http://www.pevcollaborative.org/)

[2] Examples include the State Implementation Plan for meeting the National Ambient Air Quality Standards, Assembly Bill 32's regulatory framework for greenhouse gas reduction, and Governor Brown's Executive Order B-16-2012 establishing a state GHG reduction goal of 80% of 1990 levels by 2050 for transportation and for over 1.5 million zero-emission vehicles (such as PEVs) on the road by 2025.

with clear, consistent direction to support the technological advancement and proliferation of electric vehicles, the environmental concerns associated with air quality as well as GHG reduction goals should be addressed in conjunction with one another. Combining GHG and air pollution reduction goals also results in better outcomes for both regulations and government grant programs.

Likewise, SCE continues to support and encourage interagency collaboration so that the relevant agencies can develop consistent policies and speak with one voice. This will provide clear and consistent direction to vehicle developers, researchers, and engineers. SCE suggests that the Energy Commission continue to expand its collaboration with the Air Quality Management Districts (AQMDs), Southern California Association of Governments (SCAG) and the California Air Resource Board (CARB) on transportation-related matters. The efforts of these agencies are necessitating greater electrification of transportation, such as:

- CARB's Vision for Clean Air Study[3] is leading to development of a new Sustainable Freight Plan;
- CARB rules for shore power[4] at the ports;
- South Coast AQMD's recently adopted 2012 Air Quality Management Plan[5] and 2011 Energy Policy;[6] and
- SCAG's Regional Transportation Plan[7] for new light rail lines.

Utility, agency and other stakeholder collaboration will likely improve the collective understanding of a myriad of transportation electrification issues, including, but not limited to, the amount and nature of existing inventory, load shapes, and the future penetration and development of electric transportation technologies.

SCE is committed to doing its part to support the deployment of electric transportation and to working with regulators, such as CARB, to expand transportation electrification. SCE also continues to strongly support the Energy Commission's inclusion of all types of transportation electrification in addition to electric vehicles within its demand forecasts. Such forms of transportation include high speed rail, light rail extensions, electric fixed route medium and heavy duty trucks, electric forklifts, catenary trucks and shore power. Doing so will enable the Energy Commission to assess the level of additional load created by these forms of electrified transportation.

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3 http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf

4 http://www.arb.ca.gov/ports/shorepower/meetings/10032012/presentation.pdf

5 http://www.aqmd.gov/aqmp/2012aqmp/Final/index.html

6 The CEC 2012 IEPR update noted that 2011 AQMD Energy Policy would likely result in increased electrification

7 http://rtpscs.scag.ca.gov/Documents/2012/final/f2012RTPSCS.pdf; http://rtpscs.scag.ca.gov/Documents/2012/final/SR/2012fRTP_GoodsMovement.pdf

SCE recommends that in 2013, the Energy Commission similarly expand its currently single forecast for electric vehicle adoption and consider adopting a forecast that utilizes three scenarios: a low-case or "floor" scenario based on minimum compliance with the California Air Resources Board (CARB) Zero-Emission Vehicle (ZEV) Mandate, a mid-case scenario that is substantially higher than the low-case, and a high case. SCE does not believe, however, that the minimum CARB mandated scenario is a realistic case. It is merely a bounding scenario. Several auto manufacturers are substantially exceeding the minimum mandate requirements, and manufacturers that are not subject to the mandate are also producing significant numbers of PEVs. SCE recommends that the Energy Commission consider other credible PEV forecast studies in addition to its own forecast to create a mid-case forecast that is substantially higher than the ZEV mandate.

Incorporating the uncertainty associated with the rate of transportation electrification (particularly for PEVs) into the Energy Commission's forecast will better enable industry stakeholders to understand the implications of the various scenarios for the electric system. For 2013, SCE also recommends the electric transportation forecast include port electrification and existing light rail and subways as we understand this analysis is near completion.

B. Responses to Energy Commission's Questions

At the Workshop, Commissioner McAllister asked SCE to elaborate on the state of research, development and demonstration for PEVs and battery electric vehicles (BEVs), SCE's rate options for customers that own PEVs, demand response initiatives in support of electric vehicle transportation, and SCE's expected case PEV forecast methodology and PEV GWH consumption. The power point presentation attached hereto as Appendix A supplements SCE's workshop presentation regarding the first three queries on rates, RD&D and demand response.

With respect to SCE's "expected case" PEV forecast methodology, as discussed at the workshop, SCE relied upon eight external and independent studies published by a variety of organizations, including consultancies, market research firms, investment firms, and government agencies to create its forecast.[8] SCE's current forecast was updated in the third quarter of 2012 to reflect studies that had been prepared within the previous 18 months. SCE subsequently trued-up the actual PEV sales through year-end 2012.

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[8] SCE's current forecast includes the following studies:

(1) Citigroup Global Markets report "US Autos and Auto Parts", Feb 23, 2011 at p. 18

(2) Morgan Stanley Analyst report, March 3, 2011at p. 1

(3) BCG report "Powering Autos to 2020 – The Era of the Electric Car?", July 2011 at p. 18

(4) EPRI report "Transportation Electrification: A Technology overview", July 2011 at pp. 4-10

(5) Gartner Research, Jan 24, 2012

(6) Bloomberg "Q2 2012 Advanced Transportation Market Outlook," May 11, 2012 at p. 9

(7) Pike report, "Plug-in Electric Vehicles", Q2 2012 at table 6.13

(8) CEC PEV sales forecast used for the 2012 IEPR, August 2012

SCE used these eight studies to calculate the PEV share of LDV sales within SCE's service territory, by year. Each of the eight studies provides PEV sales estimates, expressed either as an absolute number of PEV sales or as a share of light duty vehicle (LDV) sales. Likewise, some studies forecast PEV sales for California while others forecast PEV sales for the United States. In order to compare all studies on an "apples to apples" basis, the California forecasts were converted to U.S. PEV sales by removing the "California Effect," an assumption that California PEV sales will be 220% greater than U.S. PEV sales (in terms of PEV share of LDV sales). The California Effect was calculated based on historical purchasing patterns of hybrid cars since their introduction in 2000. Forecasts that provided an absolute number of PEV sales were converted into a PEV share of LDV sales basis. This was done by dividing the forecasted annual PEV sales by the forecasted annual LDV sales. The eight external study results were then averaged together to produce the PEV share of U.S. LDV sales, by year. Finally, SCE grossed up these annual percentages by 220% to account for the "California Effect."[9]

To calculate the annual PEV sales for SCE's service territory (expressed as an absolute number of vehicle sales), SCE then multiplied the PEV share of LDV sales by the forecasted LDV sales for SCE's service territory. Annual LDV sales for SCE's service territory were based on the DOE's 2012 Annual Energy Outlook (AEO), California's share of U.S. LDV sales,[10] and the SCE territory share of California LDV sales.[11]

These steps were used to calculate SCE's "expected case" PEV sales forecast through the year 2030. As noted at the Workshop, SCE also developed high and low forecasts. The "low case" forecast was developed in collaboration with the CARB and is based on the number of PEVs automobile manufacturers must produce in order to comply with the ZEV mandate. As noted above, this scenario is unrealistically low. For example, it excludes sales from manufacturers such as Tesla that don't have ZEV compliance obligations or from manufacturers such as Volkswagen that won't have obligations until 2018, but that will certainly produce some PEVs prior to that year in order to establish their complying models. Additionally, it excludes sales from manufacturers with a strategy of selling more than minimally required, such as GM and Nissan[12]

The "high case" was calculated as a function of the "expected case." SCE assumed PEV sales would be two times the "expected case" by 2020 and 1.75 times the "expected case" by 2030. This is roughly the same ratio of high/expected case as SCE's original forecast from 2009. It is also slightly lower than the only "high" study currently available.

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[9] Given that Californians are currently buying PEVs at more than three times the national average, using 220% for the California Effect is a conservative assumption.

[10] California's share of U.S. LDV sales are assumed to be 12% based on historical vehicle registration data (source: National Automobile Dealers Association).

[11] The SCE territory share of California LDV sales are assumed to be 37.74%, which represents SCE's historical share of hybrid sales in California.

[12] Nissan alone, for example, has the current annual capacity at just one of its plants in Tennessee to produce enough California PEVs to satisfy this entire low case through 2017.

Finally, with respect to PEV GWh consumption, SCE's expected case is based on a model developed by SCE to estimate the annual energy usage and load shape of customers with PEVs. This model has a significant number of assumptions. Below is a summary of the assumptions that primarily impact PEV GWhs consumption.

1. ***Market Penetration Assumptions***

The primary assumption in this category is the annual PEV sales forecast.

Another significant assumption is the ratio between plug in hybrid electric vehicles (PHEVs) and BEVs. Based on near-term automaker production forecast announcements by the automakers, SCE assumed a 50/50 ratio between PHEVs and BEVs. By 2017, the forecasted ratio between PHEVs and BEVs is assumed to be 80/20.

The final material assumption is the ratio between PHEV-10s and PHEV-40s.[13] The first PHEV-10 was introduced in 2012. Production forecasts indicate that 40% of PHEV sales will be PHEV 10. Based on the number of PHEV models that have been announced, SCE assumed, however, that the PHEV-10 market share will drop to 25% by 2015 when access to high-occupancy vehicle (HOV) stickers for such vehicles terminates.

2. ***Battery Assumptions***

SCE's primary battery assumption is the number of kilowatt hours required to drive one mile. Based on input from SCE's Advance Technology group, SCE is using 2.9 kWh per mile for all PEVs.

Another significant assumption in this group is the number of Electric Vehicle Miles Traveled (EVMT). SCE assumed that PHEV-10s are limited to 10 miles, which is the capacity of one full charge. SCE assumed that all PHEV-40s and BEVs have an EVMT of 35 miles. This is based on a number of studies, both internal and external, which indicate that the average PEV owner drives 30-40 miles a day on electric power.

One last material battery assumption is charger efficiency. This assumption considers how much energy is lost from the AC to DC transfer process in the battery. SCE assumed 90% charger efficiency for all PEVs.

3. ***Output***

The output of this model is a forecast of the number of GWhs consumed by PEV owners for each year through 2030. As noted in the presentation, the result of this combination of

[13] A PHEV-10 vehicle must be able to drive at least ten miles in all-electric mode and PHEV-40 vehicle must be able to drive at least 40 miles in all-electric mode.

assumptions produced a weighted average of 11,000 electric miles per year per PEV and 4,400 PEV kWh per year through 2022.

In conclusion, SCE looks forward to its continuing collaboration with the Energy Commission and industry stakeholders and appreciates the Energy Commission's consideration of these comments. Please do not hesitate to contact me at (916) 441-2369 with any questions or concerns you may have. I am available to discuss these matters further at your convenience.

Very truly yours,

/s/ Manuel Alvarez

Manuel Alvarez

Appendix A

SCE Residential Rates

Residential Plan (D) (per kWh)			
All Year - No Hourly or Seasonal Differentiation			
Tier 1	**Tier 2**	**Tier 3**	**Tier 4**
13¢	16¢	27¢	31¢

Home & Electric Vehicle Plan (TOU-D-TEV) (per kWh)				
Time of Day	Summer (Jun 1 – Sep 30)		Winter (Oct 1 – May 31)	
	Tier 1	Tier 2	Tier 1	Tier 2
On-Peak 10 AM – 6PM *Weekdays*	28¢	47¢	16¢	35¢
Off-Peak All Other Hours	12¢	31¢	11¢	30¢
Super Off-Peak Midnight – 6AM *Every Day*	9¢	9¢	10¢	10¢

Electric Vehicle Plan (TOU-EV-1) (per kWh)		
Time of Day	Summer (May 1 – Oct 31)	Winter (Nov 1 – Apr 30)
On Peak Noon – 9 PM *Every Day*	33¢	23¢
Off Peak 9 PM – Noon *Every Day*	11¢	11¢
Rates effective 6-1-2013		

Charged Up: Southern California Edison's Key Learnings about Electric Vehicles, Customers and Grid Reliability

1. Our approach to managing plug-in electric vehicle (PEV) impact is meeting our customers' needs

2. Using the "end charge time" programming feature is good for our EV customers and their neighbors

3. What our customers want to know most about EVs

4. Initial findings show early adopters of battery electric vehicle (BEV) technology demonstrate consistent and predictable behavior

5. Multi-unit residents may face complex challenges

6. SCE and the cities we serve are charged up and ready to go

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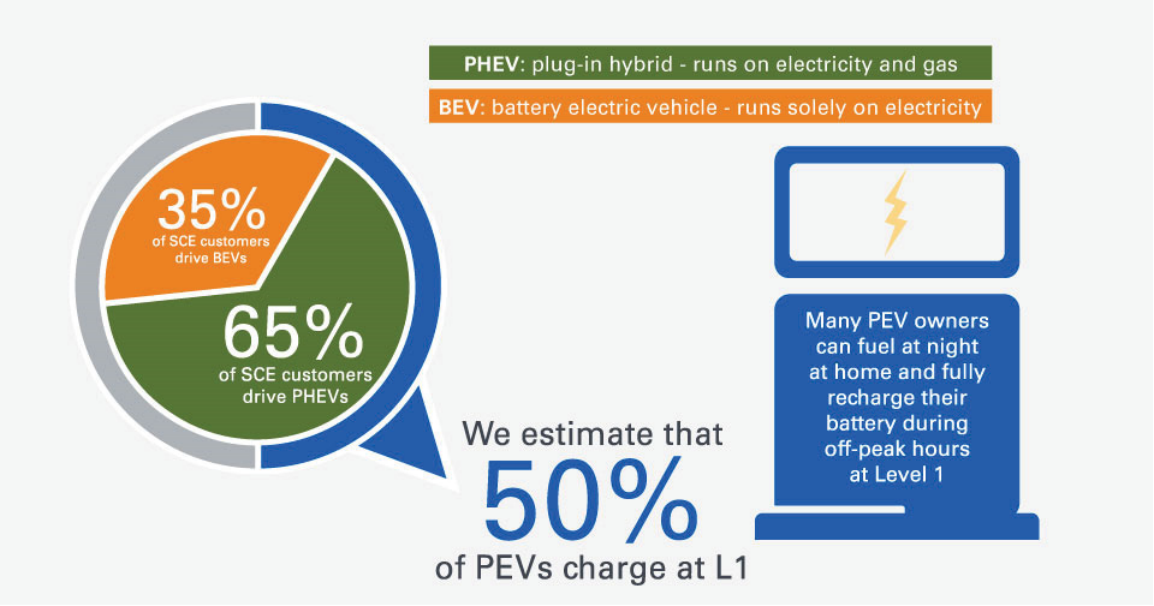
SCE's Approach to Managing PEV Grid Impacts is Meeting our Customers' Needs



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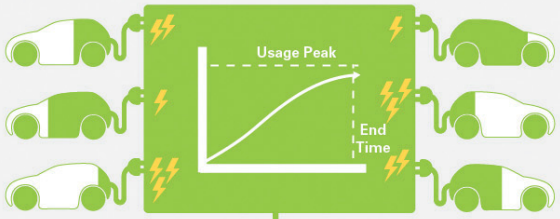
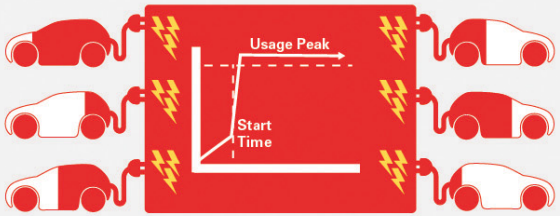
Using the "End Charge Time" Programming Feature is Good for Our EV Customers and Their Neighbors

Programming home PEV end charging times, vs. start charging times, is better for grid reliability and neighborhood circuits. Why?

Customers program an end time to charge EVs



Customers start charging EVs at the same start time



Setting end time charging

- Randomizes start times
- Prevents many vehicles from coming online simultaneously
- Helps avoid power load spikes
- Minimizes distribution impacts and supports system reliability

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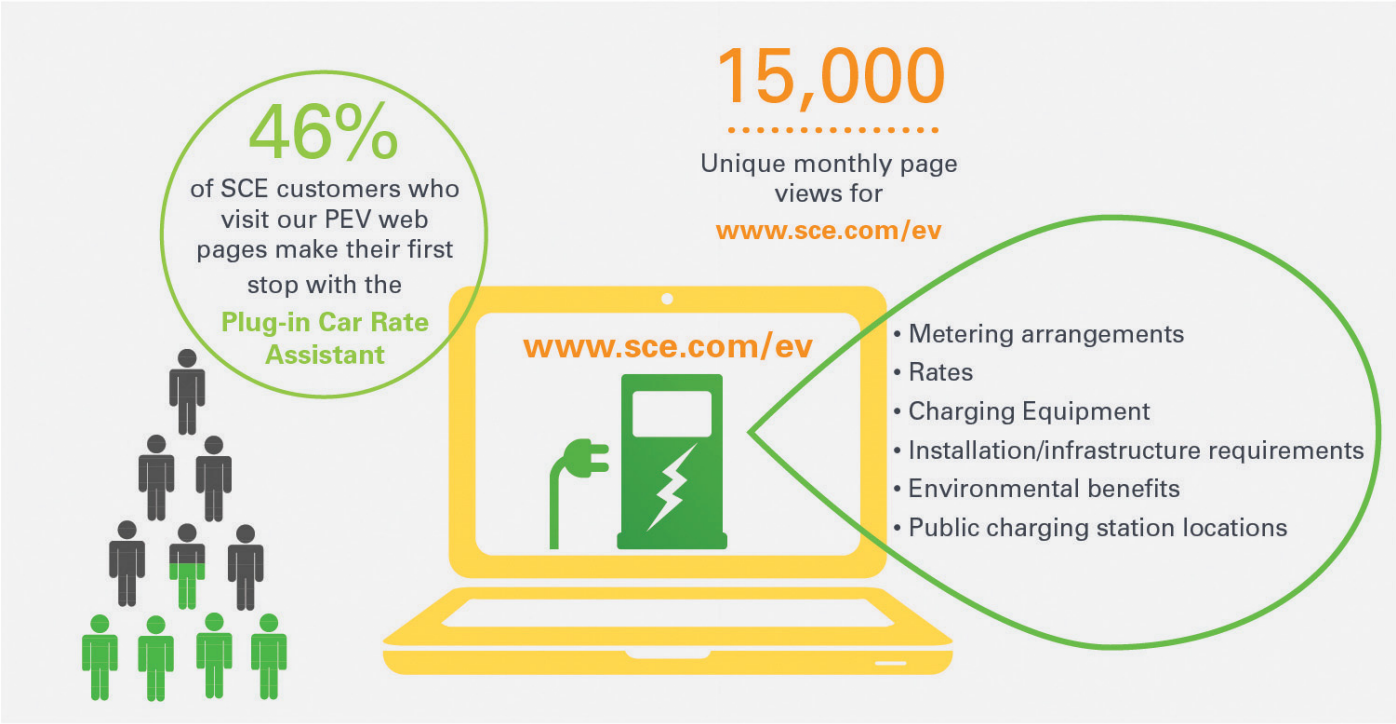
What Our Customers Want to Know Most About EVs



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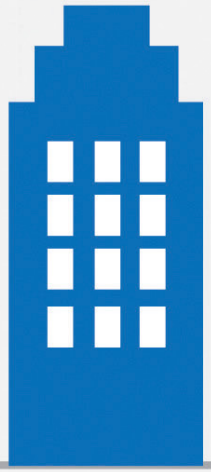
Early Adopters of BEV Technology Seem to Demonstrate Consistent and Predictable Behavior

Average daily miles driven (driven more during weekdays)

35

LEAF drivers' daily trips were similar to ICE drivers

On average charged only once a day, at home and overnight



Away-from-home work findings in study:

- Most non-home charging took place at work at 240 volts (Level 2), but only a few participants had access to this and used it mostly because it was free
- Most participants had access to free non-work Level 2 charging, but less than 40% used it

Overall, these drivers:

- Were very satisfied with the overall BEV experience
- Demonstrated that at-home charging start times corresponded to time-of-use rate plans
- Indicated that any possible "range anxiety" experienced before purchase was eliminated over time, even when away from home

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Multi-Unit Residents May Face Complex Challenges

< 5%

Building owners/condo associations considering installing the necessary infrastructure

High interest among condo/townhome residents in purchasing a PEV within

5 years

Obstacles included:

- Widely varying PEV installation costs
- Dedicated charging stations in assigned parking spaces vs. community stations for all residents
- Decisions on who carries costs of charging equipment, installation and ongoing maintenance
- Inaccessibility to electricity in parking spaces
- Costs and payments for charging when it's not connected to an individual customer meter

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Cities Charged up and Ready to go

180 Cities

Helping residents plug in and meeting green objectives by:

- Streamlining permitting processes and infrastructure
- Supporting SCE's work to provide a positive experience for PEV drivers

7 "Champion Cities"

- Beverly Hills
- Lancaster
- Rancho Cucamonga
- Rolling Hills Estates
- Santa Barbara
- Santa Monica
- Seal Beach

50 Cities and Counties with a Verified Plan

Implementing best PEV practices:

- SINGLE-DAY city permits and inspections for homes
- Inspections for businesses within 24 HOURS

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Workplace DR Pilot

Background

- In an effort to understand the impact of EV charging at work, SCE filed an application for a **DR pilot** in **2011** as part of the 2012-2014 DR cycle
- The CPUC approved SCE's DR application in **January 2013** and authorized the utility to deploy up to 183 charging stations networked with SCE's DR Management System

Project Overview

In an effort to understand the impact of EV charging at work, SCE filed an application for a DR pilot in 2011 (2012-2014 DR cycle). The CPUC approved SCE's DR application in January 2013

High-level Description and Scope

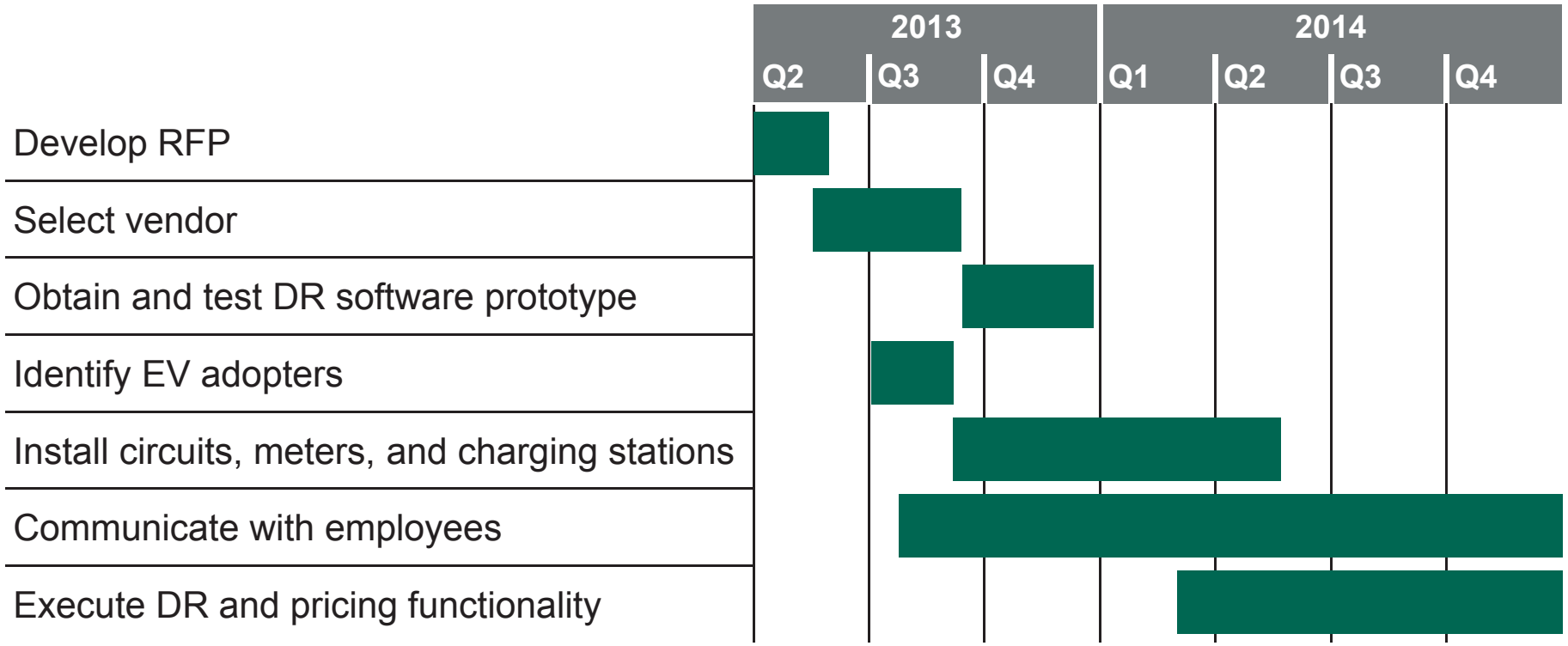
- **PUC-approved** pilot program
- Funded through **Demand Response** (not GRC)
- Up to **183** electric vehicle charging stations
- **OpenADR 2.0b** compliant
- Charging stations may be **interrupted** or **curtailed** through DR Management System; **several pricing options** will be piloted during the program
- Program term: **2013 to 2014** (potential extension to **2015**)

Objectives

- Gain a better understanding of consumer behavior, DR technologies, and system impacts related to plug-in electric vehicle charging
- Help determine the balance between the DR and customers' needs for EV charging at the workplace
- Advise business customers on the costs, benefits, and DR impacts of workplace charging that may be under consideration for customer properties in the future

High-level Timeline

Preliminary



In-closing

- RFP to procure EVSEs in process
- Employee survey soon to be deployed
- Many challenges to solve:
  - Current and future needs
  - New OpenADR 2.0b standard integration
  - Pricing
  - Charging policy (governance and compliance)