2018–2019 California Vehicle Survey: Appendices

California Energy Commission

CONSULTANT REPORT

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Abstract

This report summarizes the work performed for the 2019 California Vehicle Survey (CVS) project. The 2019 CVS includes revealed preference and stated preference surveys for the residential and commercial light-duty vehicle (LDV) market segments in California, as well as an add-on survey for respondents who own or lease zero emission vehicles. The survey data will be used to update the residential and commercial LDV demand forecasting models. These updated models will be used in generating the light duty vehicle population and fuel demand forecast for the *2021 Integrated Energy Policy Report*.

The CVS has been conducted periodically over the past two decades to support updated forecasts as vehicle technologies and preferences change over time. As in previous iterations of the CVS, the 2019 survey comprised two questionnaires: one for the household survey and one for the commercial fleet owner survey. Each survey consisted of two primary components: the revealed preference module, which collected information about current household and establishment vehicle ownership and use behavior, and the stated preference module, which collected information about vehicle preferences and future vehicle ownership and use behavior. In the 2018-2019 survey, the revealed preference module included a set of questions specific to zero emission vehicle owners to better understand their purchase decision and charging and fueling behavior.

The survey involves a lot of moving parts besides the questionnaires. This volume displays the details of different elements of the survey, except for the proprietary programming codes that went into construction of the survey website and the algorithms used in creation of real time feedback between the RP and SP portion of the survey.

Keywords: California Energy Commission, 2019 California Vehicle Survey

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Executive Summary

Introduction

Appendix 2-A: Residential Questionnaire

Outline

SURVEY SECTION	INFORMATION COLLECTED
Section A: Screener	**CHECK AGE, RESIDENCY, DECISION ROLE**
Section B: Current Vehicles	**CURRENT VEHICLE LIST (INCLUDES PURCHASED, LEASED, AND COMPANY/EMPLOYER VEHICLES)**
Section C: Household Members	**HOUSEHOLD SIZE; AGE DISTRIBUTION; IDENTIFIERS, DEMOGRAPHICS AND MOBILITY INFORMATION ON MEMBERS OLDER THAN 15**
Section D: Current Vehicle Details	**FULL DETAILS FOR EACH VEHICLE IN THE HOUSEHOLD.**
Section E: Alt Fuel Vehicles	**AWARENESS AND EXPERIENCE WITH ALTERNATIVE FUEL VEHICLES [INCLUDES ZEV OWNER-SPECIFIC QUESTIONS]**
Section F: Future Mobility Choices	**IDENTIFICATION OF LIKELY NEXT VEHICLE PURCHASE TIMING AND CONSIDERATION OF VEHICLE/FUEL TYPES**
Section G: Vehicle Purchase Tradeoffs	**INFORMATION ON THE VEHICLE PURCHASE TRADEOFFS ARE CONTAINED IN A SEPARATE DOCUMENT.**
Section H: Opinions/Attitudes	**OPINION AND ATTITUDE QUESTIONS**
Section I: Demographics and VMT/Odometer Readings	**MISCELLANEOUS HOUSEHOLD QUESTIONS, ODOMETER, AND RECRUITMENT FOR VMT**

Section A: Screener

1. [*language*]

In which language would you prefer to take the survey?
¿En qué idioma prefiere para tomar la encuesta?

- English
- Español

2. IF "'Espanol' [*spanish_delay*]

   Actualmente estamos en la fase piloto del estudio y la encuesta sólo está disponible en Inglés. Si proporciona su dirección de correo electrónico, le notificaremos cuando en la versión en español está disponible. Por favor, seleccione una opción a continuación:

   - Me gustaría continuar la encuesta en Inglés →continue to [intro]
   - Introducir correo electrónico para recibir una notificación cuando la versión en español está disponible: _____ [open end] → **End Survey.** Message: "Gracias por su interés usted. Nos pondremos en contacto con usted Whent que la versión española de la encuesta está disponible."

3. *[intro]*

Welcome to the California Vehicle Survey. Your answers will help the California Energy Commission, a State of California agency, understand your vehicle needs now and in the future. The information you provide will be kept confidential by the California Energy Commission and RSG (the company that is collecting the survey data), based on the California Information Practices Act and the non-disclosure agreement between RSG and the Energy Commission.

(skip if Research Now) If you qualify for taking the full survey, and then complete all the questions, you will have the option to **receive a $15 digital gift card** of your choice from Amazon.com or Walmart.

On average, answering all of the questions will take approximately *30* minutes.

Please use the **"Next"** button in the lower left-hand corner of the screen to go forward. To review and change a previous question, use the **"Previous"** button. It is important that you **do not use** your web browser's "forward" or "back" buttons because your new answers may not be recorded.

(skip if Research Now) If you can't finish the survey in one sitting, you can stop at any time and return to where you left off by re-entering your password.

4. The next few questions are to determine if you are in the 'target group' for this survey.

   [age] **First, which of these four groups does your age fall into?**

   - Under 18 years old → [Disqualify]
   - 18 to 34
   - 35 to 64
   - 65 or older

5. *[california]* **Is your permanent residence in the state of California?**

For the purpose of this survey, a permanent resident is someone who lives in California for at least 6 months out of the year and holds a valid State of California Driver's License or Identification Card.

   - Yes
   - No → [Disqualify]

6. [*zipcode*] **What is the ZIP Code for your residence?**

   _____ *[Must be 5 numbers]* → [Disqualify if not CA ZIP code]

7. *[county]* **What county do you currently live in?**

Select county from list: ***<Drop down list of counties>***

[county] drop-down list

1. Alameda County
2. Alpine County
3. Amador County
4. Butte County
5. Calaveras County
6. Colusa County
7. Contra Costa County
8. Del Norte County
9. El Dorado County
10. Fresno County
11. Glenn County
12. Humboldt County
13. Imperial County
14. Inyo County
15. Kern County
16. Kings County
17. Lake County
18. Lassen County
19. Los Angeles County
20. Madera County
21. Marin County
22. Mariposa County
23. Mendocino County
24. Merced County
25. Modoc County
26. Mono County
27. Monterey County
28. Napa County
29. Nevada County
30. Orange County
31. Placer County
32. Plumas County
33. Riverside County
34. Sacramento County
35. San Benito County
36. San Bernardino County
37. San Diego County
38. San Francisco County
39. San Joaquin County
40. San Luis Obispo County
41. San Mateo County
42. Santa Barbara County
43. Santa Clara County
44. Santa Cruz County
45. Shasta County
46. Sierra County
47. Siskiyou County
48. Solano County
49. Sonoma County
50. Stanislaus County
51. Sutter County
52. Tehama County
53. Trinity County
54. Tulare County
55. Tuolumne County
56. Ventura County
57. Yolo County
58. Yuba County
59. I don’t know

8. *[future decision role]* **For your household, what will be the extent of your involvement in future vehicle purchase or lease decisions?**

   - I will be the sole decision maker
   - I will be the primary decision maker with input from another household member
   - I will share equally in making the decision with another household member(s)
   - I will provide input into the decision, but I will not be the primary decision maker → [Disqualify]
   - Another person will be the sole decision maker → [Disqualify]

9. *(skip if Research Now)* *[contact_info]* **Can you provide an email address and phone number for us to contact you?**
   Your personal contact information will only be used to provide technical assistance, survey completion reminders or to gather feedback about the questionnaire and your experience. We will not sell or distribute your email address for any commercial marketing purposes.

   [name] Name *(optional)*: _____
   [email] Email *(optional)*: _____ [allow no answer, enforce a valid email if text is entered]

   [phonenum] Phone number (*optional*):
   ( ) - ext:
   [allow no answer, enforce a valid phone # (area code + number)]

Section B: Current Vehicles

10. *[hh_vehicle]* **How many registered vehicles are in your household?**

Please include cars, SUVs, minivans, vans, or pick-up trucks that are used for general transportation of household members (including those that are employer/company owned). This does not include motorcycles, RVs, or vehicles owned/leased by household members who are away at school.

- 0 (no vehicles in household)
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8 or more vehicles

11. *[vehicle_details] If [hh_vehicles] > 0*

Please tell us about the vehicles in your household.

Vehicle <x> of <n> household vehicles.

[year]
Model Year :

[make]
Make :

[model]
Model :

[fuel]
Engine / fuel type :

[type]
Vehicle type :

[obtain]
How did you obtain this vehicle?:

[company_car] If [obtain] = Company Car/provided by employer or institution
Did a household member have significant influence in the purchase decision for this vehicle?

Variable	Values
[year]	*"2020" to "1980 or earlier"*
[make]	*See vehicle database*
[model]	*See vehicle database*
[fuel]	*See vehicle database* • Gasoline • Hybrid (Gasoline) → **Flag as HEV** • Plug-in Hybrid Electric vehicle (PHEV) → **Flag as PHEV** • Gasoline - ethanol Flex Fuel vehicle (E85 FFV) • Diesel • Compressed Natural Gas (CNG) vehicle • Full Electric vehicle → **Flag as BEV** • Hydrogen fuel cell electric vehicle (FCEV) → **Flag as FCEV**
[veh_type]	*See vehicle database* • Subcompact car • Compact car • Midsize car • Large car • Sports car • Cross-over, small • Cross over, midsize • SUV small/midsize • SUV full-size/large • Pick-up truck, small • Pick-up truck, full-size/large • Van, small • Van, full-size/large
[obtain]	• Purchased new • Leased new • Purchased used or previously owned • Leased used or previously owned • Company car/provided by employer or institution • Other (e.g. gifted or inherited)
[company_car]	• Yes • No

Info Text:

[year] *info text*
Model year describes approximately when the manufacturer produced the vehicle. It may or may not match the year that you purchased the vehicle.

[make] *info text*
Vehicle make is the manufacturer name or brand of the vehicle.

[model] *info text*
A car model is the name used by a manufacturer to market a range of similar cars.

[fuel] *info text*

Fuel Type	***Description of Fuel Type***
Gasoline vehicle	*A vehicle that operates on gasoline only and has no hybrid components.*
Hybrid Electric vehicle (HEV)	*A gasoline vehicle with hybrid components to increase fuel economy (e.g. Toyota Prius), but does not plug in for charging the battery.*
Plug-in Hybrid Electric vehicle (PHEV)	*A gasoline vehicle with hybrid components and a battery that can be charged directly (e.g. Chevrolet Volt) which allows the vehicle to operate like a battery electric vehicle for a short distance (10-40 miles) and then operate on gasoline for longer distances (~300-400 miles).*
Flex Fuel vehicle (E85 FFV)	*A vehicle that will operate on gasoline, ethanol, or any blend of the two fuels and has no hybrid components.*
Diesel vehicle	*A vehicle that operates on diesel or biodiesel only and has no hybrid components.*
Battery Electric vehicle (BEV)	*A vehicle that operates on a battery only and charges by plugging in at home or at a station (e.g. Nissan Leaf).*
Hydrogen Fuel Cell Electric vehicle (FCEV)	*A vehicle that uses hydrogen fuel.*
Compressed Natural Gas (CNG) vehicle	A vehicle that only operates on compressed natural gas (CNG). It can be filled up at home, with special equipment, or at a fast fill station.

[veh_type] *info text*
Vehicle Class Definitions:

- *Subcompact Car: Ford Fiesta, Fiat 500e, Mini Cooper, Toyota Yaris*
- *Compact Car: Chevrolet Volt, Ford Focus, Honda Civic, Toyota Prius, Volkswagen Jetta*
- *Midsize Car: Ford Fusion, Honda Accord, Nissan Altima, Tesla Model 3, Toyota Camry*
- *Large Car: Chevrolet Impala, Chrysler 300, Hyundai Sonata, Subaru Outback, Tesla Model S*
- *Sports Car: BMW i8, Chevrolet Corvette, Ford Mustang, Mazda MX-5 Miata, Porsche 911*
- *Subcompact Crossover: Buick Encore, Ford EcoSport, Honda HR-V, Nissan Juke, Toyota C-HR*
- *Compact Crossover: Honda CR-V, Mazda CX-5, Nissan Rogue, Tesla Model X, Toyota Rav4*

- *Midsize Crossover/SUV: Ford Explorer, Honda Pilot, Kia Sorento, Nissan Pathfinder, Toyota Highlander*
- *Large SUV: Chevrolet Suburban, Ford Expedition, Lincoln Navigator*
- *Small Van (Minivan): Chrysler Pacifica, Kia Sedona, Honda Odyssey, Nissan Quest, Toyota Sienna*
- *Full-size/large Van: Chevrolet Express 1500, Ford Transit, Mercedes-Benz Sprinter, Nissan NV Cargo*
- *Small Pickup Truck: Chevrolet Colorado, GMC Canyon, Nissan Frontier*
- *Full-size/large Pickup Truck: Chevrolet Silverado, Ford F-Series, Nissan Ridgeline, Toyota Tacoma*

Section C: Household Members

12. *[household_members]*

In order to help us understand your household's current and future vehicle needs we first need to ask about the basic characteristics of your household. All identifying information you provide will be kept confidential.

How many people in the following age groups, including yourself, are part of your household either part-time or full-time?

Include in this number children, roommates, housemates, people living there most of the time while working, even if they have another place to live.

Do not include college students living away while attending college or people who live at another place most of the time.

Under the age of 5: _____
Between the ages of 5 to 11: _____
Between the ages of 12 to 15: _____
16 or older (including yourself): _____ *max of 10*

Total Household Members: <automatic sum>

13. *[member_details]*

Please tell us about yourself.

Household member 1 of <n> member(s).

[name]
Initials or nickname:
Text box entry – required to be unique across the household

[age]
Age:

Please tell us about the other people 16 years or older in your household.

Household member <i> of <n> member(s).

[name]
Initials or nickname:
Text box entry – required to be unique across the household

[age]
Age:

[relationship]
Relationship to you:

Variable	Values (for dropdowns)
[age]	• 16-17 • 18-24 • 25-34 • 35-44 • 45-54 • 55-64 • 65-74 • 75 or older
[relationship]	• Spouse or partner • Son or daughter (or child in-law) • Father or mother (or parent in-law) • Brother or sister (or sibling in-law) • Other relative • Roommate or friend • Other non-relative

Individual Information

[individual_info]

Show for each household member of age 16 or older.

Please complete the form below with information about <yourself / Name>.

[gender]
Gender:

[employment]
Employment Status?

[student]
Currently enrolled in college/university?

[education]
Highest level of education completed:

[license]
Has valid driver's license or permit:

[vehicle] If license = yes
Vehicle driven most often?

[drive_freq] If license = yes
How often does this person drive?

[transit_freq]
How many one-way public transit trips per week for any purpose (bus, metro, etc.)?
(Please consider a round trip - for instance, from home to work and then back - as two one-way trips)
Text box entry – Allow 0 to 100 (allow decimals)

[tnc_freq]
How many one-way ridesharing (e.g. Uber/Lyft) trips per week for any purpose?
(Please consider a round trip - for instance, from home to work and then back - as two one-way trips)
Text box entry – Allow 0 to 100 (allow decimals)

[job_type] If employment = full/part/both/self
Usual work location?

[work_mode] If job_type = fixed or varied
Usual way of commuting to primary workplace (mode used for greatest distance during usual commute)?

[work_distance] *If job_type = fixed or varied*
About how many miles is it one-way from your home to primary workplace?
Text box entry – Allow 0 to 200

[work_days] *If job_type = fixed or varied*
Number of days per week with travel to primary workplace?
Text box entry – Allow 0 to 7 whole numbers

[school_mode] *If school 'full-time' or 'part-time'*
Usual way of commuting to school (mode used for greatest distance during usual commute)?

[school_distance] *If school 'full-time' or 'part-time'*
About how many miles is it one-way from your home to school?
Text box entry – Allow 0 to 200

[ethnicity]
Is this person of Hispanic, Latino, or Spanish origin?
- Yes
- No
- Prefer not to answer

[race]
What is this person's race?
Please select all that apply.
- ☐ American Indian and Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian and Other Pacific Islander
- ☐ White
- ☐ Other, please specify: _____
- ☐ Prefer not to answer

Variable	Values (for dropdowns)
[gender]	• Male • Female • Other • Prefer not to answer
[employment]	• Full-time (total 35 or more hours per week) • Part-time (total less than 35 hours per week) • Both full- and part-time • Do not work for pay (e.g. retired, unemployed) • Self employed

[student]	• Full-time on campus • Part-time on campus • Full-time or part-time online • Not currently enrolled
[education]	• Less than high school • High school graduate/GED • Technical school/professional business school • Some college • Community college graduate (Associate degree, 2-year degree) • College graduate (4-year degree) • Post-graduate work • Post graduate degree
[license]	• Yes (license or learner's permit) • No
[vehicle]	• <<HH vehicle 1>> if hhveh > 0 • <<HH vehicle 2>> if hhveh > 1 • <<HH vehicle 3>> if hhveh > 2 • <<HH vehicle 4>> if hhveh > 3 • <<HH vehicle 5>> if hhveh > 4 • <<HH vehicle 6>> if hhveh > 5 • <<HH vehicle 7>> if hhveh > 6 • <<HH vehicle 8>> if hhveh > 7 • A carshare vehicle (e.g., Car2Go, ZipCar) • Other vehicle • None
[drive_freq]	• Frequently (i.e. every day) • Sometimes (i.e. once or twice a week) • Rarely (i.e. once a month or less) • Never
[job_type]	• Only one work location (outside of home, may also telework) • Work location regularly varies (different offices/jobsites) • Work at home ONLY (telework, self-employed) • Drive/travel for work (driver, sales)
[commute_mode]	• Drive alone using household vehicle *if has license and hh_veh > 1* • Carpool with family/household members only *if hhsize > 1* • Carpool with at least one person not in household • Walk (or jog/wheelchair) • Bicycle or electric bike (including bikeshare) • Motorcycle/moped • Scooter or electric scooter (including scootershare) • Bus (public transit) • Private shuttle bus (e.g., employer) • Paratransit

	• Subway • Light rail • Intercity rail (e.g., Amtrak) • Uber, Lyft, or other smartphone-app car service • Car from caresharing service (e.g., ZipCar, Car2Go). • Vanpool • Taxi (e.g., Yellow Cab) • Other mode
[school_mode]	• Drive alone using household vehicle *if has license* • Carpool with family/household members only *if hhsize > 1* • Carpool with at least one person not in household • Walk (or jog/wheelchair) • Bicycle • Motorcycle/moped/scooter • Bus (public transit) • Private shuttle bus (e.g., employer) • Paratransit • Subway • Light rail • Intercity rail (e.g., Amtrak) • Uber, Lyft, or other smartphone-app car service • Car from caresharing service (e.g., ZipCar, Car2Go). • Vanpool • Taxi (e.g., Yellow Cab) • Other mode

Section D: Current Vehicle Details

If vehicle is NOT a Company car provided by employer or institution AND no household member controls purchase decision for this vehicle in [company_car].

14. *[current_vehicle_info]*

Next, we would like to get some additional information on your current vehicles.

Please complete the form below focusing on your <vehicle x year> <vehicle x make> <vehicle x model>.

Vehicle <x> of <n> vehicles

[acquired_year]
What year was this vehicle acquired?

[acquired_month] If acquired_year = 2018 or 2019
What month was this vehicle acquired?

[annual_mileage]
***How many miles per year is this vehicle driven*?**
Text box entry – Allow 0 to 500,000
IF <1,000 or >50,000 show warning
Warning text: "You've entered a value outside the typical annual millage for most vehicles. Please verify you've entered the correct number. Make sure you enter the full number (e.g. for ten thousand miles enter 10,000, not 10)."

[electric_percent] If PHEV
What percentage of these miles are in electric only mode?
Text box entry – Allow 0 to 100%

[tnc_veh]
Is this vehicle used to work for ride-hailing companies such as Uber or Lyft?

[tnc_miles] If tnc_veh = 'yes'
How many miles per year is this vehicle driven for ride-hailing companies?
Must be less than [annual_mileage]

[delivery]
Is this vehicle used for food or product delivery, including app based services like Doordash, Uber Eats, Instacart, or Amazon Flex?

[delivery_miles] If delivery = 'yes'
How many miles per year is this vehicle driven for delivery purposes?
Must be less than [annual_mileage]

[mpg]
About how many miles per gallon (MPG or MPGe) does this vehicle get?
Please enter the expected city/highway combine average.
Text box entry – Allow 0 to 150
SHOW Warning if value entered is +/-50% from of the base value for vehicle of the type, fuel type, prestige, and year
Warning text: "You've entered a value outside the range we expected for this type of vehicle. Please double check that you've entered the correct MPG/MPGe."

[primary_driver] If licensed driver > 1
Who is the primary driver of this vehicle?

[replace_intent]
When do you expect to replace this vehicle?

Variable	Values (for dropdowns)
[acquired_year]	• IF Used: 2019 to <model year -2 or 1980 or earlier> • IF New: <Model year +2> to <model year -2 or 1980 or earlier>
[acquired_month]	• January • February • March • April • May • June • July • August • September • October • November • December
[tnc_veh]	• Yes • No
[tnc_delivery]	• Yes • No
[primary_driver]	• I am the primary driver • <nickname/initials> for HH member 1 with license • <nickname/initials> for HH member 2 with license • … • <nickname/initials> for HH member n with license

[replace_intent]	• Less than 1 year • 1 to 2 years • 3 to 5 years • 6 to 10 years • More than 10 years • Never, I am going to keep it • Never, I am going to dispose of it and NOT replace it

[mpg] *info text*
MPGe, or miles per gasoline gallon equivalent, is a measure of the average distance traveled per unit of energy consumed. It is used to compare energy consumption of alternative fuel vehicles and plug-in electric vehicles with conventional fuel (gasoline/diesel) vehicles.
If vehicle IS a Company car provided by employer or institution AND no household member controls purchase decision for this vehicle in [company_car].

15. *[company vehicle info]*

Please complete the form below focusing on your <vehicle x year> <vehicle x make> <vehicle x model>.

[acquired_year]
What year was this vehicle acquired?

[fuel_pay]
Do you pay for fuel when using the vehicle for personal use?

[personal_miles]
Approximately how many miles per week do you drive this vehicle for personal use?
Text box entry – Allow 0 to 2,000

[business_miles]
Approximately how many miles per week is this vehicle driven for business use?
Text box entry – Allow 0 to 2,000

[behavior]
If your employer prohibited personal use of this vehicle, how would your personal use of this vehicle be replaced? Please select all that apply.

- Buy or lease another vehicle to replace it
- Use an existing household vehicle
- Use public transit
- Use Uber/Lyft
- Walk of bicycle

[primary_driver] *If number of household drivers >1*
***Who* is the primary driver of this vehicle?**

[other_drivers] If number of household drivers >1
Are other household members allowed to drive this vehicle?

Variable	Values (for dropdowns)
[acquired_year]	• 2020 to 1980 or earlier
[fuel_pay]	• Yes • No
[primary_driver]	• I am the primary driver • <nickname/initials> for HH member 1 with license • <nickname/initials> for HH member 2 with license • … • <nickname/initials> for HH member n with license
[other_drivers]	• Yes • No

16. *[replace_soon] Create list of 3 (max) HH vehicles from [replace_intent] that the respondent reported they will replace soonest. If we cannot generate a list of 3 vehicles from the information given in [replace_intent] (i.e. respondent said 4 vehicles will be replaced in 3-5 years) then we need to create a list of HH vehicles for the respondent to chose which 3 will be replaced soonest. The list should include all HH Vehicles where [replace_intent] was NOT Never*

If list of 3 replacement vehicles cannot be determined You indicated that x of your vehicles would eventually be replaced. Using the following list, please select the three vehicles that are likely to be replaced the soonest.

Section E: Alternative Fuel Vehicles

[ZEV_intro]

In these next questions, we would like to ask you about your level of past exposure and experiences related to alternative fuel vehicles.

Alternative fuel vehicles include:

> **Hybrid electric vehicles (HEV):** A gasoline vehicle with a small battery that is charged inside the car and does not plug in for charging the battery (e.g. Toyota Prius).
>
> **Plug-in hybrid electric vehicles (PHEV):** A gasoline vehicle with a larger battery than HEVs that can plug into an electrical outlet to charge (e.g. Chevy Volt), allowing the vehicle to operate like a battery electric vehicle for a short distance (10-50 miles) and then operate on gasoline for a much longer distance (~300-400 miles)
>
> **Fully electric vehicles (also called a battery electric vehicle, or BEV):** A vehicle that operates only on electricity, with a battery that charges by plugging into an electrical outlet at home, at work, or at a fast charge station (e.g. Nissan Leaf, Tesla).
>
> **Hydrogen fuel cell electric vehicles (FCEVs):** A vehicle that uses hydrogen to generate its own electricity in a fuel cell (e.g. Toyota Mirai). Hydrogen is stored in a tank onboard the vehicle and can be filled up at a hydrogen station.

Along the way, you can review descriptions using the available information icons, should you decide to.

[ZEV QUESTIONS]

17. *[hybrid_experience]* *If the HH does NOT own HEV in [fuel]*

Has your household ever owned or leased a **hybrid electric vehicle (HEV)?**

- Yes
- No

18. *[past_hybrid]* *If [hybrid_experience] = 'No'*

Which of the following best describes your past experience with HEVs?

I have…

- … driven an HEV.
- … not driven an HEV, but have ridden in one.
- … not driven/ridden in an HEV, but know people who own them.
- … noticed HEVs being driven or parked in my community.
- … little or no experience with HEVs.

19. [*PHEV_experience*] *If the HH does NOT own PHEV in [fuel]*

Has your household ever owned or leased a **plug-in hybrid electric vehicle (PHEV)?**

- Yes
- No

20. *[past_phev] If [phev_experience] = 'No'*

Which of the following best describes your past experience with PHEVs?

I have…

- … driven a PHEV.
- … not driven a PHEV, but have ridden in one.
- … not driven/ridden in a PHEV, but know people who own them.
- … noticed PHEVs being driven or parked in my community.
- … little or no experience with PHEVs.

21. [*BEV_experience*] *If the HH does NOT own BEV in [fuel]*

Has your household owned or leased a **fully electric vehicle** (also called a **battery electric vehicle**, or **BEV**)**?**

- Yes
- No

22. *[past_bev] If [bev_experience] = 'No'*

Which of the following best describes your past experience with BEVs?

I have…

- … driven a BEV.
- … not driven a BEV, but have ridden in one.
- … not driven/ridden in a BEV, but know people who own them.
- … noticed BEVs being driven on streets or parked in my community.
- … little or no experience with BEVs.

23. [*FCV_experience*] *If the HH does NOT own FCV in [fuel]*

Has your household owned or leased a hydrogen fuel cell vehicle (also called a **fuel cell vehicle**, or **FCV**)**?**

- Yes
- No

24. *[past_fcv] If [fcv_experience] = 'No'*

Which of the following best describes your past experience with FCVs?

I have…

- … driven an FCV.
- … not driven a FCV, but have ridden in one.
- … not driven/ridden in a FCV, but know people who own them.
- … noticed FCVs being driven on streets or parked in my community.
- … little or no experience with FCVs.

25. [*charge_spots*] [Skip if BEV or PHEV owner]

Plug-in vehicles such as BEVs or PHEVs have batteries that are recharged with electricity from electrical outlets or charging stations. Some people have charging options at home where they park their vehicles. However, vehicles can also be recharged away from home in public parking facilities, or at the workplace using chargers like those in the picture below.

Have you seen electric vehicle charging spots in any of the parking facilities that you frequent?

- No, I haven't seen any.
- Yes, in one place.
- Yes, in a few places.
- Yes, in several places.
- I'm not sure whether I've seen any or not.

26. *[charge_work] If 'Yes' in [charge_spots] AND [job_type_1_1] is "Only one work location (outside of home, may also telework)" OR "Work location regularly varies (different offices/jobsites)"*

Is your workplace one of the places where you've seen electric vehicle charging spots?

- Yes
- No
- I'm not sure

27. [*home_parking*] *Only if you don't own a BEV or PHEV.*

Suppose you were considering whether to purchase a PHEV or BEV. One factor might be the availability of recharging where you park while at home. Which of the following parking options are available at your home?

[Choose all that apply]

- Attached garage
- Detached garage
- Carport (covered, not fully enclosed)
- Driveway (not covered)
- On the street
- Assigned parking in lot or garage
- Unassigned parking in lot or garage
- Other, please specify _____
- None of these are available at my home

28. [*home_electricity_access*] *If NOT 'None of these' in [home parking]*

Of the parking options available at your home, which of them has the best access to electricity for possibly charging an electric vehicle?

Choose one.

- *[Filtered choices from above]*
- None of them has reasonable access.

29. [*hydrogen_station_awareness*]

Fuel cell vehicles (FCVs) use hydrogen as their fuel. Are you aware of any hydrogen refueling stations in your region?

- Yes
- No
- Don't know

30. *[hsa_distance]* *If [hydrogen station awareness] = 'yes'*

Of the hydrogen stations you know about, about how far is the closest one from your home? (your best estimate, either in miles or minutes of driving time).

[Create linked responses options with selection of either miles or minutes of driving time as units.]

Section F: Future Mobility Choices

[future_mobility_intro]

The following summarizes your household's current situation for vehicles and commute modes (based on your answers to previous questions).

Person	Vehicle Most Driven	Driving Frequency	Usual Commute Mode
DSB	2011 Nissan Leaf	Frequent	Drive alone
MJW	2012 Volvo S60	Frequent	Drive alone

Household Vehicle	Vehicle type	Fuel type	Approximate cost per 100 miles based on reported fuel economy
2011 Nissan Leaf	Compact car	Battery electric	<Calculated based on *[mpg] & medium fuel cost*>
2012 Volvo S60	Midsize car	Gasoline	<Calculated based on *[mpg] & medium fuel cost*>

We have a few more sets of questions related to how your household might meet its future mobility needs.

31. *[future_purchase]* *If [hh_vehicles] = 0*

Which of the following best describes your household?

- We are likely to purchase or lease a car, SUV, van, or pickup truck sometime in the future.
- We will likely continue to meet our mobility needs without purchasing or leasing our own vehicle.

32. *[next_purchase]* *If [hh_vehicles] > 0*

Considering your current situation, which of the following best describes your household's next purchase or lease of another car, SUV, van, or pickup truck? The next vehicle will be…

- *a replacement for my <vehicle #1 on soonest list>*
- *a replacement for my <other vehicles if tied on soonest list>*
- an additional vehicle for the household
- We will not be purchasing another vehicle. *If soonest list is null (i.e. 'Never' in replace intent')*

33. *[replace_soon1]* IF more than 1 vehicle is being replaced in 'Less than 1 year' in [replace_intent] AND 'an additional vehicle for the household' in [next_purchaase]

Which vehicle will your household replace next?

- <Vehicle 1 that will be replaced in less than 1 year>
- <Vehicle 2 that will be replaced in less than 1 year >
- <Vehicle n that will be replaced in less than 1 year >

34. *[purchase timing] If [next_purchase] = 'an additional vehicle for the household' OR [future_purchase] = "We are likely to purchase or lease a car, SUV, van, or pickup truck sometime in the future. "*

When is this purchase or lease most likely to occur?

- Less than 1 year
- 1 to 2 years
- 3 to 5 years
- 6 to 10 years
- More than 10 years

35. *[info_display1] IF [purchase timing] < 3 years*

For the next set of questions, please assume that the purchase/lease decision you have been considering will occur in the year 2021. → flag dce_year = 2021

36. *[info_display2] IF [purchase timing] >= 3 years*

For the next set of questions, please assume that the purchase/lease decision you have been considering will occur in the year 2025. → flag dce_year = 2025

37. *[info_display3] If [zero vehicle household purchase] = 'We will likely continue to meet our mobility needs without purchasing or leasing our own vehicle' OR [vehicle transaction type] = 'We will not be purchasing another vehicle'*

Although you have indicated that you are unlikely to be purchasing or leasing a vehicle in the future, we are still interested in your opinions (should you change your mind).

For the next set of questions, please assume that you have decided to purchase or lease a vehicle for your household in the year *<randomly assign 2021 or 2025>*. → flag dce_year = <2021 or 2025>

38. *[info_display4] [Combine this with whichever previous info display (1, 2, or 3) was identified.]*

At that time a wide range of vehicle types may be more available than today, including plug-in vehicles (BEVs and PHEVs) as well as hydrogen fuel cell vehicles (FCVs), in both the new and used vehicle markets. Vehicles may (or may not) have improved on features such as range, recharging/refueling time, and purchase price.

Similarly, there may be a greater number and availability of recharging stations for BEVs and PHEVs, and hydrogen refueling stations than there are today.

In the next questions, we would like you to identify which vehicle/fuel types you would seriously *consider* purchasing or leasing, assuming their features turn out to be acceptable.

39. *[vehicletype_consideration]*

First, laying aside such issues as new versus used, specific make/model, price range, etc., which of the following vehicle types are you most likely to consider purchasing in [*dce year***].**

Please select up to four. Must select at least one vehicle type.

- Subcompact Car
- Compact Car
- Midsize Car
- Large Car
- Sports Car
- Subcompact Crossover
- Compact Crossover
- Midsize Crossover/SUV
- Large SUV
- Small Van (Minivan)
- Full-size/large Van
- Small Pickup Truck
- Full-size/large Pickup Truck

Vehicle Class Definitions:

- *Subcompact Car: Ford Fiesta, Fiat 500e, Mini Cooper, Toyota Yaris*
- *Compact Car: Chevrolet Volt, Ford Focus, Honda Civic, Toyota Prius, Volkswagen Jetta*
- *Midsize Car: Ford Fusion, Honda Accord, Nissan Altima, Tesla Model 3, Toyota Camry*
- *Large Car: Chevrolet Impala, Chrysler 300, Hyundai Sonata, Subaru Outback, Tesla Model S*
- *Sports Car: BMW i8, Chevrolet Corvette, Ford Mustang, Mazda MX-5 Miata, Porsche 911*
- *Subcompact Crossover: Buick Encore, Ford EcoSport, Honda HR-V, Nissan Juke, Toyota C-HR*

- *Compact Crossover: Honda CR-V, Mazda CX-5, Nissan Rogue, Tesla Model X, Toyota Rav4*
- *Midsize Crossover/SUV: Ford Explorer, Honda Pilot, Kia Sorento, Nissan Pathfinder, Toyota Highlander*
- *Large SUV: Chevrolet Suburban, Ford Expedition, Lincoln Navigator*
- *Small Van (Minivan): Chrysler Pacifica, Kia Sedona, Honda Odyssey, Nissan Quest, Toyota Sienna*
- *Full-size/large Van: Chevrolet Express 1500, Ford Transit, Mercedes-Benz Sprinter, Nissan NV Cargo*
- *Small Pickup Truck: Chevrolet Colorado, GMC Canyon, Nissan Frontier*
- *Full-size/large Pickup Truck: Chevrolet Silverado, Ford F-Series, Nissan Ridgeline, Toyota Tacoma*

40. *[fueltype_consideration]*

For each vehicle type you are considering, which of the following fuel types would you consider in [*dce year***].**

Fill in rows from answers chosen in [vehicletype_consideration]	Gasoline only	Gas HEV	PHEV (gas/elec)	Diesel	BEV (electric only)	FCEV (hydrogen only)	PFCEV (hydrogen /elec)	Flex Fuel
Vehicle type 1	☐	☐	☐	☐	☐	☐	☐	☐
Vehicle type 2	☐	☐	☐	☐	☐	☐	☐	☐
…	☐	☐	☐	☐	☐	☐	☐	☐
Vehicle type 4	☐	☐	☐	☐	☐	☐	☐	☐

Fuel Type Definitions:

Powertrain	***Fuel(s) Used***	***Description of Vehicle***
Gasoline vehicle	*-Gasoline*	*A vehicle that operates on gasoline only and has no hybrid components.*
Hybrid Electric vehicle (HEV)	*-Gasoline*	*A gasoline vehicle with hybrid components to increase fuel economy (e.g. Toyota Prius), but does not plug in for charging the battery.*
Plug-in Hybrid Electric vehicle (PHEV)	*-Gasoline* *-Electricity*	*A gasoline vehicle with hybrid components and a battery that can be charged directly (e.g. Chevrolet Volt) which allows the vehicle to operate like a battery electric vehicle for a short distance (10-40 miles) and then operate on gasoline for longer distances (~300-400 miles).*
Flex Fuel vehicle (E85 FFV)	*-Gasoline* *-E85*	*A vehicle that will operate on gasoline, ethanol, or any blend of the two fuels and has no hybrid components.*

Diesel vehicle	*-Diesel*	*A vehicle that operates on diesel or biodiesel only and has no hybrid components.*
Battery Electric vehicle (BEV)	*-Electricity*	*A vehicle that operates on a battery only and charges by plugging in at home or at a station (e.g. Nissan Leaf).*
Hydrogen Fuel Cell Electric vehicle (FCEV)	*-Hydrogen*	*A vehicle that uses hydrogen to generate its own electricity in a fuel cell (e.g. Toyota Mirai). Hydrogen is stored in a tank onboard the vehicle and can be filled up at a hydrogen station.*
Plug-in Fuel Cell Electric vehicle (PFCEV)	*-Hydrogen* *-Electricity*	*A fuel cell electric vehicle with a battery that can be recharged directly from an electrical outlet or charging station. This vehicle can be powered by hydrogen fuel or electricity.*

41. *[new_used]*

For each vehicle/fuel types you are considering in *[dce_year]***, which vehicle age and brand type would you most likely consider?**

Brand type consists of standard brands and premium brands. Standard brands have more affordable vehicles; whereas, premium brands offer high-end, luxury vehicles. Please select the information (i) to see which brands are classified as standard or premium.

Prices shown represent the final vehicle purchase price before rebates or other incentives.

	Standard Make/Brand			**Premium Make/Brand**		
	New	**Used (2-3 Years)**	**Used (4-6 Years)**	**New**	**Used (2-3 Years)**	**Used (4-6 Years)**
Vehicle 1	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*
Vehicle 2	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*
…	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*
Vehicle 32	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*

Vans and pickup trucks cannot be premium

Standard/Premium info button:

Standard Makes		**Premium Makes**
Buick	Pontiac	Acura
Chevrolet	Saturn	Audi
Chrysler	Smart	BMW
Dodge	Subaru	Cadillac
Ford	Suzuki	Hummer
GMC	Toyota	Infiniti
Honda	Volkswagen	Jaguar
Hyundai		Land Rover
Jeep		Lexus
Kia		Lincoln
Mazda		Mercedes-Benz
Mercury		Porsche
Mini		Saab
Mitsubishi		Tesla
Nissan		Volvo

Section G: Tradeoff Exercises

[*cbc_intro*] **You're almost done! Thanks for hanging in there!**

For the next part of the survey, we have created sets of vehicle choices for you with each set including four vehicles. Please carefully review the features for each of the vehicles and select the ONE vehicle you would most likely buy or lease. Please choose one vehicle from each set of options.

We understand that some of the combinations of features and fuel types may not currently exist. For these hypothetical scenarios, please assume the combinations of features do exist and you could buy any of the vehicles presented to you.

Some features that you may find important are not listed here, such as warranty, safety, technology and entertainment features, etc. Please assume that these features are identical across the four vehicles and only focus on the features that are listed when making your decision.

We also understand that the vehicles offered may not completely suit your needs. For the purpose of this study, please assume the four vehicles on each page are the only four available and you must buy one.

You will see that each feature has an information icon next to it. If you put your cursor over the you will see a definition. It is important that you take some time to read and consider the definitions of any unfamiliar terms before answering any questions.

[The last section of the survey is up for 100% reconsideration. Many of the issues in the previous version have already been addressed in the revised questions that appear earlier. Also, many of the questions appearing in the 2015-2016 version appear to be directed at specific research objectives that we are unclear on, and whether or not they are still relevant for this survey.]

Section H: Autonomous Vehicle Opinions and Attitudes

42. *[modes_used]*

Thank you for your answers on the *future vehicle choice* questions. In this final survey section we would like to learn your opinions on more general *mobility options* that could be used by your household now and in the future.

What is your experience with the following transportation options for trips in your local area?
Please select one answer per row.

RANDOMIZE	I'm not familiar with it	Not available where I live	Available where I live, but I never use it	Available where I live, and I use it
Work/school provided shuttle				
Public bus				
Light rail/tram/subway (e.g., BART, LA Metro)				
Commuter train (e.g. Amtrak, Caltrain)				
Taxi (e.g. Yellow Cab)				
Rental car				
Ride-hailing (Uber/Lyft)				
Shared ride-hailing (UberPool/LyftLine)				
Carsharing (Car2Go, ZipCar)				
Bikesharing (e.g. Bay Area Bike Share)				
Shared eBikes or eScooters (e.g., Jump)				
Peer-to-peer car rental (e.g., Getaround, Turo)				

43. *[modes_freq]* **Skip if no modes used in [modes_used]**

How frequently do you use these transportation options?
Please select one answer per row.

Insert all 'I use it' modes from [modes_used] Same order as [modes_used]	Less than once a month	1-3 times a month	1-2 times a week	3 or more times a week
<Mode 1>				
<Mode 2>				
<Mode n>				

44. *[autonomous_aware]*

Which of the following best describes your familiarity with "autonomous" or "self-driving" (i.e. driverless) vehicles?

- I have never heard of them
- I have heard of them but am not familiar
- I have heard of them and am somewhat familiar
- I have heard of them and am very familiar

45. *[autonomous_att]*

IF 'Never heard of' or 'Not familiar' show text: Autonomous vehicles drive themselves, control all operations, and are even able to travel without a human inside. They would be connected to the Internet and able to communicate with users and other vehicles. This technology would allow riders to rest or perform other tasks while in the vehicle. Autonomous vehicles could also pick-up or drop-off people or things, fully operating without anyone inside.

For each of the following statements, please choose the response that best expresses your opinion about self-driving vehicles. Your impressions are important even if you're not sure about some of the topics mentioned.

RANDOMIZE	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
A self-driving vehicle would enable me to enjoy traveling more (e.g., watch scenery, rest).				
I would miss the joy of driving and being in control.				

I would accept longer travel times so the self-driving vehicle could drive at a speed low enough to prevent unsafe situations for pedestrians and bicyclists.				
I do not see a need for self-driving vehicles.				
I would reduce my time at the regular workplace and work more in the self-driving car.				
To confirm you're reading this, please select "strongly disagree" in this row.				
I would send an empty self-driving car to pick up/drop my child.				
I would be able to travel more often even when I am tired, sleepy, or under the influence of alcohol/medications.				

46. *[autonomous_hhveh]*

Now, consider your current situation with the vehicles your household now owns (if any), and imagine that driverless vehicles have become widely available for purchase. Which of the following scenarios best describes your household?

- We would be one of the first to buy a self-driving vehicle (either as a replacement or additional household vehicle)
- We would eventually buy a self-driving vehicle, but only after they are in common use
- We would wait as long as possible and try to avoid ever buying a self-driving vehicle

47. *[autonomous_rideshare]* ***IF HH Vehicles > 0***

In the future, companies (like today's Uber or Lyft) could operate a large fleet of driverless vehicles to provide on-demand ride-hailing services. When you and/or family members decide to make a trip, an app is used to notify the fleet.

If *on-demand driverless ride-hailing services were widely available today*, which of the following best describes how your household would use these services and how it would impact the vehicle(s) you currently own?

- Keep current vehicles and not use any driverless services
- Keep current vehicles, but also use these driverless services whenever needed or convenient

- Get rid of one (or more) household vehicles and use driverless ride-hailing services instead

48. *[autonomous_pooled]*

In some cases, driverless ride-hailing services may allow rides to be shared with strangers who are making similar trips. These shared rides are offered at lower cost than traditional un-shared rides.

Please choose the response that best expresses your opinion on the following statement:

"I would be unlikely to use shared driverless services (even at lower cost) because I would not want to share a vehicle with strangers."

- Strongly disagree
- Somewhat disagree
- Somewhat agree
- Strongly agree

49. *[autonomous_pref]*

Overall, what would be your relative interest in owning a driverless vehicle versus using on-demand ride-hailing services?

- Much more interested in owning a driverless vehicle
- Somewhat more interested in owning a driverless vehicle
- Somewhat more interested in using on-demand driverless services
- Much more interested in using on-demand driverless services

Section I: Demographics and VMT/Odometer Readings

50. *[housing]*

What type of housing do you live in?

- Single family house not attached to any other house
- Single family house attached to one or more houses (townhouse, duplex, triplex) each with separate entry
- A mobile home
- Building with 2-4 apartments/ condos / studios /rooms
- Building with 5-19 apartments/ condos / studios / rooms
- Building with 20 or more apartments/ condos / studios / rooms
- Boat, RV, Van, etc.
- Other, please specify: _____

51. *[solar]*

Do you currently have solar panels installed on your residence?

- Yes
- No

52. *[solar_future] If [solar] = 'No'*

Are you planning on purchasing solar panels for your residence within the next 5 years?

- Yes
- No

53. *[income]*

To make certain our survey represents all income groups in California could you select the range below that best represents your annual household income?

- Less than $9,999
- $10,000 to $24,999
- $25,000 to $34,999
- $35,000 to $49,999
- $50,000 to $74,999
- $75,000 to $99,999
- $100,000 to $149,999
- $150,000 to $199,999
- $200,000 to $249,999
- $250,000 or more
- Prefer not to answer

[if HH vehicles > 0] *[vmt_options]*

Finally, it is very important that we get accurate information about how much each vehicle in your household is driven. <u>If you choose to participate you will be required to go to each vehicle and read the odometer before completing the survey</u>.

In addition to the current odometer reading you have the option to report a previous reading from your vehicle records OR to be re-contacted in 2 months to give an updated odometer reading for each vehicle. Please make sure you choose an option that will work for ALL of your household's vehicles.

[if NOT panel] **If you agree to provide your odometer readings, you will be entered in a raffle to win one of two $50 Amazon or Walmart e-gift cards.**

Would you be willing to participate in this part of the study? Please select your preferred option below.

- *[if ALL HH vehicles > 1 year ownership]* Look back at maintenance records for previous odometer readings
- *[if ANY HH vehicles <= 1 year ownership]* Look back at purchase or maintenance records for previous odometer readings
- Report updated odometer readings two months from now
- I do not wish to participate in this part of the study

If [vmt_options] = ' Look back at records' or [vmt_options] = ' Report updated odometer readings in two months'

54. *[odometer_miles]*

What is the mileage on the odometer today?
Please enter the full number to the nearest mile (e.g. enter "20,250", NOT 20k or 20 thousand)

<vehicle_1 year make model>: _____ total miles on odometer today
<vehicle_2 year make model>: _____ total miles on odometer today
<vehicle_n year make model>: _____ total miles on odometer today

IF [vmt_options] = ' Report updated odometer readings in two months' and NOT Panel

55. *[odometer_email]*

Please provide us with an email that we can recontact you at for follow-up odometer readings.

email: _____ [prepopulate if previously gave email in *[contact_info]*] [force valid email]

If [vmt_options] = ' Look back at records'

56. *[Previous_odometer_miles_date]*

What is the previous odometer reading you found in your records?
Please enter the full number to the nearest mile (e.g. enter "20,250", NOT 20k or 20 thousand)

<vehicle_1 year make model>: _____ miles recorded on **[month] [day] [year] (3 separate drop downs)**
<vehicle_2 year make model>: _____ miles recorded on **[month] [day] [year] (3 separate drop downs)**
<vehicle_n year make model>: _____ miles recorded on **[month] [day] [year] (3 separate drop downs)**

[Month] List all 12 months
[Day] List days appropriate for month selected
[Year] List 2019 and all years back to vehicle purchase year

If [vmt_options] = ' Look back at records' and NOT Panel

57. *[Raffle_options]*

Would you like to be entered into the raffle to win one of two $50 Walmart or Amazon gift cards of your choosing?

Your email address will only be used if you are chosen for the prize.

- Yes, email: _____ *enforce a valid email address*
- No thanks

[if Not Panel]
[prize_ email] Thanks for participating in the survey! Before you finish, please enter an email address where we can send you a $15 electronic gift card from an online retailer of your choice.

Your email address will only be used to send along your prize.

- email: _____ *enforce a valid email address*
- No thanks

58. *[prize]* *If entered a valid email in [prize_email]*

Which online retailor would you like to have a $15 electronic gift card to spend at?
You should receive your prize at the email address you provided in three to four weeks from 'California Energy Commission'

1. Walmart
2. Amazon.com

59. *[comments]*

Thank you for participating!

If you have additional comments or suggestions either about the survey or the survey experience itself, please enter them in the box below and click the "Next" button.

Thanks again for completing the survey. All of your answers have been saved, you may now close your browser and exit the survey.

Appendix 2-B: Commercial Questionnaire

Outline

SURVEY SECTION	INFORMATION COLLECTED
SECTION A: SCREENER	**CHECKS BUSINESS TYPE, COUNTY, BUSINESS DETAILS**
SECTION B: FLEET INFORMATION	**FLEET SIZE, VEHICLE TYPES, VEHICLE PURCHASE INTENTIONS**
SECTION C: VEHICLE USE AND REFUELING	**CURRENT REFUELING SYSTEMS AND EXPECTED COST OF FUTURE INSTALLATIONS**
SECTION D: ALTERNATIVE FUEL VEHICLES	**ALTERNATIVE VEHICLE CONSIDERATION**
SECTION E: FUTURE MOBILITY CHOICES	**FULL DETAILS ON THE EXPECTED NEXT BUSINESS VEHICLE**
SECTION F: TRADEOFF EXERCISES	**INFORMATION ON THE VEHICLE TRADEOFF EXERCISES IN CONTAINED IN A SEPARATE DOCUMENT**
SECTION G: CURRENT VEHICLE INFORMATION	**DETAILS ON UP TO FIVE BUSINESS VEHICLES**
SECTION H: ODOMETER READING & CONTACT INFORMATION	**ODOMETER READING AND RESPONDENT CONTACT INFORMATION**

Section A: Screener

60. ***[intro]***

Welcome to the California Vehicle Survey of Commercial Vehicle Owners and Managers.

The purpose of this survey is to do research on light-duty commercial vehicles in California, to better understand:

1. **What vehicle types are being used, and how much they are driven; and**
2. **What vehicle choices are likely to be in the near future.**

Your answers will help the California Energy Commission, a State of California agency, understand and address your organization's vehicle and fuel needs now and in the future. The information you provide will be kept confidential by the California Energy Commission and RSG (the company that is collecting the survey data), based on the California Information Practices Act and the non-disclosure agreement between RSG and the Energy Commission. *(skip if Panel)* Complete this survey and you will have the option to receive a $40 e-gift card to spend at Amazon.com or Walmart.

Please use the **"Next"** button in the lower left-hand corner of the screen to go forward. To review and change a previous question, use "Previous" button. It is important that you do not use your web browser's "forward" or "back" buttons because your new answers will be lost.
Answering all of the questions will take approximately *30* minutes. *(skip if Panel):* If you can't finish the survey in one sitting, you can stop at any time and return to where you left off by re-entering your password on the survey website.
Please click **"Next"** to begin.

61. *[decision_maker]*

We are interested in learning about your company's light-duty vehicles (less than 10,000 pounds gross weight). Are you familiar with any of the following?

Select all that apply.

- ☐ The types and number of vehicles used in your organization
- ☐ How vehicle purchase decisions are made within your organization
- ☐ Neither [This clears other selections]

62. *[switch respondent] If "Neither"' on [decision_maker]*

This survey must be completed by a person familiar with the types of light-duty vehicles used by your company at this location. Please share the postcard or letter with someone more familiar with your company's vehicles so they have an opportunity to complete the survey. They may resume the survey using the same password. Thank you.

The next button on this page should return respondents to the [intro] page so they can proceed from the beginning again with the same password.

63. *[org type]*

Is your organization any of the following?

Select all that apply.

- ☐ Religious organization
- ☐ Non-profit organization
- ☐ For-profit organization
- ☐ Car rental company → [Disqualify]
- ☐ Taxicab company → [Disqualify]
- ☐ Government agency → [Disqualify]
- ☐ None of the above
- ☐ I don't know → [Disqualify]

64. [*zipcode*]

What is the zip code at your business's location?

_____ *[Must be 5 numbers]* → [Disqualify if not CA ZIP code]

65. *[county]*

Which county is your office or place of business located in?

Select county from list: ***<Drop down list of counties>***

60. Alameda County
61. Alpine County
62. Amador County
63. Butte County
64. Calaveras County
65. Colusa County
66. Contra Costa County
67. Del Norte County
68. El Dorado County
69. Fresno County
70. Glenn County
71. Humboldt County
72. Imperial County
73. Inyo County
74. Kern County
75. Kings County
76. Lake County
77. Lassen County
78. Los Angeles County
79. Madera County
80. Marin County
81. Mariposa County
82. Mendocino County
83. Merced County
84. Modoc County
85. Mono County
86. Monterey County
87. Napa County
88. Nevada County
89. Orange County

90. Placer County
91. Plumas County
92. Riverside County
93. Sacramento County
94. San Benito County
95. San Bernardino County
96. San Diego County
97. San Francisco County
98. San Joaquin County
99. San Luis Obispo County
100. San Mateo County
101. Santa Barbara County
102. Santa Clara County
103. Santa Cruz County
104. Shasta County
105. Sierra County
106. Siskiyou County
107. Solano County
108. Sonoma County
109. Stanislaus County
110. Sutter County
111. Tehama County
112. Trinity County
113. Tulare County
114. Tuolumne County
115. Ventura County
116. Yolo County
117. Yuba County
118. I don’t know

66. *[contact]* *(skip if Panel)*

Can you provide an email address and phone number for us to contact you?

Your personal contact information will only be used to provide technical assistance, survey completion reminders or to gather feedback about the questionnaire and your experience. We will not sell or distribute your email address for any commercial marketing purposes.

[name] Name *(optional)*:_____ [allow no answer]

[email] Email *(optional)*: _____ [allow no answer, enforce a valid email if text is entered]

[phonenum] Phone number (*optional*):

( ) - ext:

[allow no answer, enforce a valid phone # (area code +number)]

67. *[business_type]*

How would you describe the type of business activity or industry associated with your company?

Business type: [text box]

68. *[title]*

What is your title or role in the company?

Title: [text box]

69. *[cal_locations]*

About how many business locations, in total, does your company have in California?

Business locations in California: _____ [allow 1-500]

70. *[loc_amnt]* *If [cal_locations] > 1*

How many of these locations have company-owned commercial light-duty vehicles (less than 10,000 pounds gross weight) based there?

Locations with company owned commercial light-duty vehicles: _____ [allow 0 to value entered on [cal_locaitons]] ***If 0 disqualify***

71. *[employee_num]*

How many employees are there at the location where you work? Please include all shifts and all employees that work off-site but are based out of your location.

Number of employees: [allow 1-100,000]

Section B: Fleet Information

72. *[comm_veh]* **Does your organization have any vehicles that meet <u>ALL</u> of the requirements below?**

Vehicle Requirements:

- Must be based at your location
- Must be registered to a business or company
- Must be light-duty (weighing under 10,000lbs)
- Must be driven for business purposes 50% of the time or more

  - Yes, my organization has at least one vehicle that meets all of these requirements
  - No **-> FLAG, branch to *[fleet_personal], then disqualify***

IF has vehicle meeting requirements

73. *[vtype]* **What types of vehicles does your organization have that meet all of these requirements?**

Remember to focus only on vehicles that are:

- Based at your location
- Registered for business or commercial purposes
- Light-duty (weighing under 10,000lbs)
- Driven for business purposes 50% of the time or more

Please select all that apply.

- ☐ Car -> flag *has_cars*
- ☐ SUV/Crossover -> flag *has_SUV_X*
- ☐ Van/Minivan-> flag *has_Van*
- ☐ Pickup Truck -> flag *has_Pickup*
- ☐ None of these **-> FLAG, branch to *[fleet_personal], then disqualify***

IF has vehicle meeting requirements

74. *[ftype]* **What fuel types are the vehicles that meet these requirements?**

Remember to focus only on vehicles that are:

- Based at your location
- Registered to a business or company
- Light-duty (weighing under 10,000lbs)
- Driven for business purposes 50% of the time or more

Please select all that apply.

ONLY show vehicle types selected in [vtype]

<Cars>

- ☐ Gasoline (runs on gasoline only)
- ☐ Hybrid electric [HEV] (runs on gasoline)
- ☐ Flex fuel [E85/FFV] (runs on gasoline or E85)
- ☐ Plug-in hybrid electric [PHEV] (runs on gasoline and/or electricity)
- ☐ Diesel (runs on diesel and/or biodiesel fuel)
- ☐ Compressed natural gas [CNG] (runs on compressed natural gas)
- ☐ Battery electric [BEV] (runs on electricity only)
- ☐ Hydrogen fuel cell electric [FCEV]
- ☐ Other, please specify: _____

<SUVs/Crossovers>

- ☐ Gasoline (runs on gasoline only)
- ☐ …
- ☐ Other, please specify: _____

<Vans/Minivans>

- ☐ Gasoline (runs on gasoline only)
- ☐ …
- ☐ Other, please specify: _____

<Pickup Trucks>

- ☐ Gasoline (runs on gasoline only)
- ☐ …
- ☐ Other, please specify: _____

Respondents must select at least 1 fuel type for each vehicle type that's shown.

Error text: "You must select at least one fuel type for each category. If your business/organization doesn't own any vehicles within one of the categories shown please click the 'Previous' button and adjust your response to the last question."

IF has vehicle meeting requirements

75. *[veh_count]* **How many of each type of vehicle does your organization have which meet these requirements?**

Remember to focus only on vehicles that are:

- Based at your location
- Registered to a business or company
- Light-duty (weighing under 10,000lbs)
- Driven for business purposes 50% of the time or more

Please enter a value for each vehicle type listed.

ONLY show vehicle/fuel type selections from [ftype]

Number of <Gasoline> <Cars>_____
Number of <Hybrid electric [HEV]> <Cars>_____
Number of <Flex fuel [E85/FFV]> <Cars>_____
Number of <Plug-in hybrid electric [PHEV]> <Cars_____
Number of <Diesel> <Cars>_____
Number of <Compressed natural gas [CNG]> <Cars>_____ _____
Number of <Battery electric [BEV]> <Cars>_____
Number of <Hydrogen fuel cell electric [FCEV]> <Cars>_____
Number of <other fuel text><Cars>_____

Number of <Gasoline> < suv/crossover >_____
Number of ... _____
Number of <other fuel text> <suv/crossover >_____

Number of <Gasoline> < Vans/Minivans >_____
Number of ... _____
Number of <other fuel text> < Vans/Minivans >_____

Number of <Gasoline> <Pickup Trucks>_____
Number of …_____
Number of <other pickup truck text> <Pickup Trucks>_____

Total Number of Vehicles: <sum>

Respondents must enter a value >0 for every vehicle/fuel type shown

Error text: "You indicated that your business/organization has at least one of each of the vehicle types shown. If this is incorrect please click the 'Previous' button and adjust your response to the last question."

IF has vehicle meeting requirements

76. *[fleet_verify]* **Based on your responses there are/is <veh_sum> total vehicle(s) meeting all of the requirements below. Is this correct?**

Vehicle Requirements:

- Must be based at your location
- Registered to a business or company
- Must be light-duty (weighing under 10,000lbs)
- Must be driven for business purposes 50% of the time or more

  - Yes, this total is correct
  - No, bring me back so I can update my responses → branch back to [*comm_veh]*

77. *[fleet_personal]* **Does your organization have any vehicles meeting the requirements below that are driven for personal use over 50% of the time?**

Vehicle Requirements:

- Must be based at your location
- Registered to a business or company
- Must be light-duty (weighing under 10,000lbs)

  - Yes, we have _____ vehicles meeting these criteria that are driven for personal use over 50% of the time.
  - <if qualifying business vehicle> No, all of the vehicles meeting these criteria are used for business purposes 50% of the time or more.
  - <if No qualifying business vehicle> No, we don't have any vehicles meeting these requirements.

IF no vehicles are used for business 50% of the time or more disqualify at this point.

78. *[survey_focus]* **From this point forward we ask that you focus ONLY on light-duty vehicles registered and based in your location that are driven for business 50% of the time of more.**

For the remainder of the survey please focus ONLY on vehicles that are:

- Based at your location
- Registered to a business or company
- Light-duty (weighing under 10,000lbs)
- Driven for business purposes 50% of the time or more

Click next to continue.

79. *[fleet_mpg]* **IF veh_sum > 5**

About how many miles per gallon does the average vehicle in your fleet get? Please enter the expected city/highway combined average. For CNG, electric, and hydrogen vehicles, please provide the energy equivalent of a gallon of gasoline, or MPGe.

<Cars> _____ MPG/MPGe [text box allow 7-150]

<SUVs> _____ MPG/MPGe [text box allow 7-150]

<Vans> _____ MPG/MPGe [text box allow 7-150]

<Trucks> _____ MPG/MPGe [text box allow 7-150]

Section C: Vehicle Use and Refueling

Q22.1 *[refueling_parking]*
To improve our understanding of current and future energy use in California, we would like to learn more about how you use and refuel your vehicles.

Does your company have access to its own dedicated parking facilities where vehicles can be parked/stored (including overnight)?
Please select all that apply.

- ☐ Yes, at or near my location → **Flag as "on-location"**
- ☐ Yes, elsewhere [at other company owned location(s)] → **Flag as "other-location"**
- ☐ No → **Skip to [refueling_possible]**

Q22.2 *[refueling_infrastructure]* **Does your company currently have any onsite refueling capabilities (for example, gasoline, diesel or hydrogen pumps, electric vehicle recharging, etc.) at any of its dedicated parking facilities**?

Yes
No → **Go to [refueling_possible]**

Q22.3 *[refueling_types]* **If 'Yes' on [refueling_infrastrcutre]**
Which types of onsite refueling are currently available?

	<At or near my current location>	<At a company owned location elsewhere>
Gasoline		
Diesel		
Compressed Natural Gas (CNG)		
E85		
Level 1 (120 V) (standard outlet)	**Flag 'company charging'**	**Flag 'company charging'**
Level 2 (240 V)	**Flag 'company charging'**	**Flag 'company charging'**
DC Fast charger	**Flag 'company charging'**	**Flag 'company charging'**
Hydrogen	**Flag 'company hydrogen'**	**Flag 'company hydrogen'**

Q22.4 [refueling_possible] **IF 'No' on [refueling_infrastructure] or 'No' on [refueling_possible]**
Although your company's dedicated parking facilities do not currently have any on-site refueling, would it be physically possible to install onsite refueling/recharging in the future?

- Yes
- No
- Don't know

Q22.5 [refueling_future] **IF 'Yes' on [refueling_infrastructure] or 'Yes' on [refueling_possible]**

Does your company plan on purchasing/installing any new or additional refueling capabilities at your current location in the next 5 years?

Please select all that apply.

- ☐ Gasoline fueling capabilities
- ☐ Diesel fueling capabilities
- ☐ E85 fueling capabilities
- ☐ 120 V Level 1 Charger (standard outlet)
- ☐ 240 V Level 2 Charger
- ☐ DC Fast Charger
- ☐ Hydrogen fueling capabilities
- ☐ Compressed natural gas fueling capabilities
- ☐ None of the above

BRANCH TO ZEV NOW IF ANY PEVs or FCEVs ARE IN THE FLEET

Section D: Alternative Fuel Vehicles

[ZEV_intro]

In these next questions, we would like to ask you about your level of past exposure and experiences related to alternative fuel vehicles.

Alternative fuel vehicles include:

Hybrid electric vehicles (HEV): A gasoline vehicle with a small battery that is charged inside the car and does not plug in for charging the battery (e.g. Toyota Prius).

Plug-in hybrid electric vehicles (PHEV): A gasoline vehicle with a larger battery than HEVs that can plug into an electrical outlet to charge (e.g. Chevy Volt), allowing the vehicle to operate like a battery electric vehicle for a short distance (10-50 miles) and then operate on gasoline for a much longer distance (~300-400 miles).

Fully electric vehicles (also called a battery electric vehicle, or BEV): A vehicle that operates only on electricity, with a battery that charges by plugging into an electrical outlet at home, at work, or at a fast charge station (e.g. Nissan Leaf, Tesla).

Hydrogen fuel cell electric vehicles (FCEVs): A vehicle that uses hydrogen to generate its own electricity in a fuel cell (e.g. Toyota Mirai). Hydrogen is stored in a tank onboard the vehicle and can be filled up at a hydrogen station.

Along the way, you can review descriptions using the available information icons, should you decide to.

1. [*hybrid_experience*] *If flag_HEV is FALSE*

Has your company ever owned or leased any hybrid electric vehicles (HEVs)?

- Yes
- No

2. *[past_hybrid] If [hybrid_experience] = 'No'*

Which of the following best describes your past experience with HEVs?

I have…

- … driven an HEV.
- … not driven an HEV, but have ridden in one.
- … not driven/ridden in an HEV, but know people who own them.
- … noticed HEVs being driven or parked in my community.
- … little or no experience with HEVs

3. [*PHEV_experience*] *If flag_PHEV is FALSE*

Has your company ever owned or leased any plug-in hybrid electric vehicles (PHEVs)?

- Yes
- No

4. *[past_phev] If [phev_experience] = 'No'*

Which of the following best describes your past experience with PHEVs?

I have…

- … driven a PHEV.

- … not driven a PHEV, but have ridden in one.
- … not driven/ridden in a PHEV, but know people who own them.
- … noticed PHEVs being driven or parked in my community.
- … little or no experience with PHEVs.

5. [*PHEV_consideration*] *If [phev_experience] = 'No'*

Has your company ever *considered* purchasing light-duty PHEVs?

- Yes
- No
- Not Sure

6. *[PHEV_concerns] If flag_PHEV is FALSE*

Suppose you were considering purchasing/leasing plug-in hybrid electric vehicles (PHEVs) for use at your company. Please indicate your top concerns about these vehicles by selecting from the following list.

*Select **up to five** concerns…*
[Randomize list]

- ☐ Too expensive
- ☐ Limited seating capacity
- ☐ Limited hauling capacity
- ☐ Limited vehicle body/styling of vehicle:
- ☐ Battery life uncertainty
- ☐ Uncertain gasoline/electricity price
- ☐ Cost of installing charging infrastructure
- ☐ Lack of charging infrastructure outside the company
- ☐ Time to charge the battery
- ☐ Uncertain resale value
- ☐ Technology is still too new/unreliable
- ☐ Other, please specify: _____ *[anchor]*
- ☐ I don't have any concerns because I don't know enough about this technology *[anchor]*
- ☐ Nothing concerns me about this technology *[anchor]*

7. [*BEV_experience*] *If flag_BEV is FALSE*

Has your company ever owned or leased any fully electric vehicles (also called battery electric vehicles, or BEVs)?

- Yes
- No

8. *[past_bev] If [bev_experience] = 'No'*

Which of the following best describes your past experience with BEVs?

I have…

- … driven a BEV.
- … not driven a BEV, but have ridden in one.
- … not driven/ridden in a BEV, but know people who own them.
- … noticed BEVs being driven on streets or parked in my community.
- … little or no experience with BEVs.

9. *[BEV_consideration]* *If [bev_experience] = 'No'*
Has your company ever *considered* purchasing light-duty BEVs?

- Yes
- No
- Not Sure

10. *[BEV_concerns]* *If flag_BEV is FALSE*
Suppose you were considering purchasing/leasing Battery Electric Vehicle (BEVs) for use at your company. Please indicate your top concerns about these vehicles by selecting from the following list.

*Select **up to five** concerns.*
[Randomize list]

- ☐ Too expensive
- ☐ Limited driving range on the electric battery
- ☐ Limited seating capacity
- ☐ Limited hauling capacity
- ☐ Limited vehicle body/styling of vehicle
- ☐ Battery life uncertainty
- ☐ Uncertain gasoline/electricity price
- ☐ Cost of installing charging infrastructure
- ☐ Lack of charging infrastructure outside the company
- ☐ Time to charge the battery
- ☐ Uncertain resale value
- ☐ Technology is still too new/unreliable
- ☐ Fear of getting stranded on a job or route
- ☐ Other, please specify: _____ *[anchor]*
- ☐ I don't have any concerns because I don't know enough about this technology *[anchor]*
- ☐ Nothing concerns me about this technology *[anchor]*

11. [*FCEV_experience*] *If flag_FCEV is FALSE*
Has your company owned or leased any hydrogen fuel cell electric vehicles (also called fuel cell electric vehicles, or FCEVs)?

- Yes
- No

12. *[past_fcv]* *If [fcv_experience] = 'No'*
Which of the following best describes your past experience with FCEVs?
I have…

- … driven an FCEV
- … not driven a FCEV, but have ridden in one
- … not driven/ridden in a FCEV, but know people who own them
- … noticed FCEVs being driven on streets or parked in my community
- … little or no experience with FCEVs.

13. *[fcev_consideration] If [fcv_experience] = 'No'*
Has your company ever *considered* purchasing light-duty FCEVs ?

- Yes
- No
- Not Sure

14. *[FCEV concerns] If flag_FCEV is FALSE*
Suppose you were considering purchasing/leasing hydrogen fuel cell electric vehicles (FCEVs) for use at your company. Please indicate your top concerns about these vehicles by selecting from the following list.

*Select **up to five** concerns…*
[Randomize list]

- ☐ Too expensive
- ☐ Limited seating capacity
- ☐ Limited hauling capacity
- ☐ Limited vehicle body/styling of vehicle
- ☐ Safety of hydrogen tank
- ☐ Uncertain gasoline/hydrogen price
- ☐ Cost of installing fueling equipment at your work location
- ☐ Lack of fueling infrastructure outside your work location
- ☐ Uncertain resale value for vehicle
- ☐ Technology is still too new/unreliable
- ☐ Other, please specify: _____ *[anchor]*
- ☐ I don't have any concerns because I don't know enough about this technology *[anchor]*
- ☐ Nothing concerns me about this technology *[anchor]*

15. *[charge_spots] If flag_phev is FALSE and flag_bev is FALSE*

Plug-in vehicles such as BEVs or PHEVs have batteries that are recharged with electricity from electrical outlets or charging stations. Some people have charging options at home where they park their vehicles. However, vehicles can also be recharged away from home in public parking facilities, or at the workplace using chargers like those in the picture to the right.

Have you seen electric vehicle charging spots in any of the parking facilities that you frequent?

- No, I haven't seen any.
- Yes, in one place.
- Yes, in a few places.
- Yes, in several places.
- I'm not sure whether I've seen any or not.

16. *[fcv_station_awareness]* *If flag_fcev is FALSE*

Hydrogen fuel cell vehicles (FCEVs) use hydrogen as their fuel. Are you aware of any hydrogen refueling stations in your region?

- Yes
- No
- Don't know

Info button text **:**

Hybrid electric vehicle (HEV): A gasoline vehicle with a small battery that is charged inside the car and does not plug in for charging the battery (e.g. Toyota Prius).

Plug-in hybrid electric vehicle (PHEV): A gasoline vehicle with a larger battery than HEVs that can plug into an electrical outlet to charge (e.g. Chevy Volt), allowing the vehicle to operate like a battery electric vehicle for a short distance (10-50 miles) and then operate on gasoline for a much longer distance (~300-400 miles).

Fully electric vehicle (also called a battery electric vehicle, or BEV): A vehicle that operates only on electricity, with a battery that charges by plugging into an electrical outlet at home, at work, or at a fast charge station (e.g. Nissan Leaf, Tesla).

Hydrogen Fuel Cell Electric Vehicles (FCEVs): A vehicle that uses hydrogen to generate its own electricity in a fuel cell (e.g. Toyota Mirai). Hydrogen is stored in a tank onboard the vehicle and can be filled up at a hydrogen station.

Section E: Future Mobility Choices

17. *[replacement]*

In this next section, we would like to explore what types of vehicles might be purchased/leased for your organization in the future.

Considering your current situation, which of the following best describes your company's next purchase/lease decision for light-duty vehicles (cars, SUVs/crossover, vans/minivans, or pickup trucks)?

The next vehicle(s) will most likely be…

- a replacement for one or more current vehicles
- additional vehicle(s) for the fleet
- our company is unlikely to ever obtain any other vehicles

18. *[replacement_vehicle]* *If 'a replacement for one or more current vehicles in the fleet' in [replacement] and multiple fuel/vehicle types*

Which type of vehicle in your fleet would is most likely to be replaced next?

- <fuel type> <vehicle type> 1
- <fuel type> <vehicle type> 2
- <fuel type> <vehicle type> n

19. *[purchase_timing]* *If NOT 'our company is unlikely to ever obtain any other vehicles.' In [replacement]*

When is this purchase or lease most likely to occur?

- Less than 1 year
- 1 to 2 years
- 3 to 5 years
- 6 to 10 years
- More than 10 years

20. *[mpg_replace]* *If NOT 'additional vehicle(s) for the fleet' and 'our company is unlikely to ever obtain any other vehicles.' In [replacement]*

Please consider one of your current vehicles that is most likely to be replaced. About how many miles per gallon (MPG or MPGe) does it get?

Please enter the city/highway combined average. For CNG, electric, and hydrogen vehicles, please provide the energy equivalent of a gallon of gasoline, or MPGe.

_____ MPG or MPGe [text box allow 7-150]

21. *[info display1] IF [purchase timing] < 3 years*

For the next set of questions, please assume that the purchase/lease decision being considered will occur in the year 2021. → flag dce_year = 2021

[info display2] IF [purchase timing] >= 3 years

For the next set of questions, please assume that the purchase/lease decision being considered will occur in the year 2025. → flag dce_year = 2025

22. *[info display3] If 'our company is unlikely to ever obtain any other vehicles.' In [replacement]*

Although you have indicated that you are unlikely to be purchasing or leasing a vehicle in the future, we are still interested in your opinions (should you change your mind).

For the next set of questions, we are going to ask you to assume that you have decided to purchase or lease a vehicle for your company in the year <*randomly assign 2021 or 2025*>. → flag dce_year = <2021 or 2025>

23. *[info display4] [Combine this with whichever previous info display (1, 2, or 3) was identified.]*

At that time a wide range of vehicle types may be more available than today, including plug-in vehicles (BEVs and PHEVs) as well as hydrogen fuel cell vehicles (FCVs), in both the new and used vehicle markets. Vehicles may (or may not) have improved on features such as range, recharging/refueling time, and purchase price.

Similarly, there may be a greater number and availability of recharging stations for BEVs and PHEVs, and hydrogen refueling stations than there are today.

In the next questions, we would like you to identify which vehicle/fuel types you would seriously *consider* purchasing or leasing, assuming their features turn out to be acceptable.

24. *[vehicletype_consideration]*

First, laying aside such issues as new versus used, specific make/model, price range, etc., which of the following vehicle types are you most likely to consider purchasing in <dce year>.

Please select up to four. Must select at least one vehicle type.

- ☐ Subcompact Car
- ☐ Compact Car
- ☐ Midsize Car
- ☐ Large Car
- ☐ Sports Car
- ☐ Subcompact Crossover
- ☐ Compact Crossover
- ☐ Midsize Crossover/SUV

☐ Large SUV
☐ Small Van
☐ Full-size/large Van
☐ Small Pickup Truck
☐ Full-size/large Pickup Truck

Vehicle Class Definitions & Examples:

- *Subcompact Car: Such as, Ford Fiesta, Fiat 500e, Mini Cooper, Toyota Yaris*
- *Compact Car: Such as, Chevrolet Volt, Ford Focus, Honda Civic, Toyota Prius, Volkswagen Jetta*
- *Midsize Car: Such as, Ford Fusion, Honda Accord, Nissan Altima, Tesla Model 3, Toyota Camry*
- *Large Car: Such as, Chevrolet Impala, Chrysler 300, Hyundai Sonata, Subaru Outback, Tesla Model S*
- *Sports Car: Such as, BMW i8, Chevrolet Corvette, Ford Mustang, Mazda MX-5 Miata, Porsche 911*
- *Subcompact Crossover: Such as, Buick Encore, Ford EcoSport, Honda HR-V, Nissan Juke, Toyota C-HR*
- *Compact Crossover: Such as, Honda CR-V, Mazda CX-5, Nissan Rogue, Tesla Model X, Toyota Rav4*
- *Midsize Crossover/SUV: Such as, Ford Explorer, Honda Pilot, Kia Sorento, Nissan Pathfinder, Toyota Highlander*
- *Large SUV: Such as, Chevrolet Suburban, Ford Expedition, Lincoln Navigator*
- *Small Van (Minivan): Chrysler Pacifica, Kia Sedona, Honda Odyssey, Nissan Quest, Toyota Sienna*
- *Full-size/large Van: Such as, Chevrolet Express 1500, Ford Transit, Mercedes-Benz Sprinter, Nissan NV Cargo*
- *Small Pickup Truck: Such as, Chevrolet Colorado, GMC Canyon, Nissan Frontier*
- *Full-size/large Pickup Truck: Chevrolet Silverado, Ford F-Series, Nissan Ridgeline, Toyota Tacoma*

25. *[fueltype_consideration]*

For each vehicle type your company is considering, which of the following fuel types will be considered in *<dce year>***.**

Fill in rows from answers chosen in [vehicletype_consideration]	Gasoline only	Gas HEV	PHEV (gas/elec)	Diesel	BEV (electric only)	FCEV (hydrogen only)	PFCEV (hydrogen/elec)	Flex Fuel
Vehicle type 1	☐	☐	☐	☐	☐	☐	☐	☐

Vehicle type 2	☐	☐	☐	☐	☐	☐	☐	☐
…	☐	☐	☐	☐	☐	☐	☐	☐
Vehicle type 4	☐	☐	☐	☐	☐	☐	☐	☐

Vehicle Fuel Definitions

Powertrain	***Fuel(s) Used***	***Description of Vehicle***
Gasoline vehicle	*-Gasoline*	*A vehicle that operates on gasoline only and has no hybrid components.*
Hybrid Electric vehicle (HEV)	*-Gasoline*	*A gasoline vehicle with hybrid components to increase fuel economy (e.g. Toyota Prius), but does not plug in for charging the battery.*
Plug-in Hybrid Electric vehicle (PHEV)	*-Gasoline* *-Electricity*	*A gasoline vehicle with hybrid components and a battery that can be charged directly (e.g. Chevrolet Volt) which allows the vehicle to operate like a battery electric vehicle for a short distance (10-40 miles) and then operate on gasoline for longer distances (~300-400 miles).*
Flex Fuel vehicle (E85 FFV)	*-Gasoline* *-E85*	*A vehicle that will operate on gasoline, ethanol, or any blend of the two fuels and has no hybrid components.*
Diesel vehicle	*-Diesel*	*A vehicle that operates on diesel or biodiesel only and has no hybrid components.*
Battery Electric vehicle (BEV)	*-Electricity*	*A vehicle that operates on a battery only and charges by plugging in at home or at a station (e.g. Nissan Leaf).*
Hydrogen Fuel Cell Electric vehicle (FCEV)	*-Hydrogen*	*A vehicle that uses hydrogen to generate its own electricity in a fuel cell (e.g. Toyota Mirai). Hydrogen is stored in a tank onboard the vehicle and can be filled up at a hydrogen station.*
Plug-in Fuel Cell Electric vehicle (PFCEV)	*-Hydrogen* *-Electricity*	*A fuel cell electric vehicle with a battery that can be recharged directly from an electrical outlet or charging station. This vehicle can be powered by hydrogen fuel or electricity.*

26. *[new/used]*

For each vehicle/fuel types you are considering in <dce_year>, which vehicle age and brand type would you most likely consider?

Brand type consists of standard brands and premium brands. Standard brands have more affordable vehicles; whereas, premium brands offer high-end, luxury vehicles. Please select the information (i) to see which brands are classified as standard or premium.

Price ranges shown indicate purchase price.

	Standard Make/Brand			Premium Make/Brand		
	New	**Used (2-3 Years)**	**Used (4-6 Years)**	**New**	**Used (2-3 Years)**	**Used (4-6 Years)**
Vehicle 1	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*
Vehicle 2	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*
…	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*
Vehicle 32	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*	○ *(Price Range)*

Note: Vans and pickup trucks cannot be premium

Standard/Premium info button:

Standard Makes		**Premium Makes**
Buick	Pontiac	Acura
Chevrolet	Saturn	Audi
Chrysler	Smart	BMW
Dodge	Subaru	Cadillac
Ford	Suzuki	Hummer
GMC	Toyota	Infiniti
Honda	Volkswagen	Jaguar
Hyundai		Land Rover
Jeep		Lexus
Kia		Lincoln
Mazda		Mercedes-Benz
Mercury		Porsche
Mini		Saab
Mitsubishi		Tesla
Nissan		Volvo

Section F: Tradeoff Exercises

27. [*cbc intro*]

Thank you for your answers so far!

For the next part of the survey, we have created sets of vehicle choices for you with each set including four vehicles. Please carefully review the features for each of the vehicles and select the ONE vehicle you would most likely buy or lease for your business. Please choose one vehicle from each set of options.

We understand that some of the combinations of features and fuel types may not currently exist. For these hypothetical vehicle options, please assume the combinations of features do exist and you could buy any of the vehicles presented to you.

Some features that you may find important are not listed here, such as warranty, safety, technology and entertainment features, etc. Please assume that these features are identical across the four vehicles and only focus on the features that are listed when making your decision.

We also understand that the vehicles offered may not completely suit your business needs. For the purpose of this study, please assume the four vehicles on each page are the only four available and you must buy one.

You will see that each feature has an information icon next to it. If you click on the you will see a definition. It is important that you take some time to read and consider the definitions of any unfamiliar terms before answering any questions.

Section G: Current Vehicle Information

- ☐ If the respondent has less than or equal to 5 business vehicles we ask them about all business vehicles (must be used over 50% for business)
- ☐ If respondent has more than 5 vehicles and exactly 5 body type, fuel type combinations then we ask about each body type, fuel type combo
- ☐ If the respondent has more than 5 vehicles and less then 5 body type, fuel type combinations, then we ask about each combination and then the combinations that have a higher proportion of vehicles
    - Example if there are 15 gas vans, 10 gas truck and 1 electric car, then we ask the respondent about the electric car, 2 gas vans and 2 gas trucks
    - Step one: select one vehicle from each combination
    - Step two: Calculate which additional vehicle(s) we will ask about
        - Need to calculate proportionally
        - ((5 vehicle set) – (# of fuel type/body type combinations)) * (# of vehicles in that fuel/type body type combination)

Fuel/body type combinations (a)	# of vehicles (b)	Fleet proportions (c) = (b)/(sum(b))	Number of additional vehicles needed (d) = 5 - count(a)	Additional vehicles we should ask about (c)*(d)
gas vans	15	58%	2	1
gas truck	10	38%	2	1
electric car	1	4%	2	0

- ☐ If the respondent has more than 5 vehicles and more than 5 body type fuel type combinations, then we ask about all different body type fuel type combinations, and choose them based on which combination has the most vehicles
    - For example if we had 15 gas vans, 10 gas trucks, 6 hybrid SUVs, 2 hydrogen compact cars, 2 gas subcompact cars and 2 electric large car; then we would ask the respondent about one of their gas vans, one of their gas trucks, one of their hybrid SUVs and then randomly select 2 fuel type/body type combinations from the gas subcompact car, electric car and hydrogen car.

28. *[vehicle_details_intro]*

For the next part of this survey we'd like to know some additional information about your current vehicles to help us better understand energy usage by light-duty commercial vehicles in California.

In the table below we have listed the types of vehicles in your organization we would like to know more about.

Vehicle 1 fuel type	**Vehicle 1 body type**
Vehicle 2 fuel type	**Vehicle 2 body type**
Vehicle 3 fuel type	**Vehicle 3 body type**
Vehicle 4 fuel type	**Vehicle 4 body type**
Vehicle 5 fuel type	**Vehicle 5 body type**

29. *[vehicle_details_intro]*

If only have 1 <fuel type> <vehicle type> in fleet:
Please tell us about the <fuel type> <vehicle type> in your fleet.
If fleet has > 1 <fuel type> <vehicle type> in fleet:
Please tell us about one of the <fuel type> <vehicle type> in your fleet.
Please choose a particular vehicle from that group that is most similar to the other vehicles in that class and answer the following questions for that particular vehicle.

[year]
Model Year :

[make]
Make :

[model]
Model :

[type]
Vehicle type :

Variable	Values
[year]	*"2019" to "1980 or earlier"*
[make]	*See vehicle database*
[model]	*See vehicle database*
[veh_type]	*See vehicle database* • Subcompact car • Compact car • Midsize car • Large car • Sports car • Cross-over, small • Cross over, midsize

	• SUV small/midsize • SUV full-size/large • Pick-up truck, small • Pick-up truck, full-size/large • Van, small • Van, full-size/large

Info Text:

[year] *info text*

Model year describes approximately when the manufacturer produced the vehicle. It may or may not match the year that you purchased the vehicle.

[make] *info text*

Vehicle make is the manufacturer name or brand of the vehicle.

[model] *info text*

A car model is the name used by a manufacturer to market a range of similar cars.

[fuel] *info text*

Fuel Type	***Description of Fuel Type***
Gasoline vehicle	*A vehicle that operates on gasoline only and has no hybrid components.*
Hybrid Electric vehicle (HEV)	*A gasoline vehicle with hybrid components to increase fuel economy (e.g. Toyota Prius), but does not plug in for charging the battery.*
Plug-in Hybrid Electric vehicle (PHEV)	*A gasoline vehicle with hybrid components and a battery that can be charged directly (e.g. Chevrolet Volt) which allows the vehicle to operate like a battery electric vehicle for a short distance (10-40 miles) and then operate on gasoline for longer distances (~300-400 miles).*
Flex Fuel vehicle (E85 FFV)	*A vehicle that will operate on gasoline, ethanol, or any blend of the two fuels and has no hybrid components.*
Diesel vehicle	*A vehicle that operates on diesel or biodiesel only and has no hybrid components.*
Battery Electric vehicle (BEV)	*A vehicle that operates on a battery only and charges by plugging in at home or at a station (e.g. Nissan Leaf).*
Hydrogen Fuel Cell Electric vehicle (FCEV)	*A vehicle that uses hydrogen to generate its own electricity in a fuel cell (e.g. Toyota Mirai). Hydrogen is stored in a tank onboard the vehicle and can be filled up at a hydrogen station.*

[veh_type] *info text*

Vehicle Class Definitions:

- *Subcompact Car: Ford Fiesta, Fiat 500e, Mini Cooper, Toyota Yaris*
- *Compact Car: Chevrolet Volt, Ford Focus, Honda Civic, Toyota Prius, Volkswagen Jetta*
- *Midsize Car: Ford Fusion, Honda Accord, Nissan Altima, Tesla Model 3, Toyota Camry*
- *Large Car: Chevrolet Impala, Chrysler 300, Hyundai Sonata, Subaru Outback, Tesla Model S*

- *Sports Car: BMW i8, Chevrolet Corvette, Ford Mustang, Mazda MX-5 Miata, Porsche 911*
- *Subcompact Crossover: Buick Encore, Ford EcoSport, Honda HR-V, Nissan Juke, Toyota C-HR*
- *Compact Crossover: Honda CR-V, Mazda CX-5, Nissan Rogue, Tesla Model X, Toyota Rav4*
- *Midsize Crossover/SUV: Ford Explorer, Honda Pilot, Kia Sorento, Nissan Pathfinder, Toyota Highlander*
- *Large SUV: Chevrolet Suburban, Ford Expedition, Lincoln Navigator*
- *Small Van (Minivan): Chrysler Pacifica, Kia Sedona, Honda Odyssey, Nissan Quest, Toyota Sienna*
- *Full-size/large Van: Chevrolet Express 1500, Ford Transit, Mercedes-Benz Sprinter, Nissan NV Cargo*

Current Vehicle Details

30. *[current vehicle info]*

Next, we would like to get some additional information on your current vehicles.

Please complete the form below focusing on the <vehicle x year> <vehicle x make> <vehicle x model>.

Vehicle <x> of <n> vehicles

[how_acquired]
How was this vehicle obtained?

[acquired_year]
What year was this vehicle acquired?

[acquired_month] If 2019 or 2018 in [acquired_year]
What month was this vehicle acquired?

[annual_mileage]
How many miles per year is this vehicle driven? (please give us your best estimate)
Text box entry – Allow 0 to 500,000
IF <1,000 or >50,000 show warning
Warning text: "You've entered a value outside the typical annual millage for most vehicles. Please verify you've entered the correct number. Make sure you enter the full number (e.g. for ten thousand miles enter 10,000, not 10)."
[electric_miles] If PHEV
Approximately what percentage of annual miles use electric only mode? _____
Text box entry – Allow 0 to 100%
[MPG]
About how many miles per gallon (MPG or MPGe) does this vehicle get?

Info button text: Please enter the expected city/highway combined average. For CNG, electric, and hydrogen vehicles, please provide the energy equivalent of a gallon of gasoline, or MPGe, if that is easier.

[text box allow 7-150]

[current_use]
What is this vehicle primarily used for?

[tnc_replacement]
Could this vehicle be replaced by using ride-hailing (Uber/Lyft) services?

[delivery_replacement]
Could this vehicle be replaced by using "delivery-hailing" services (e.g. Amazon Flex, Instacart)?

[veh_home]

Is this vehicle often taken to your (or another employee's) home overnight?

[personal_use] *If yes in [veh_home]*
Can this vehicle be used for personal use unrelated to the business?

[personal_miles] *If yes in [personal_use]*
What portion of the miles driven using this vehicle are for personal use?
Text box entry – Allow 0 to 50%
[HV_replacement] *If gas/flex or phev or diesel*
If this vehicle were replaced by an electric or hydrogen vehicle, what would be the minimum range (in miles) required for it to meet your business needs?
Text box entry – Allow 10 to 1000
[fcev_fuel_cost] *If hydrogen (FCEV) vehicle*
Was free hydrogen fuel included in the purchase or lease of this vehicle from the manufacture or dealer?

Variable	Values (for dropdowns)
[how_acquired]	• Purchased new • Leased new • Purchased used or previously owned • Leased used or previously owned • Other (e.g. gifted or inherited)
[acquired_year]	• IF Used: 2019 to <model year -2 or 1980 or earlier> • IF New: <Model year +2> to <model year -2 or 1980 or earlier>
[acquired_month]	• January • February • March • April • May • June • July • August • September • October • November • December
[current_use]	• Delivery/Pick Up • Employee / Customer Transportation • Making Sales Calls • Making Service Calls • Transporting Materials or Equipment • Some other purpose, please specify show text box

[tnc_replacement]	• Yes • No
[delivery_replacement]	• Yes • No
[veh_home]	• Yes • No
[personal_use]	• Yes • No
[fcev_fuel_cost]	• Yes • No

[mpg] *info text*
MPGe, or miles per gasoline gallon equivalent, is a measure of the average distance traveled per unit of energy consumed. It is used to compare energy consumption of alternative fuel vehicles and plug-in electric vehicles with conventional fuel (gasoline/diesel) vehicles.

Section H: Odometer Reading and Contact Information

Odometer Reading

Finally, it is very important that we get accurate information about how much each vehicle in your fleet is driven. We will be using this information to predict vehicle use and fuel consumption by commercial fleets in California.

<u>If you choose to participate in this portion you will be required to go to each vehicle and read the odometer before completing the survey.</u>

In addition to the current odometer reading you have the option to report a previous reading from your vehicle records OR to be re-contacted in 2 months to give an updated odometer reading for each vehicle. Please make sure you choose an option that will work for ALL of the vehicles you provided details on in the previous section.

[if NOT panel] **If you agree to provide your odometer readings, you will be entered in a raffle to win one of two $50 Amazon or Walmart e-gift cards.**

- *[if ALL vehicles > 1 year ownership]* Look back at maintenance records for previous odometer readings
- *[if ANY vehicles <= 1 year ownership]* Look back at purchase or maintenance records for previous odometer readings
- Report updated odometer readings two months from now
- I do not wish to participate in this part of the study

If [vmt_options] = ' Look back at records' or [vmt_options] = 'Report updated odometer readings in two months'

31. *[odometer_miles]*

What is the mileage on the odometer today?

Please enter the full number to the nearest mile (e.g. enter "20,250", NOT 20k or 20 thousand)

<vehicle_1 year make model>: _____ total miles on odometer today
<vehicle_2 year make model>: _____ total miles on odometer today
<vehicle_n year make model>: _____ total miles on odometer today

32. *[Previous_odometer_miles_date] if [vmt_options] = ' Look back at records'*

What is the previous odometer reading you found in your records?

Please enter the full number to the nearest mile (e.g. enter "20,250", NOT 20k or 20 thousand)

<vehicle_1 year make model>: _____ miles recorded on **[month] [day] [year] (3 separate drop downs)**
<vehicle_2 year make model>: _____ miles recorded on **[month] [day] [year] (3 separate drop downs)**
<vehicle_n year make model>: _____ miles recorded on **[month] [day] [year] (3 separate drop downs)**

If [vmt_options] = ' Look back at records' and NOT Panel

33. *[Raffle_options]*

Would you like to be entered into the raffle to win one of two $50 Walmart or Amazon gift cards of your choosing?

Your email address will only be used if you are chosen for the prize.

- Yes, email: _____ *enforce a valid email address*
- No thanks

End / Contact Information

34. *[comments]*
If you have any comments or suggestions about the content of the survey or the survey experience itself, please enter them in the box below:

35. *[incentive_contact]* *Skip if Panel*
Thanks for participating in the survey! Before you finish, please enter an email address where we can send you a $40 electronic gift card from an online retailer of your choice. Your email address will only be used to send along your prize.

- email: _____ - *enforce a valid email address*
- No thanks *– send to [end]*

36. *[prize]*
Which online retailor would you like to have a $40 electronic gift card to spend at?
You should receive your prize at the email address you provided in three to four weeks from 'California Energy Commission'

- Walmart
- Amazon.com

37. *[end]*
Thank you for participating! Your responses will help the California Energy Commission understand the future vehicle needs of California businesses and residents. If you have any questions about the survey, please email us at info@cavehiclesurvey.org.

Appendix 2C: ZEV Questionnaires

ZEV selection priority:

1. *FCEV*
2. *BEV*
3. *PHEV*

IF there are multiple vehicles tied for highest priority, select the vehicle which respondent indicated they were primary driver of in [primary_driver].

IF there are multiple vehicles tied for highest priority with the same primary driver status, let respondent choose between the tied vehicles.

[pev_choice] **Please choose a vehicle you are most familiar with:**

- Year make model 1
- Year make model 2
- Year make model n

Residential PEV Owner Questions

Your Plug-in Vehicle

[PEV Intro]
The next questions are specifically about your <year> <make> <model> Plug-in Electric Vehicle (*PEV*), including how it is driven.

IF *[primary_driver]* is NOT "I am the primary driver": Earlier, you indicated that *[primary_driver]* is the primary driver of the *PEV*. Even though you may not be the primary driver, it is very important to us that you complete this survey. Please answer the questions as best you can, perhaps asking *[primary_driver]* for help *if it is convenient to do so*.

Show banner for remainder of PEV survey: Please focus on your <Year> <Make> <Model>.

1. *[pev_miles]*
   About how many miles is your *PEV* driven in a typical week/month?
   _____ Miles per
   - Week
   - Month

2. *[phev_percent]* IF PHEV
What percentage of these miles is driven using gasoline?

_____ percent of miles on gasoline

3. *[battery_miles]*
IF BEV: How far can your *PEV* be driven when starting with a fully-charged battery (on average)?

IF PHEV: When starting with a fully-charged battery, how far can your *PEV* be driven on *electricity only*?

_____ Miles *Allow > 0 and < 500*

4.5 *[recharge_amount] IF BEV*
When recharging your *<year> <make> <model>* *how* much charge is typically left when you plug in (your best estimate)?

- When the low battery light comes on
- 1/8 of a full charge
- ¼ of a full charge
- ½ of a full charge
- More than ½ of a full charge

4. *[home_charge]*
Do you have the capability of recharging your *PEV* when it is parked at home?

- Yes
- No

5. *[home_charge_type] IF [home_charge] is 'Yes'*

Depending on where you live, your options for recharging while *parked at home* might vary. We would like to know about the recharging options available to you. Which of the following types of parking can you use while recharging *at home*?

Please select all that apply.

1. Attached garage.
2. Detached garage.
3. Carport (covered, not fully enclosed).
4. Driveway (not covered).
5. A parking spot on the street.
6. Assigned parking in lot or garage.
7. Unassigned parking in lot or garage.
8. Other _____.

6. *[charging_tech] IF [home_charge] is 'Yes'*

Which of the following charging technologies are available at the location(s) you selected?

	Level 1 (120 V) (Household outlet)	Level 2 (240 V)	Direct Current (DC) fast charger
[home_charge_type] 1	☐	☐	☐
[home_charge_type] 2	☐	☐	☐
[home_charge_type] n	☐	☐	☐

7. *[primary_charge] IF there are multiple options from [charging_tech]*

Which of the following do you use most often?

- [charging_tech] 1
- [charging_tech] 2
- [charging_tech] n

8. *[electric_expense] IF [home_charge] is 'Yes'*

Did you incur any expense to upgrade your electrical system to support recharging your *PEV*? Please select the following which best describes your upgrade expenses.

- Yes, at 100% expense to my household.
- Yes, with some or all expense covered by a subsidy.
- No, it was already installed for a vehicle we owned previously (all at our expense).
- No, it was already installed for a vehicle we owned previously (with some or all expense covered by a subsidy).
- No, it was already installed by someone else (e.g., prior occupant).
- No, we did not upgrade the existing electrical system.
- Other: _____.

8.5. *[upgrade_cost] IF 'Yes' in [electrical expense]*
About how much did you spend on installation of the charging system?
$_____ *Allow > 0 and < $10,000*

9. *[weekday_charging] IF [home_charge] is 'Yes'*
During a *typical week*, how often do you plug your *PEV* in *at home* during the following times over *all five weekdays* (Monday through Friday)? (Your best estimate, and please make a choice in each row.)

	Never	Less than once a week	1 or 2 times per week	3 or 4 times per week	Daily
Morning (7 am to noon)	○	○	○	○	○
Afternoon (noon to 6 pm)	○	○	○	○	○
Evening (6 pm to 11 pm)	○	○	○	○	○
Overnight (11 pm to 7 am)	○	○	○	○	○

10. *[weekend_charging] IF [home_charge] is 'Yes'*
During a typical week, how often do you plug your PEV in at home during the following times over a two-day weekend (Saturday and Sunday)? (Your best estimate, and please make a choice in each row.)

	Never	Less than 1 time	1 time	2 times	3 or more times
Morning (7 am to noon)	○	○	○	○	○
Afternoon (noon to 6 pm)	○	○	○	○	○
Evening (6 pm to 11 pm)	○	○	○	○	○
Overnight (11 pm to 7 am)	○	○	○	○	○

[electricity_intro] **Next, we have a few questions about the electricity you use at home. Electricity providers frequently offer multiple types of rate plans.**

One type is called *Time-of-Use* (TOU) where the basic rate can vary depending on the time of day, and also the time of year. Electricity on a TOU plan is typically more expensive during *peak hours* when demand is high (for example, noon to 6 pm for May through October), and less expensive at other times (so-called *off-peak* or *partial-peak times*).

11. [variable_rates] IF [home_charge] is 'Yes'
Does your electricity provider offer different rates for peak and non-peak usage?

- Yes
- No
- Not sure/Don't know

11. [variable_rates_usage] IF [variable_rates] is 'Yes'
If your electricity provider offers different rates for peak and non-peak usage, do you take advantage of this program?

- Yes
- No

12. *[ev_rate] IF [home_charge] is 'Yes'*
Do you receive a special rate from your provider for charging electric vehicles?

- Yes, and it applies to all my electricity usage
- Yes, but it only applies to what is used on a separate EV meter
- No
- Not Sure/Don't Know

13. *[charge_cost] IF [home_charge] is 'Yes'*
How much do you pay (in cents per kilowatt-hour) to charge your *PEV at home*? (Your best estimate. If you don't know, you may leave this blank.)

_____ cents per kilowatt-hour (kWh) *Allow > 0 and < 100*

- Don't know

14. *[determine_cost] IF [charge_cost] is NOT null*
How did you determine your answer to the cent-per-kilowatt-hour question?

- I knew this off the top of my head
- I looked at a bill (or asked someone in our household).
- I made a rough guess

15. *[home_importance] IF [home_charge] is 'Yes'*
When deciding to purchase your *PEV*, how important was the *availability* of *home recharging*?

- Not at all important
- Slightly Important
- Moderately Important
- Very Important
- Extremely Important

Work/School Recharging

16. *[park_work_school]*
Many owners of plug-in vehicles use them for driving to work and/or to attend school, and park them there for extended periods of time. How often is your *PEV* parked at a work or school location in a typical week?

- Never
- Less than once a week
- 1 or 2 times per week
- 3 or 4 times per week
- 5 or 6 times per week
- Daily

17. *[recharge_stations]* *If [park_work_school] is NOT 'Never'*
Which of the following types of recharging are available at the work/school locations where your PEV is typically parked (your best estimate)?

	Available at multiple locations	Available at one location	Not Available	Not Sure
Level 1 (120 V) (can be used for free)	○	○	○	○
Level 1 (120 V) (requires payment)	○	○	○	○
Level 2 (240 V) (can be used for free)	○	○	○	○
Level 2 (240 V) (requires payment)	○	○	○	○
Direct Current (DC) fast charger (can be used for free)	○	○	○	○
Direct Current (DC) fast charger (requires payment)	○	○	○	○

18. *[charging_freq]* *If [recharge_stations] = 'Available at multiple locations' OR 'Available at one location'*
For each available charging method, how often do you use it?

	Never	Less than once per week	1-2 times per week	3-4 times per week	5 or more times per week

Option 1					
Option 2					

19. *[work_school_importance] If [recharge_stations] = 'Available at multiple locations' OR 'Available at one location'*

When deciding to purchase your *PEV*, how important were the following?

	Not at all important	Slightly important	Moderately Important	Very Important	Extremely Important
Availability of recharging at work/school					
Availability of *free* recharging at work/school					

[public_charging_intro] **Finally, we would like to ask about *public* chargers. These are chargers that are available for use by anyone in the general public, located in gasoline stations, parking lots, parking garages, at hotels, hospitals, etc.**

20. *[public_availability]*

Which of the following best describes the availability of electric vehicle *public chargers* (not at work/school) in the parking facilities you frequent?

- Chargers are not available.
- Chargers are available in only one place
- Chargers are available in some places
- Chargers are available in many places

20.5 *[public_distance] If [public_availability] <> 'Chargers are not available'*

How far is the closest public charger (that you have noticed) from your home?
(your best estimate, either in miles or minutes of driving time).

- _____ miles *Allow > 0 and < 100*
- _____minutes of driving time *Allow > 0 and < 100*

21. *[public_use]* *If [public_availability] <> 'Chargers are not available'*

About how many times have you used a *public charger* in the past month?

_____ times *Allow > 0 and < 100*

22. *[public_type]* *If [public_use] > 0*

Please indicate which of the following types of public charging you have used over the past month.

Select all that apply.

- Level 1 (120V)
- Level 2 (240 V)
- Direct Current (DC) fast charger
- Other (please specify): _____

22.5. *[public_wait]* *If [public_use] > 0*

Have you ever been unable to use public charging because all of the chargers were being used?

- Never
- Not really, less than half of the time
- Yes, about half of the time
- Yes, most or all of the time

23. *[public_importance]*

When deciding to purchase your *PEV*, how important was the availability of *public charging* in your decision?

- Not at all important
- Slightly Important
- Moderately Important
- Very Important
- Extremely Important

24. *[pev_compare_cost]*

How would you compare your fuel costs to what they would be for a comparable gasoline vehicle?

- 1- My vehicle is much less expensive
- 2-
- 3- They cost about the same
- 4-
- 5- Gasoline version is much less expensive

25. *[pev_cost_importance]*

When deciding to purchase your *PEV*, how important was *fuel cost* in your purchase decision?

- Not at all important
- Slightly Important

- Moderately Important
- Very Important
- Extremely Important

26. *[pev_incentives]*

Over the past several years a variety of *incentives* have been available to buyers and leasers of plug-in vehicles. We would like to understand what role these might have played in *your* decision to buy or lease a *PEV*. Please review the following descriptions of incentives, and indicate how important they were (or, if you were unaware of them, or they were not applicable).

[do not randomize]	Not at all important	Slightly mportant	oderately mportant	Very mportant	tremely important	Unaware	ot applicable
Local or utility incentive (rebate or tax incentive, up to $5,000)	O	O	O	O	O	O	
Federal tax incentives (up to $7,500)	O	O	O	O	O	O	
California state vehicle rebate (up to $2,500)	O	O	O	O	O	O	
Manufacturer or dealer incentives (e.g. low interest rate, cash back)	O	O	O	O	O	O	
Parking incentives (employer, business, or government)	O	O	O	O	O	O	
Availability of carshare/car rental as part of purchase	O	O	O	O	O	O	
HOV lane access	O	O	O	O	O	O	

27. *[pev_experience]*

How would you judge your overall experience with your *PEV*?

- I Hate it
- A Failure
- Unsatisfactory
- Satisfactory
- Excellent
- Delightful
- I Love it

28. *[pev_recommend]*

How likely are you to recommend your *PEV* to a friend or family member?

- Extremely Unlikely
- Unlikely
- Neutral

- Likely
- Extremely Likely

29. *[pev_confidence]* IF *Primary-PEV-Driver-Flag ~= 1.*
Thank you for answering these questions about your *PEV* (even though you may not be the primary driver). Which of the following best describes your opinion about your answers to these questions:

- Confident. I actually drive the vehicle frequently.
- Confident. I got help from the primary driver.
- Not as confident. I did my best based on my available knowledge.
- Other: _____

Residential Hydrogen Fuel Cell Electric Vehicle (FCEV) Owner Questions

[fcev_intro]
The next questions are specifically about your <year> <make> <model> Hydrogen Fuel Cell Electric Vehicle (*FCEV*), including how it is driven.

IF *[primary_driver]* is NOT "I am the primary driver": Earlier, you indicated that *[primary_driver]* is the primary driver of the *FCEV*. Even though you may not be the primary driver, it is very important to us that you complete this survey. Please answer the questions as best you can, perhaps asking *[primary_driver]* for help *if it is convenient to do so*.

[fcev_choice] **Please choose a vehicle you are most familiar with:**

- Year make model 1
- Year make model 2
- Year make model n

Show banner for remainder of FCEV survey: Please focus on your <Year> <Make> <Model>.

2. *[fcev_mile]*
About how many miles is your *FCEV* driven in a typical week/month?

_____ Miles per

- Week
- Month

3. *[fcev_refuel]*
How frequently is your *FCEV* refueled in a typical week/month?

_____ Times per

- Week
- Month

3.5. *[fcev_refuel_when]*
How low does the tank typically get before you refuel?

- When the fuel light turns on
- ¼ of a full charge
- ½ of a full charge

4. *[fcev_refuel_time]*
About how long does it take to refuel your *FCEV* (once you get access to a pump)?

_____ minutes

5. *[fcev_refuel_wait]*

Do you ever need to wait in line to refuel your *FCEV?*

- Yes, most or all of the time
- Yes, about half of the time
- Not really, less than half of the time
- I have almost never had to wait in line

6. *[fcev_refuel_locations]*

How many *different* hydrogen refueling *locations* have you used to refuel your *FCEV* in the past month?

- One
- Two
- Three
- Four or more

7. *[fcev_refuel_routine]* *IF [fcev_refuel_routine] is NOT 'One'*

Of these *<[fcev_refuel_locations]>* stations, how many are used for "routine" refueling (when you are living at home and not traveling)?

Allow value from [fcev_refuel_locations] or less

- One
- Two
- Three
- Other: _____

8. *[fcev_refuel_distance]*

How far is the hydrogen refueling station you use the most from your home?

_____ miles

Or _____ minutes of driving time.

9. *[fcev_station_convenience]*

Which of the following statements best describe routine trips to a hydrogen refueling station?

Please select all that apply.

- A station is conveniently located close to my home.
- A station is conveniently located close to my workplace/school.
- I must make a special trip just to refuel my FCEV.

10. *[fcev_alternative]*

Since owning your FCEV, have you taken any trips that required *use of a different vehicle (or travel mode)* due to concerns about hydrogen station availability?

- Yes
- No

12. *[fcev_alternative]* IF 'Yes' in *[fcev_alternative]*

About how many times has this occurred?

_____ times during the past

- Year
- Month

11. *[fcev_alternative]* IF 'Yes' in *[fcev_alternative]*
Which of the following did you use instead? (select all that apply)

- Another household vehicle
- Rental car
- Taxi
- Ridesharing service
- Carsharing service (e.g. Zipcar, Car2Go)
- Company/employer-owned car
- Vehicle borrowed from relative/friend
- Train
- Bus
- Public transit
- Airline
- Other: _____

13. *[fcev_convenience]*
Overall, how convenient is refueling your FCEV compared to a gasoline vehicle?

- 1- Hydrogen is much more convenient
- 2-
- 3- Hydrogen and gasoline are about the same
- 4-
- 5- Gasoline is much more convenient

14. *[fcev_pay]*
How do you typically pay when refueling your *FCEV*?

- Cash
- Credit card
- Special fuel card (that I pay for)
- Special fuel card (free hydrogen that came with the vehicle purchase)

15. *[fcev_fuel_cost]* IF NOT "Special fuel card (free hydrogen that came with the vehicle purchase)"
Overall, what is the estimated total *fuel* cost for driving your *FCEV* in a typical week/month (for all household members)?

_____ dollars per

- Week
- Month

16. *[fcev_compare_cost]*
How would you compare the *fuel cost* to drive your *FCEV* to those of a comparable gasoline vehicle?

- 1- My vehicle is much less expensive

- 2-
- 3- They cost about the same
- 4-
- 5- Gasoline version is much less expensive

17. *[fcev_cost_importance]*
When deciding to purchase your *FCEV*, how important was *fuel cost* in your purchase decision?

- Not at all important
- Slightly Important
- Moderately Important
- Very Important
- Extremely Important

18. *[fcev_incentives]*
Over the past several years a variety of *incentives* have been available to purchasers of hydrogen fuel cell electric vehicles. We would like to understand what role these might have played in *your* decision to purchase a *FCEV*. Please review the following descriptions

of incentives, and indicate how important they were (or, if you were unaware of them, or they were not applicable).

[randomize]	Not at all important	Somewhat important	Moderately important	Very important	Extremely important	Unaware	Not applicable
Local incentive (tax incentive or rebate, up to $3,000)	O	O	O	O	O	O	O
). California state vehicle rebate (up to $5,000)	O	O	O	O	O	O	O
. Federal tax incentives (up to $8,000)	O	O	O	O	O	O	O
2. Manufacturer or dealer incentives (e.g. low interest rate, cash back, favorable lease terms)	O	O	O	O	O	O	O
3. Free fuel card	O	O	O	O	O	O	O
4. Parking incentives (employer, business, or government)	O	O	O	O	O	O	O
Availability of carshare/car rental as part of purchase	O	O	O	O	O	O	O
HOV lane access	O	O	O	O	O	O	O

19. *[fcev_experience]*

How would you judge your overall experience with your *FCEV*?

- I Hate it
- A Failure
- Unsatisfactory
- Satisfactory
- Excellent
- Delightful
- I Love it

20. *[fcev_recommend]*

How likely are you to recommend your *FCEV* to a friend or family member?

- Extremely Unlikely
- Unlikely

- Neutral
- Likely
- Extremely Likely

21. *[fcev_confidence]* IF *[primary_driver]* is NOT "I am the primary driver"

Thank you for answering these questions about your *FCEV* (even though you might not be the primary driver). Which of the following best describes your opinion about your answers to these questions:

- Confident. I actually drive the vehicle frequently.
- Confident. I got help from the primary driver.
- Not as confident. I did my best based on my available knowledge.
- Other: _____

Appendix 2-D: Commercial ZEV Questionnaires

Commercial ZEV owners responded to different sets of questions depending on the type of ZEV vehicles they owned.

Commercial PEV Owner Questions

1. [primary_chargeloc] *IF flagged as 'company charging' on [refueling_types]*
   Considering your company's plug-in electric vehicles, are they charged primarily using chargers on a company site, at a non-company location, or a mix of both company and non-company locations?

	Primarily company site chargers	Primarily non-company chargers	A mix of company and non-company chargers
<Cars>	○	○	○
<SUVs>	○	○	○
<Vans>	○	○	○
<Trucks>	○	○	○

2. [primary_chargetech] *IF ('Company' OR 'Mix' on [primary_chargeloc]) AND multiple charging technologies on [refueling_types]*
   For those vehicles charged on site, which charging technology is used most often?

	<Level I (120 V)>	<Level II (240 V)>	<DC Fast>
<Cars>	○	○	○
<SUVs>	○	○	○
<Vans>	○	○	○
<Trucks>	○	○	○

3. [pulg_freq] *IF 'Company' OR 'Mix' on [primary_chargeloc]*

During weekdays (Monday-Friday), about how often are these vehicles plugged in on site?

	Never	Less than once a week	1 or 2 times per week	3 or 4 times per week	Daily
<Cars>	○	○	○	○	○
<SUVs>	○	○	○	○	○

<Vans>	○	○	○	○	○
<Trucks>	○	○	○	○	○

4. [chargetime_day] *IF ('Company' OR 'Mix' on [primary_chargeloc]) AND NOT 'Never' on [plug_freq]*
During weekdays (Monday-Friday), what time of day are these vehicles typically plugged in on site?

	Morning (7 am to noon)	Afternoon (noon to 6 pm)	Evening (6 pm to 11 pm)	Overnight (11 pm to 7 am)
<Cars>	☐	☐	☐	☐
<SUVs>	☐	☐	☐	☐
<Vans>	☐	☐	☐	☐
<Trucks>	☐	☐	☐	☐

5. [chargetime_weekend] *IF 'Company' OR 'Mix' on [primary_chargeloc]*
During weekends, about how often are these vehicles typically plugged in on site?

	Never	Less than one time	1 or more times
<Cars>	○	○	○
<SUVs>	○	○	○
<Vans>	○	○	○
<Trucks>	○	○	○

6. [charetime_weekend] *IF ('Company' OR 'Mix' on [primary_chargeloc]) AND NOT 'Never' on [chargetime_weekend]*
During weekends, what time of day are these vehicles typically plugged in on site?

	Morning (7 am to noon)	Afternoon (noon to 6 pm)	Evening (6 pm to 11 pm)	Overnight (11 pm to 7 am)
<Cars>	☐	☐	☐	☐
<SUVs>	☐	☐	☐	☐
<Vans>	☐	☐	☐	☐
<Trucks>	☐	☐	☐	☐

7. [electricity_rate] *IF flagged as 'company charging' on [refueling_types]*

15. **About how much does your company pay (in cents per kilowatt-hour) to charge *plug-in electric vehicles at company charging locations*?**

16.

_____ cents per kilowatt-hour (kWh)

☐ I don't know

8. [rate_source] *IF [electricity_rate] is NOT blank*

17. **How did you determine your answer to the cent-per-kilowatt-hour question?**

- o I knew this off the top of my head
- o I looked at a bill (or asked someone who has access).
- o I made a rough guess

9. [variable_rates] *IF [electricity_rate] is NOT blank*

18. **Does your company's electricity provider offer different rates for peak and non-peak usage?**

- o Yes
- o No
- o Not sure/Don't know

Off-Site Recharging

10. [offsite_chargeloc] *IF ('Non-Company' or 'Mix' on [primary_chargeloc]) OR NOT flagged as 'company charging' on [refueling_types]*

Based on your earlier responses, your company uses non-company chargers. Please indicate which of the following are used for charging your company's plug-in electric vehicles.

	Primarily at an Employee's / Owner's home(s)	Primarily at Public charging stations	A mix of home and public	Primarily at another location	Not Sure
<Cars>					
<SUVs>					
<Vans>					
<Trucks>					

11. *[home_upgrade] IF 'Primarily at home' OR 'Mix' on [offsite_chargeloc]*

19. **Did your business incur any expense to upgrade your (or another employee's) electrical system at home to support recharging plug-in electric vehicles?** Please select the following which best describes the upgrade expenses.

- o Yes, at 100% expense to the business
- o Yes, with shared payment from the business and the homeowner
- o No, it was paid for by the homeowner
- o No, the electrical system at the home was not upgraded for this vehicle

- Other: _____
- I don't know

12. *[home_pay] IF 'Primarily at home' OR 'Mix' on [offsite_chargeloc]*
Who pays for the electricity for recharging this vehicle when it is parked at your (or another employee's) home?
- Our business
- I do / another employee
- Partially by the business and partially by myself or another employee
- I don't know

13. [incentive_importance]

20. **Over the past several years a variety of *incentives* have been available to buyers and leasers of plug-in vehicles. We would like to understand what role these might have played in *your company's* decision to buy or lease *plug-in electric vehicles*. Please review the following descriptions of incentives, and indicate how important they were (or, if you were unaware of them, or they were not applicable).**

21.

2. [randomize]	Not at all important	Slightly important	Moderately important	Very important	Extremely important	Unaware	Not applicable
3. Local or utility incentive (rebate or tax incentive, up to $5,000)	O	O	O	O	O	O	O
4. Federal tax incentives (up to $7,500)	O	O	O	O	O	O	O
5. California state vehicle rebate (up to $2,500)	O	O	O	O	O	O	O
6. Manufacturer or dealer incentives (e.g. low interest rate, cash back)	O	O	O	O	O	O	O
7. Parking incentives (employer, business, or government)	O	O	O	O	O	O	O
Availability of carshare/car rental as part of purchase	O	O	O	O	O	O	O
HOV lane access	O	O	O	O	O	O	O

14. [PEV_experience]

28. **How would you judge your company's overall experience with plug-in electric vehicles?**

- We Hate Them
- A Failure
- Unsatisfactory
- Satisfactory
- Excellent
- Delightful
- We Love Them

Hydrogen Fuel Cell Electric Vehicle (FCEV) Owner Questions

15. [fcev_offsite] *IF flagged as 'company hydrogen' on [refueling_types]*
Does your company use off-site facilities (not owned by the company) to refuel your Hydrogen Full Cell Vehicle(s) (FCEV)?

- Yes
- No

29.

16. [fcev_fuelnumloc] *IF NOT flagged as 'company hydrogen' on [refueling_types] OR 'Yes' on [fcev_offiste]*
How many different off-site hydrogen refueling locations has your company used in the past month?
    - One
    - Two
    - Three
    - Four or more

30.

17. [fcev_refueldist] *IF NOT flagged as 'company hydrogen' on [refueling_types] OR 'Yes' on [fcev_offiste]*
How far from your location is the hydrogen refueling station that's used most by your company?
Please select which value you prefer to answer.

- _____ miles
- _____ minutes of driving time

18. [fcev_refuelwait] *IF NOT flagged as 'company hydrogen' on [refueling_types] OR 'Yes' on [fcev_offiste]*
When refueling off-site, is there a line of vehicles waiting for access to the pump(s)?

- Yes, most or all of the time
- Yes, about half of the time
- Not really, less than half of the time
- No, they almost never have to wait in line
- I don't know

19. [fcev_refueldist]
About how long does it take to refuel your company's FCEV(s) (once the operator has access to a pump)?

31.

32. _____ minutes

□ I don't know

20. [fcev_refuelfreq]

On average, how frequently are your FCEVs refueled in a typical week/month?

_____ times per

- week
- month

21. [fcev_fuelrate]

33. **About how much does your company pay (dollars per kg) to refuel your FCEVs? (Your best estimate.)**

34.

_____ dollars per kilogram

☐ Other, please explain: _____

☐ I don't know

22. [fcev_ratesource] *IF value for [hydrogen_rate] is NOT blank*

35. **How did you determine your answer to the hydrogen dollars per kg question?**

- I knew this off the top of my head
- I looked at a bill/receipt (or asked someone who has access).
- I made a rough guess

23. [fcev_miles]

On average, about how many miles are each of your company's FCEVs driven in a typical week/month?

_____ miles per

- Week
- Month

24. [fcev_incentives]

36. **We would like to understand what role purchase incentives might have played in *your* company's decision to purchase *FCEVs*. Please review the following descriptions of incentives, and indicate how important they were (or, if you were unaware of them, or they were not applicable).**

[randomize]	Not at all important	Slightly important	Moderately important	Very important	Extremely important	Unaware	Not applicable
Local or utility incentive (rebate or tax incentive, up to $5,000)	O	O	O	O	O	O	O
Federal tax incentives (up to $7,500)	O	O	O	O	O	O	O
California state vehicle rebate (up to $5,000)	O	O	O	O	O	O	O
Manufacturer or dealer incentives (e.g. low interest rate, cash back)	O	O	O	O	O	O	O
Parking incentives (employer, business, or government)	O	O	O	O	O	O	O
Availability of carshare/car rental as part of purchase	O	O	O	O	O	O	O
HOV lane access	O	O	O	O	O	O	O
Free hydrogen fuel from manufacturer or dealer	O	O	O	O	O	O	O

37.

38.

25. [fcev_why]

Why did you company choose to purchase an FCEV(s) over other alternatives? Please explain.

26. [fcev_advantages]

In your opinion, are there any advantages to using an FCEV for business compared to other types of vehicles?
If yes, please explain below.

27. [fcev_challenges]
Are there any issues or challenges in owning and operating an FCEV for business use?
If yes, please explain below.

28. [fcev_experience]
39. **How would you judge your company's overall experience with FCEVs?**

- We Hate Them
- A Failure
- Unsatisfactory
- Satisfactory
- Excellent
- Delightful
- We Love Them

29. [fcev_future]
40. **How likely is your company to purchase or lease FCEVs in the future?**

- Extremely Unlikely
- Unlikely
- Neutral
- Likely
- Extremely Likely

30. [fcev_confidence]
41. **Thank you for answering these questions about your company's FCEV(s). Which of the following best describes your confidence about your answers:**

- Confident. I drive or monitor the use of the vehicle(s) frequently.

- Confident. I got help from the primary operator(s).
- Not as confident. I did my best based on my available knowledge.

Other: _____

Appendix 2-E: Odometer Follow on Questionnaire

Residential and commercial survey participants who chose to participate in a follow on survey and provide a second odometer reading, responded to separate questionaires.

Residential Odometer Follow-up Survey

[intro]
Thank you for recently completing the California Vehicle Survey sponsored by the California Energy Commission. You have been re-contacted because you agreed to provide a second odometer reading for the vehicle(s) in your household.

In this brief follow-up survey, you will be asked to verify the vehicles currently in your household and provide an odometer reading for each.

[If not research panel] **Once you complete this survey you will be entered in a raffle to win one of two $50 Amazon or Walmart e-gift cards.**

[current_veh]
Are the following vehicles still owned or leased by your household?

<vehicle_1 year make model>
<vehicle_2 year make model>
<vehicle_n year make model>

- Yes
- No

[veh_removed] *If No on [current_veh]*

Which of these vehicles are <u>no longer</u> owned or leased by your household?

- ☐ <vehicle_1 year make model>
- ☐ <vehicle_2 year make model>
- ☐ <vehicle_n year make model>

[odometer_miles] *If NOT all vehicles are selected on [veh_removed]*

What is the mileage on the odometer today?

It is very important that we get accurate information about how much each vehicle in your household is driven so we require that you to go to each vehicle and read the odometer to answer this question.

Please enter the full number to the nearest mile (e.g. enter “20,250”, NOT 20k or 20 thousand)

	Previously Reported Odometer Reading	Today's Odometer Reading
<vehicle_1 year make model>	<vehicle_1 mileage>	
<vehicle_2 year make model>	<vehicle_2 mileage>	
<vehicle_3 year make model>	<vehicle_3 mileage>	

[comments]

Thank you for participating!

If you have any comments on the survey, please enter them in the box below and click the "Next" button.

[end]

You have been successfully entered into the raffle!

Thanks again for completing the survey. All of your answers have been saved, you may now close your browser and exit the survey.

Commercial Odometer Follow-up Survey

[intro]
You recently completed a vehicle survey for the California Energy Commission and agreed to be re-contacted to give an updated odometer reading for one or more vehicles in your organization.

It is very important that we get accurate information about how much each vehicle in your company is driven, so you will be required to go to each vehicle and read the odometer before completing the survey.

If you provide your odometer readings, you will be entered in a raffle to win one of two $50 Amazon or Walmart e-gift cards.

[current_veh]
Are the following vehicles still owned or leased by your company?

<vehicle_1 year make model>
<vehicle_2 year make model>
<vehicle_n year make model>

- Yes
- No

[veh_removed] If No on [current_veh]

Which of these vehicles are <u>no longer</u> owned or leased by your company?

☐ <vehicle_1 year make model>
☐ <vehicle_2 year make model>
☐ <vehicle_n year make model>

[odometer_miles] If NOT all vehicles are selected on [veh_removed]

What is the mileage on the odometer today?
Please enter the full number to the nearest mile (e.g. enter "20,250", NOT 20k or 20 thousand)

<vehicle_1 year make model>: _____ total miles on odometer today
<vehicle_2 year make model>: _____ total miles on odometer today
<vehicle_n year make model>: _____ total miles on odometer today

[comments]

Thank you for participating!

If you have additional comments or suggestions either about the survey or the survey experience itself, please enter them in the box below and click the "Next" button.

You have been successfully entered into the raffle!

Thanks again for completing the survey. All of your answers have been saved, you may now close your browser and exit the survey.

Appendix 2-F: Stated Preferences Design

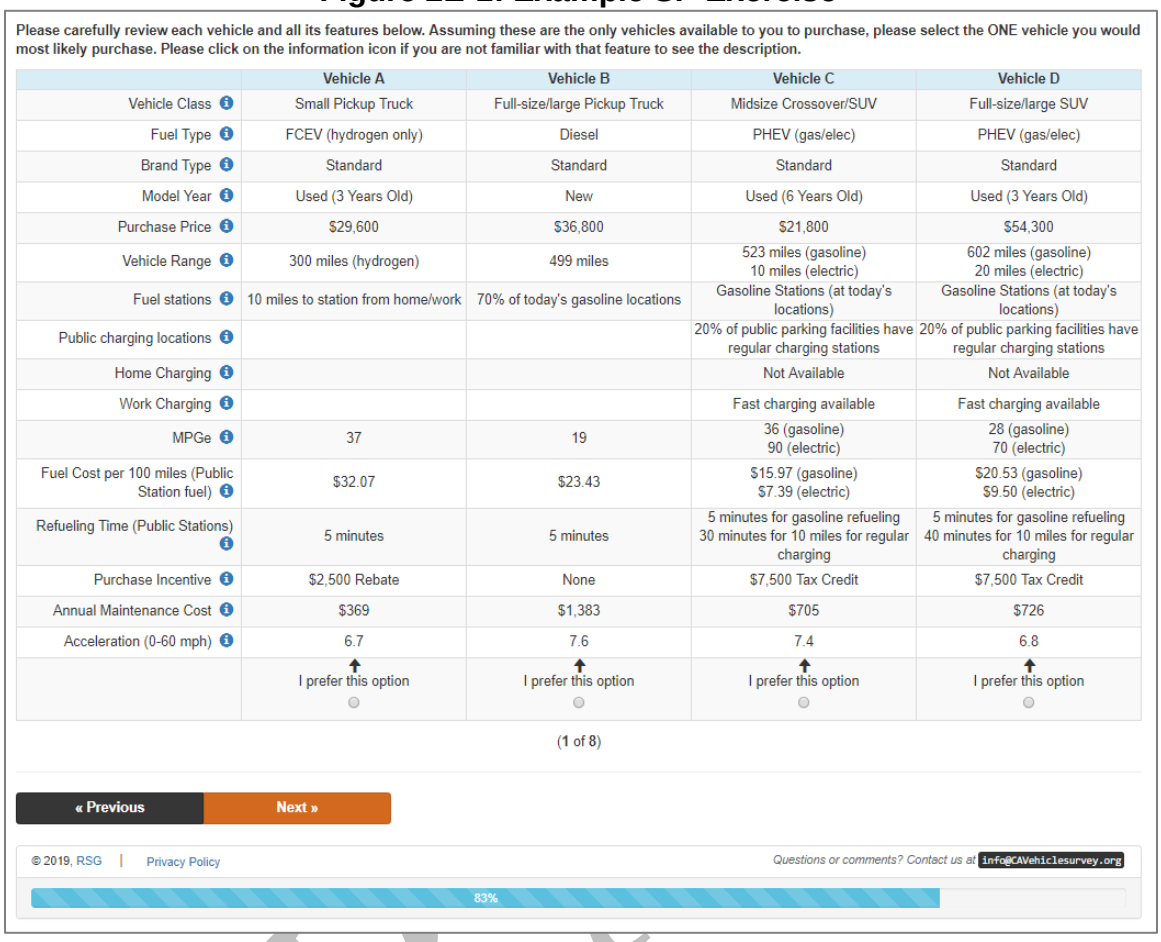
This appendix summarizes the stated preference (SP) survey design for the 2018–2019 California Vehicle Survey (CVS) project. The design includes discussion of the attributes and levels used to create the alternatives presented in the eight SP exercises; and a brief description of the underlying experimental design.

The 2018–2019 CVS included both revealed preference (RP) and SP surveys for the residential light-duty vehicle (LDV) sector and the commercial LDV sector in California. Respondents began the survey by completing the RP component of the survey before moving on to the SP component of the survey.

Data from the RP survey was used to construct a set of eight SP exercises for the survey. In the RP survey, respondents were asked to generate a set of vehicle class/fuel type combinations to be considered for their next vehicle purchase (referred to as the consideration set). For each fuel type, the set of associated vehicle classes was displayed, and the respondent was asked to choose one combination of prestige level (described as standard or premium) and model year (described as new, 2-3 years old, and 4-6 years old). Using this approach, the set of selected vehicle class-fuel type combinations was systematically reviewed by iterating through each fuel type that was present in the set. The SP experiments included a purchase year for the respondents next vehicle purchase, either 2021 or 2025. Respondents were assigned a purchase year at random and asked to assume they would purchase a vehicle for their household in the purchase year. Each SP exercise presented respondents with four hypothetical vehicles as alternatives. One of the vehicle alternatives in each experiment—referred to as the reference vehicle—was a vehicle selected from the consideration set. The attributes that described this reference vehicle were consistent with what the respondent reported in the RP survey. The next three alternatives were presented as vehicles of different vehicle classes, fuel types, prestige levels, age, and fuel efficiency, among other varying attributes. The four alternatives—including the reference vehicle—for a given respondent were assigned in random order to alternatives labeled Vehicle A, Vehicle B, Vehicle C, and Vehicle D for each choice situation.

The four alternative vehicles in each exercise were described by a set of 13 to 16 attributes, including the vehicle class and fuel type presented. Respondents were asked to select the vehicle they would most prefer to purchase based on the attribute values presented in each alternative. The values of each attribute varied according to an experimental design, requiring respondents to value attributes against each other. Figure 2E-1 presents an example of one of the eight SP exercises for a hypothetical respondent.

Figure 2E-1: Example SP Exercise



Please carefully review each vehicle and all its features below. Assuming these are the only vehicles available to you to purchase, please select the ONE vehicle you would most likely purchase. Please click on the information icon if you are not familiar with that feature to see the description.

	Vehicle A	Vehicle B	Vehicle C	Vehicle D
Vehicle Class	Small Pickup Truck	Full-size/large Pickup Truck	Midsize Crossover/SUV	Full-size/large SUV
Fuel Type	FCEV (hydrogen only)	Diesel	PHEV (gas/elec)	PHEV (gas/elec)
Brand Type	Standard	Standard	Standard	Standard
Model Year	Used (3 Years Old)	New	Used (6 Years Old)	Used (3 Years Old)
Purchase Price	$29,600	$36,800	$21,800	$54,300
Vehicle Range	300 miles (hydrogen)	499 miles	523 miles (gasoline) 10 miles (electric)	602 miles (gasoline) 20 miles (electric)
Fuel stations	10 miles to station from home/work	70% of today's gasoline locations	Gasoline Stations (at today's locations)	Gasoline Stations (at today's locations)
Public charging locations			20% of public parking facilities have regular charging stations	20% of public parking facilities have regular charging stations
Home Charging			Not Available	Not Available
Work Charging			Fast charging available	Fast charging available
MPGe	37	19	36 (gasoline) 90 (electric)	28 (gasoline) 70 (electric)
Fuel Cost per 100 miles (Public Station fuel)	$32.07	$23.43	$15.97 (gasoline) $7.39 (electric)	$20.53 (gasoline) $9.50 (electric)
Refueling Time (Public Stations)	5 minutes	5 minutes	5 minutes for gasoline refueling 30 minutes for 10 miles for regular charging	5 minutes for gasoline refueling 40 minutes for 10 miles for regular charging
Purchase Incentive	$2,500 Rebate	None	$7,500 Tax Credit	$7,500 Tax Credit
Annual Maintenance Cost	$369	$1,383	$705	$726
Acceleration (0-60 mph)	6.7	7.6	7.4	6.8
	I prefer this option	I prefer this option	I prefer this option	I prefer this option

(1 of 8)

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83%

RSG worked closely with the California Energy Commission to finalize the attributes and levels used to describe each alternative. Respondents can become overwhelmed if too many attributes are presented in each choice exercise; therefore, only the most important attributes that have the greatest influence on vehicle choice behavior were presented. The survey also retained similar attributes and levels from to the previous SP surveys conducted for this study for consistency and comparison purposes.

Vehicle Consideration Set

The SP exercises were designed around a 'consideration set' of vehicles provided by each respondent in the RP portion of the survey. Respondents were asked to identify the vehicle types they would consider purchasing or leasing for their next vehicle, described across the following four attributes:

1. Vehicle class
2. Fuel type
3. Prestige level
4. Model year

The procedure began by asking which vehicle classes would be considered by each respondent for their next vehicle purchase. Vehicle class described the type and size of the vehicle, and included the following 13 possible values:

1. Subcompact Car
2. Compact Car
3. Midsize Car
4. Large Car
5. Sports Car
6. Subcompact Crossover
7. Compact Crossover/SUV
8. Midsize Crossover/SUV
9. Full-Size/Large SUV
10. Small Van
11. Full-size/large Van
12. Small Pickup Truck
13. Full-size/large Pickup Truck

Respondents were asked to select up to a maximum of four vehicle classes they would consider for their next vehicle purchase.
Next, respondents were asked to identify which fuel types they would consider for each of the vehicle classes selected. Fuel type described the type of fuel and powertrain used to propel the vehicle, and included the following eight possible values:

1. Gasoline
2. Gasoline Hybrid Electric Vehicle (HEV)
3. Gasoline Plug-in Hybrid Electric Vehicle (PHEV)
4. Flex Fuel Vehicle (FFV)
5. Diesel
6. Battery Electric Vehicle (BEV)
7. Hydrogen Fuel Cell Electric Vehicle (FCEV)
8. Hydrogen Plug-in Fuel Cell Electric Vehicle (PFCEV)

Using this approach, the number of possible vehicle class-fuel type combinations could vary anywhere from 1 to 32 (four vehicle classes by eight fuel types).
Finally, respondents were asked to select the most likely prestige level and model year for each vehicle class-fuel type combination in the consideration set.
Prestige level described the type of vehicle brand and included up to two possible values:

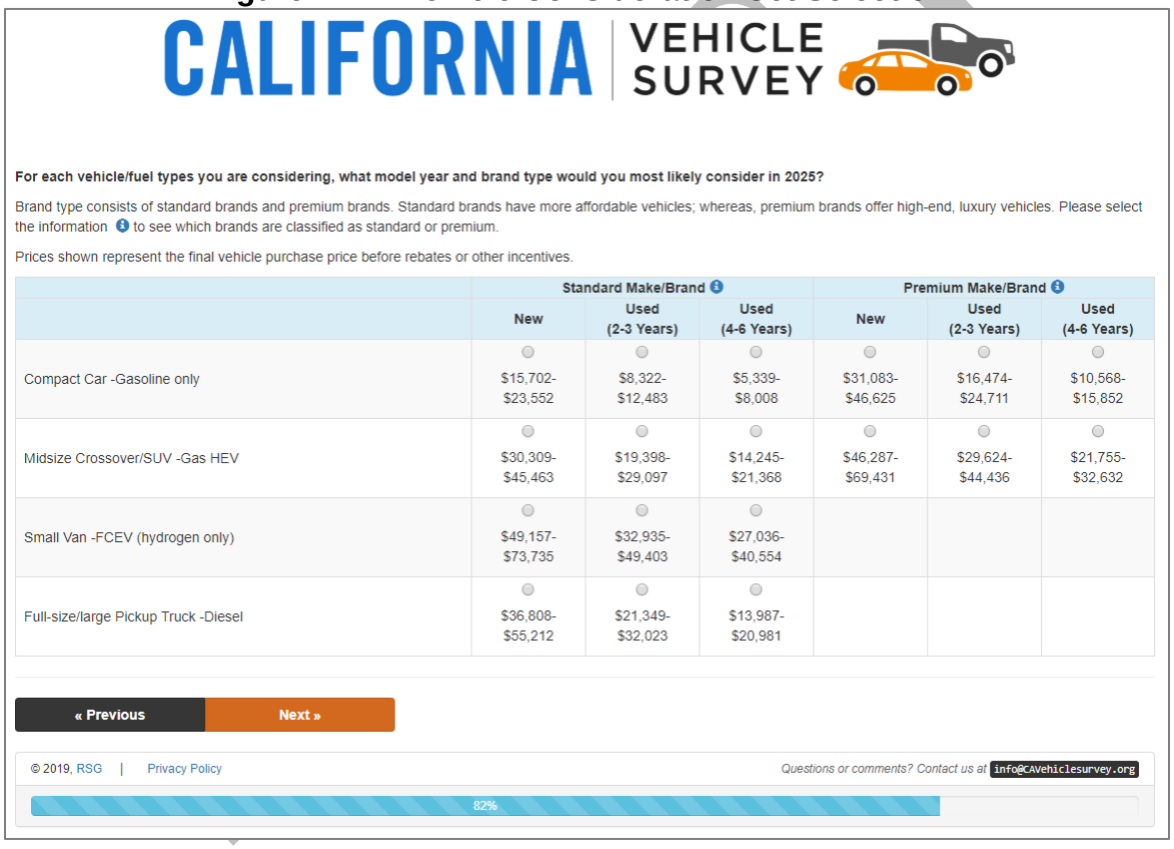
1. Standard Make/Brand
2. Premium Make/Brand

Standard brands were described as brands offering affordable vehicles and premium brands were described as brands offering high-end, luxury vehicles. Premium brands were not available for vans and pickup trucks as few vehicle manufacturers offer these types of vehicles under luxury brands in the market currently.
Model year described the age of the vehicle at the time of purchase and included the following three possible values:

1. New
2. Used (2-3 years)
3. Used (4-6 years)

Price ranges were included for each combination of vehicle class, fuel type, prestige level, and model year to aid in the selection (Figure 2E-2E-2).

Figure 2E-2: Vehicle Consideration Set Selection



Upon completion of this procedure, each respondent had defined a consideration set consisting of between one and thirty-two vehicles described by vehicle class, fuel type, prestige level, and model year. While each respondent could have up to 32 vehicles in their individual consideration set, there were a total of 528 possible consideration set vehicles—a combination of 13 vehicle classes, 8 fuel types, 3 model years, and 2 prestige levels (except one prestige level for vans and trucks). The SP experiments were customized for each respondent depending on the vehicles in their consideration set.

Stated Preferences Attributes and Levels

This section summarizes the attributes and levels used to create the four alternatives in the SP exercises, presented as Vehicle A, Vehicle B, Vehicle C and Vehicle D. Many of the attributes—except vehicle class, fuel type, prestige level, and model year—varied around base values that represent average values for all vehicles of a vehicle type, fuel type, prestige level, and model year. The values for these remaining attributes varied according to an efficient experimental design.

Vehicle Class, Fuel Type, Prestige Level, and Model Year

The first four attributes presented for each vehicle alternative were the attributes used to build the vehicle consideration set: vehicle class, fuel type, prestige level, and model year. These attributes were assigned to the four vehicle choice alternatives using the following approach.

Vehicle A (Reference Vehicle)

Vehicle A in each experiment—referred to as the reference vehicle—was selected from one of the vehicles in the respondent's consideration set according to the following procedure:

1. The fuel types in the consideration set (up to eight possible values) were loaded into a randomized array and the first value was selected.
2. The vehicle classes in the consideration set (up to four possible values) were loaded into a randomized array and the array was incremented sequentially until a valid fuel type-vehicle class combination was found in the consideration set.
3. One vehicle was selected from the consideration set with the fuel type-vehicle class combination determined above. This selection from the consideration set was made at random without replacement.
4. The fuel type array was incremented to the second position and the entire process was repeated.
5. Once the consideration set was exhausted, the fuel type and vehicle class arrays were reloaded and the process resumed.

This process was repeated until Vehicle A was determined for all eight experiments.

Vehicles B, C, and D

Vehicle Class

For the remaining three vehicle alternatives in each experiment, vehicle class was drawn from one of the following 13 values:

1. Subcompact Car
2. Compact Car
3. Midsize Car
4. Large Car
5. Sports Car

6. Subcompact Crossover
7. Compact Crossover/SUV
8. Midsize Crossover/SUV
9. Full-Size/Large SUV
10. Small Van
11. Full-size/large Van
12. Small Pickup Truck
13. Full-size/large Pickup Truck

The selection of vehicle class was made using weighted draws based on the reference vehicle class selected from the respondent's consideration set (any vehicle could be selected for the three alternative vehicles). Weighted draws were used because it was expected that respondents would have relatively strong preferences for at least a broad category of vehicle (e.g., small or large); as a result, presenting a respondent with a choice between a reference subcompact car and a large van made little sense. In that situation, vehicle type would dominate the choice process and little or no information could be gained for the sensitivities to other attributes. On the other hand, it was also not seen as appropriate to completely restrict the different combinations of vehicle types presented to a respondent.

A set of weights was developed for each reference vehicle type. Table 2E-1 presents the weights that were used for the vehicle class selection for the three alternative vehicles, with the reference vehicle types presented in the table's header. With these weights, all vehicle classes had a nonzero probability of being included in an exercise, but the probability was higher for vehicles that are more like the reference vehicle class. An especially high weight of over 50% was used for the reference vehicle class, which ensured that, at least for one pair of alternatives, the relative preference was not influenced by vehicle class. The reference vehicle could repeat in one other alternative, allowing respondents to compare attributes other than vehicle class. No other vehicle classes were repeated across alternatives within a single exercise.

Table 2E-1: Vehicle Type Weights

Alternative Vehicle Type	Reference Vehicle Type													Total
	Subcompact Car	Compact Car	Midsize Car	Large Car	Sports Car	Subcompact Crossover	Compact Crossover/SUV	Midsize Crossover/SUV	Full-Size/Large SUV	Small Van	Full-size/large Van	Small Pickup Truck	Full-size/large Pickup Truck	
Subcompact Car	0.52	0.05	0.03	0.03	0.05	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.93
Compact Car	0.05	0.52	0.05	0.03	0.05	0.05	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.97
Midsize Car	0.05	0.05	0.52	0.05	0.05	0.03	0.05	0.04	0.03	0.04	0.03	0.04	0.03	1.01
Large Car	0.03	0.04	0.05	0.52	0.03	0.04	0.04	0.05	0.05	0.03	0.04	0.04	0.04	1.00
Sports Car	0.05	0.05	0.05	0.03	0.52	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.95
Subcompact Crossover	0.05	0.05	0.04	0.04	0.04	0.52	0.05	0.04	0.04	0.04	0.04	0.03	0.04	1.02
Compact Crossover/SUV	0.04	0.04	0.05	0.04	0.04	0.05	0.52	0.05	0.05	0.04	0.04	0.04	0.04	1.04
Midsize Crossover/SUV	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.52	0.05	0.05	0.04	0.04	0.04	1.06
Full-Size/Large SUV	0.03	0.03	0.03	0.04	0.03	0.05	0.05	0.05	0.52	0.05	0.05	0.05	0.05	1.03
Small Van	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.05	0.04	0.52	0.05	0.05	0.05	1.03
Full-size/large Van	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.04	0.05	0.05	0.52	0.05	0.05	0.99
Small Pickup Truck	0.04	0.03	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.05	0.05	0.52	0.05	1.01
Full-size/large Pickup Truck	0.03	0.03	0.03	0.05	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.52	0.96
Total	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**13.00**

Fuel Type

The fuel types for Vehicle B, C, and D were derived from the following list:

1. Gasoline
2. Gasoline Hybrid Electric Vehicle (HEV)
3. Gasoline Plug-in Hybrid Electric Vehicle (PHEV)
4. Diesel
5. Battery Electric Vehicle (BEV)
6. Hydrogen Fuel Cell Electric Vehicle (FCEV)
7. Hydrogen Plug-in Fuel Cell Electric Vehicle (PFCEV)
8. Flex Fuel Vehicle (FFV)

The selection of fuel type was also made using weighted draws based on the reference fuel type in Vehicle A as in the case of the vehicle class attribute. It was expected that respondents would have relatively strong preferences for their reference fuel type; therefore, presenting respondents with a choice between a reference gasoline car and a PFCEV car was not deemed appropriate. On the other hand, it was also not seen as appropriate to completely restrict the different combinations of fuel types presented to a respondent. As a result, a set of weights was developed for each reference fuel type. Table 2E-2 presents the weights that were used for the fuel type selection for the three alternative vehicles, with the reference fuel types presented in the table's header. The reference vehicle fuel type could repeat in one (at most) of the three alternative vehicles; this allowed respondents to compare attributes other than fuel type. No other fuel types could repeat across alternatives within a single choice exercise.

Table 2E-2: Fuel Type Weights

Alternative Fuel Type	Reference Fuel Type								Total
	Gasoline Vehicle	Hybrid Electric Vehicle (HEV)	Plug-in Hybrid Electric Vehicle (PHEV)	Flex Fuel Vehicle (E85 FFV)	Diesel Vehicle	Battery Electric Vehicle (BEV)	Hydrogen Fuel Cell Electric Vehicle	Plug-in Fuel Cell Electric Vehicle (PFCEV)	
Gasoline Vehicle	0.25	0.11	0.11	0.11	0.11	0.11	0.11	0.11	1.02
Hybrid Electric Vehicle (HEV)	0.11	0.25	0.11	0.11	0.11	0.11	0.11	0.11	1.02
Plug-in Hybrid Electric Vehicle (PHEV)	0.11	0.11	0.25	0.11	0.11	0.11	0.11	0.11	1.02
Flex Fuel Vehicle (E85 FFV)	0.09	0.09	0.09	0.23	0.09	0.09	0.09	0.09	0.86
Diesel Vehicle	0.11	0.11	0.11	0.11	0.25	0.11	0.11	0.11	1.02
Battery Electric Vehicle (BEV)	0.11	0.11	0.11	0.11	0.11	0.25	0.11	0.11	1.02
Hydrogen Fuel Cell Electric Vehicle (FCEV)	0.11	0.11	0.11	0.11	0.11	0.11	0.25	0.11	1.02
Plug-in Fuel Cell Electric Vehicle (PFCEV)	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.25	1.02
Total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	8.00

Prestige Level

The prestige levels for Vehicles B, C, and D were derived from the following list:

1. Standard
2. Premium

The selection was made using weighted draws from the distribution of standard and premium vehicles in each respondent's consideration set. A minimum weight of 0.25 and a maximum weight of 0.75 was set for each level to increase the likelihood that both standard and premium prestige levels were presented in each experiment even if the consideration set only included one prestige level.

Model Year

The model year for Vehicles B, C, and D were derived from the following list:

1. New
2. Used (2-3 years)
3. Used (4-6 years)

The model year selection was made using weighted draws from the distribution of model years in each respondent's consideration set. Table 2E-3 presents the base weights for each reference vehicle model year, with the reference vehicle model year in the table's header. The appropriate set of weights based on the reference vehicle model year was then multiplied by the actual distribution of model years in each respondent's consideration set to develop the final weighted draws.

Table 2E-3: Model Year Weights

Alternative Vehicle Model Year	Reference Vehicle Model Year		
	New	Used 2-3	Used 4-6
New	0.7	0.2	0.1
Used 2-3	0.2	0.6	0.2
Used 4-6	0.1	0.2	0.7

Other Vehicle Attributes

The remaining vehicle attributes were dependent on the vehicle class, fuel type, prestige level, and model year selected for each choice alternative. The values for the remaining attributes varied according to an efficient experimental design.

Many of these remaining vehicle attributes varied around a base value. In the cases of vehicle purchase price, maintenance cost, range, fuel economy, and acceleration, the Energy Commission provided tables of base values, and RSG worked with the Energy Commission to refine the base values for use in the survey. These base values represent average values for all vehicles of a vehicle class, fuel type, and model year.

Vehicle Purchase Price

The purchase price of each vehicle varied around a base value that was dependent on the vehicle class, fuel type, prestige level, and model year. The base price values were varied using the following levels:

1. Base price -20%
2. Base price -10%
3. Base price +10%
4. Base price +20%

Purchase Incentive

The purchase incentives levels varied based on the fuel type. Gasoline, diesel, FFV, and HEV vehicles were presented with no purchase incentive, shown as "None," while the remaining alternative fuel vehicles had one of the following levels:

PHEV or BEV:

1. None
2. HOV lane access for 3 years
3. $2,500 Tax Credit
4. $5,000 Tax Credit
5. $7,500 Tax Credit
6. $1,000 Rebate
7. $1,500 Rebate
8. $2,500 Rebate

FCEV or PFCEV:

1. None
2. HOV lane access for 3 years
3. $2,500 Tax Credit
4. $5,000 Tax Credit
5. $7,500 Tax Credit
6. $1,000 Rebate
7. $1,500 Rebate
8. $2,500 Rebate
9. $5,000 Rebate
10. $10,000 Rebate

Vehicle Range

Vehicle range represented the maximum distance a vehicle could travel on a full tank of fuel or a full charge without refueling. This attribute had five levels for each fuel type. Vehicles that operate on a single fuel (gasoline, diesel, FFV, BEV, and FCEV) were presented with a single range for that fuel. Dual fuel vehicles (PHEV and PFCEV) were presented with two ranges – one for the primary fuel (gasoline or hydrogen) and another for the electric range. The levels for gasoline, diesel, FFV, and HEV vehicles pivoted off the base range distance according to the following values:

1. Base range -10%
2. Base range -5%
3. Base range
4. Base range +5%
5. Base range +10%

BEV and FCEV vehicles pivoted off the base range distance according to the following values:

1. Base range -25%
2. Base range -10%
3. Base range
4. Base range +10%
5. Base range +25%

Dual fuel vehicles (PHEV and PFCEV) used the appropriate levels for the primary fuel and the following fixed levels for the vehicle's electric range:

1. 10 miles
2. 20 miles
3. 30 miles

Fuel Availability

Fuel availability represents the availability of vehicle refueling infrastructure expressed relative to gasoline refueling stations (for diesel vehicles), distance from home or work (for hydrogen vehicles), or as a percentage of public parking facilities with Level 2 and DC fast charging available (for electric vehicles). Electric vehicles had additional attributes to indicate whether recharging infrastructure was available at home, at workplace/school locations, or both.

Gasoline vehicles were always presented with gasoline stations at today's locations for the availability of fuel. Diesel vehicles were presented with one of the following three levels relative to gasoline:

1. 30% of today's gasoline locations
2. 50% of today's gasoline locations
3. 70% of today's gasoline locations

Hydrogen vehicles were presented with one of the following five levels for distance to the nearest refueling station:

1. 1 mile to station from home/work

2. 5 miles to station from home/work
3. 10 miles to station from home/work
4. 20 miles to station from home/work
5. 30 miles to station from home/work

Electric vehicles were presented with one of the following three levels for regular (Level 2 charging) availability at public parking locations:

1. 10% of public parking facilities have regular charging stations
2. 20% of public parking facilities have regular charging stations
3. 30% of public parking facilities have regular charging stations

In addition to regular charging, electric vehicles were presented with one of the following three levels for fast (DC fast charging) availability at public parking locations:

1. 10% of public parking facilities have fast charging stations
2. 20% of public parking facilities have fast charging stations
3. 30% of public parking facilities have fast charging stations

Electric vehicles were also presented with an attribute describing whether or not home charging was available that included the following two levels:

1. Not Available
2. Regular charging available

Finally, electric vehicles were presented with an attribute indicating whether or not regular or fast charging was available at their primary work or school location. This attribute included the following three levels:

1. Not Available
2. Regular charging available
3. Fast charging available

Miles per Gasoline Gallon Equivalent (MPGe)

A base value for miles per gasoline gallon equivalent (MPGe) was estimated for each vehicle type, fuel type, prestige level, and model year combination. This value was varied according to the following five levels:

1. Base MPGe -25%
2. Base MPGe -10%
3. Base MPGe
4. Base MPGe +10%
5. Base MPGe +25%

Dual-fuel vehicles varied the presented MPGe value for each fuel type and varied both using the same levels described above.

Fuel Cost Per 100 Miles

The cost to drive a vehicle 100 miles was calculated as a function of the fuel cost in gasoline gallon equivalent and the vehicle fuel efficiency in miles per gallon equivalent. The fuel cost per gasoline gallon equivalent was not shown to respondents; however, this value was used to calculate the fuel cost per 100 miles of driving. The fuel cost in gasoline gallon equivalent was estimated for each type of fuel and varied according to three levels:

1. Low price scenario
2. Medium price scenario
3. High price scenario

The price scenarios were defined for each fuel type and each purchase year (either 2021 or 2025). The low, medium, and high fuel costs values for each fuel type and purchase year are presented in Table 2E-4.

Table 2E-4: Fuel Cost

Fuel Type	Purchase Year	High	Mid	Low
Gasoline	2021	$4.98	$3.97	$2.77
	2025	$5.75	$4.14	$2.79
Diesel	2021	$5.29	$4.23	$3.39
	2025	$6.19	$4.45	$3.38
Electricity	2021	$6.34	$6.11	$5.88
	2025	$6.65	$6.24	$5.84
Hydrogen	2021	$14.62	$14.26	$13.91
	2025	$13.14	$12.48	$11.87

Refueling Time

Refueling time represents the time needed to refuel a vehicle. This attribute had different levels based on fuel type as with the fuel availability attribute. All gasoline, diesel, FFV, HEV, and FCEV vehicles were presented with a fixed refueling time of 5 minutes. Dual-fuel vehicles (PHEV and PFCEV) were presented with a refueling time of 5 minutes for the primary fuel and an electric recharging time that varied according to the following three levels:

1. 20 minutes for 10 miles for regular charging
2. 30 minutes for 10 miles for regular charging
3. 40 minutes for 10 miles for regular charging

All BEVs were presented with both regular (Level 2) and fast (DC Fast Charging) refueling times. The regular charging times varied according to the following three levels:

1. 2 hours for 100 miles for regular charging
2. 4 hours for 100 miles for regular charging
3. 6 hours for 100 miles for regular charging

The fast charging times varied according to the following three levels:

1. 5 minutes for 100 miles for fast charging
2. 15 minutes for 100 miles for fast charging
3. 25 minutes for 100 miles for fast charging

Annual Maintenance Cost

The annual maintenance cost represents the cost to maintain a vehicle over the course of a year. Maintenance costs include all costs associated with normal routine maintenance during a year including oil and filter changes. It does not include insurance, registration, fees, or unexpected repairs. A base maintenance cost per year for each vehicle was estimated based on the vehicle type, fuel type, prestige level, and model year. These annual maintenance costs were varied according to the following three levels:

1. Base annual maintenance cost -20%
2. Base annual maintenance cost
3. Base annual maintenance cost +20%

Acceleration

The acceleration attribute represents the amount of time (in seconds) it takes a vehicle to accelerate to 60 mph. A base acceleration time for each vehicle was estimated based on the vehicle type, fuel type, prestige level, and model year. The base acceleration value was varied according to the following three levels:

1. Base acceleration -20%
2. Base acceleration
3. Base acceleration +20%

Table 2E-5 provides a complete summary of the attributes and levels described above.

Table 2E-5: Attributes and Levels for the SP Survey

Level	Fuel Type	1	2	3	4	5	6	7	8	9	10	11	12	13
Vehicle Class	N/A	Car-Subcompact	Car-Compact	Car-Midsize	Car-Large	Car-Sport	Cross/Ut-Subcompact	Cross/Ut-Compact	Cross/Ut-Midsize	Sport/Ut-Large	Van-Compact	Van-Std	Pickup-Compact	Pickup-Std
Fuel Type	N/A	Gasoline only	Gas HEV	PHEV	Diesel	BEV	FCEV	PFCEV	Flex Fuel					
Brand Type	N/A	Premium	Standard											
Model Year	N/A	New	Used (2-3)	Used (4-6)										
Number of Models	N/A	-30%	-15%	0%	15%	30%								
Purchase Price	N/A	-20%	-10%	0%	10%	20%								
Vehicle Range	Gas/Diesel/ HEV/FFV/PHEV (gas)	-10%	-5%	0%	5%	10%								
	BEV/FCEV/ PFCEV (hydrogen)	-25%	-10%	0%	10%	25%								
	PHEV/PFCEV electric range	10 miles	20 miles	30 miles										
Public Refueling Station Availability	Gas	Today's gasoline locations												
	Diesel	30% of today's gasoline locations	50% of today's gasoline locations	70% of today's gasoline locations										
	Hydrogen	1 mile to station from home/work	5 miles to station from home/work	10 miles to station from home/work	20 miles to station from home/work	30 miles to station from home/work								
	Electric (L2 local)	10% of public parking facilities have regular charging stations	20% of public parking facilities have regular charging stations	30% of public parking facilities have regular charging stations										
	Electric (Fast chargers local)	10% of public parking facilities have fast charging stations	20% of public parking facilities have fast charging stations	30% of public parking facilities have fast charging stations										
Home Recharging (if available)	N/A	Not Available	Regular charging available											
Workplace/ School Recharging	N/A	Not Available	Regular charging available	Fast charging available	Regular charging available	Fast charging available								
MPGe (see lookup table)	Fuel 1	-25%	-10%	0%	10%	25%								
	Fuel 2	-25%	-10%	0%	10%	25%								
Fuel Cost per 100 miles	N/A	Low	Medium	High										
Refueling Time (Public Stations)	Gasoline/Diesel/FFV	5 minutes												
	PHEV/PFCEV: L2 recharging	20 minutes for 10 miles for regular charging	30 minutes for 10 miles for regular charging	40 minutes for 10 miles for regular charging										
	BEV: L2 recharging	2 hours for 100 miles for regular charging	4 hours for 100 miles for regular charging	6 hours for 100 miles for regular charging										
	BEV: Fast chargers	5 minutes for 100 miles for fast charging	15 minutes for 100 miles for fast charging	25 minutes for 100 miles for fast charging										
Purchase Incentive	Gas/Diesel/ FFV/HEV	None												
	PHEV/BEV	None	HOV lane access for 3 years	$2,500 Tax Credit	$5,000 Tax Credit	$7,500 Tax Credit	$1,000 Rebate	$1,500 Rebate	$2,500 Rebate					
	FCEV/PFCEV	None	HOV lane access for 3 years	$2,500 Tax Credit	$5,000 Tax Credit	$7,500 Tax Credit	$1,000 Rebate	$1,500 Rebate	$2,500 Rebate	$5,000 Rebate	$10,000 Rebate			
Annual Maintenance Cost	N/A	-20%	0%	20%										
Acceleration (0-60 mph)	N/A	-20%	0%	20%										

Experimental Design

The experimental design for the SP survey was based on an underlying efficient design. In contrast to an orthogonal design, which was used in prior iterations of CVS, an efficient design does not merely minimize the correlation between attribute levels, but also aims to result in a design that generates coefficient estimates with minimum possible standard errors.

Vehicle class, fuel type, prestige level, and model year were not included directly in the design. Instead, they were added to the design in a second stage after the generation of the base efficient design. This reduced the complexity of the efficient design and obviated the need to generate a large number of different designs for different combinations of vehicle classes and fuel types. The final design combined the efficient design with weighted random allocations of vehicle class, fuel type, prestige level, and model year.

Base Efficient Design

The base design was split into several blocks of eight choices. The blocking was used to avoid any correlation between the attributes and the blocks (e.g., avoiding the situation where one respondent gets all the high-priced options). The design contained the levels for all attributes other than vehicle class, fuel type, prestige level, and model year across four alternatives.
In the survey, each respondent was presented with one block of eight choice situations. Care was taken to ensure that the different blocks were presented the same number of times and that there was no correlation between sample subgroups and blocks. The choice situations were constructed based on the set of vehicle class/fuel type/prestige level/model year combinations drawn for that respondent, and the block of eight choice situations used from the experimental design for that respondent. The order in which the eight choice situations from a given block were presented to a respondent was also randomized across respondents.

Ordering of Alternatives

Several steps were taken to eliminate potential ordering effects in the design. In each choice set, a respondent was faced with four alternatives: the reference alternative and three remaining alternatives. All four alternatives in each of the eight choice situations were assigned in random order. In this way, each alternative had an equal probability of being assigned the reference vehicle type.