

Do plug-in vehicle buyers want “Green” electricity?

Presented: November 12, 2012

Dr. Jonn Axsen, Simon Fraser University
Dr. Kenneth S. Kurani, University of California, Davis

Funded by BMW of North America, LLC



Introduction

Plug-in electric vehicles (PEVs):

Plug-in hybrid vehicles (10-40 miles electric, then hybrid)

Electric vehicles (75-200 miles, electric only)

Widespread PEV uptake can cut gasoline use

What about GHG emission and air pollution impacts?

With **fossil fuel-based** electricity, impacts are substantial.

With **renewable-based** electricity, impacts are near-zero.

Ways to reduce PEV impacts:

1. Regulate electricity generation to increase renewables.
2. Build a consumer market for renewables (**explored here**).

Research Objectives

1. Assess consumer interest in PEVs and green electricity programs (**separately**).
2. Does combination of a PEV with a green electricity program increase demand for PEVs (**complementary**)?
3. Characterize consumer motivations regarding this demand.

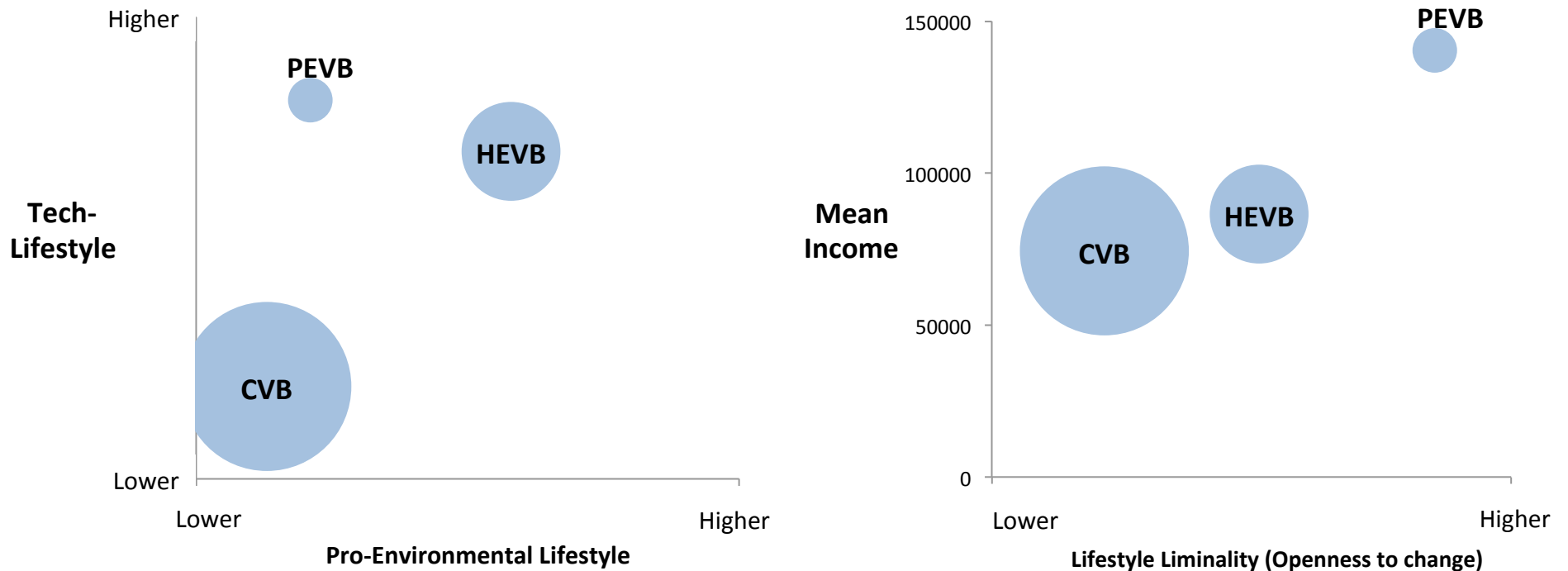
Recruited three U.S. samples to complete a web-based survey:

- A) Buyers of new conventional vehicles (**CVB = 1064**)
- B) Buyers of hybrid vehicles (**HEVB = 364**)
- C) Buyers PEVs, e.g. MINI E, Chevrolet Volt and Nissan Leaf (**PEVB = 74**)

Vehicle segments differ by “lifestyle”

Compared to conventional vehicle buyers (CVBs):

- PEVB/HEVB are more likely to engage in technology exploration
- HEVB are more likely to engage in pro-environmental activities
- PEVB have higher income, and higher openness to change (higher “liminality”)



Method Overview

20-minute web-based survey

1. **Game 1:** PEV design
2. **Game 2:** Green-electricity design
3. **Game 3:** “Combined” design (PEV and Green-E)
4. Motivation assessment
 - After each game
 - 12-15 motivation statements (drawn from focus groups)
 - Respondent rates statement importance (with finite rating points)

Game 1: PEV Design

Game 1: PEV design games

Respondents first select their next anticipated vehicle by type (CV or HEV) and body size (compact, sedan, mid-sized or full SUV/truck).

Incremental price, compared to base vehicle.

HEV: 33% improved fuel economy.

[\$780 to \$1740]

PHEV: 10-40 mile range, and 33% improvement in fuel economy.

[\$2090 to \$7540]

Electric vehicle (EV): 75-200 miles of pure electric range.

[\$2940 to \$25,380]





Example Screenshot from Survey

Which version of your next **Mid-sized car** would you like to purchase?
Consult other household members if you would normally do so when making a vehicle purchase.

Except for the differences described, assume the hybrid, plug-in hybrid and electric versions of any vehicle has the same body, performance, interior size, etc. as the gasoline version.

Please select a vehicle design for your next **Mid-sized car**
(Click [here](#) to see the vehicle descriptions.)

You can only select ONE of the follow vehicle designs. When you have explored the designs as much as you want, select your vehicle design by choosing the button on the right.

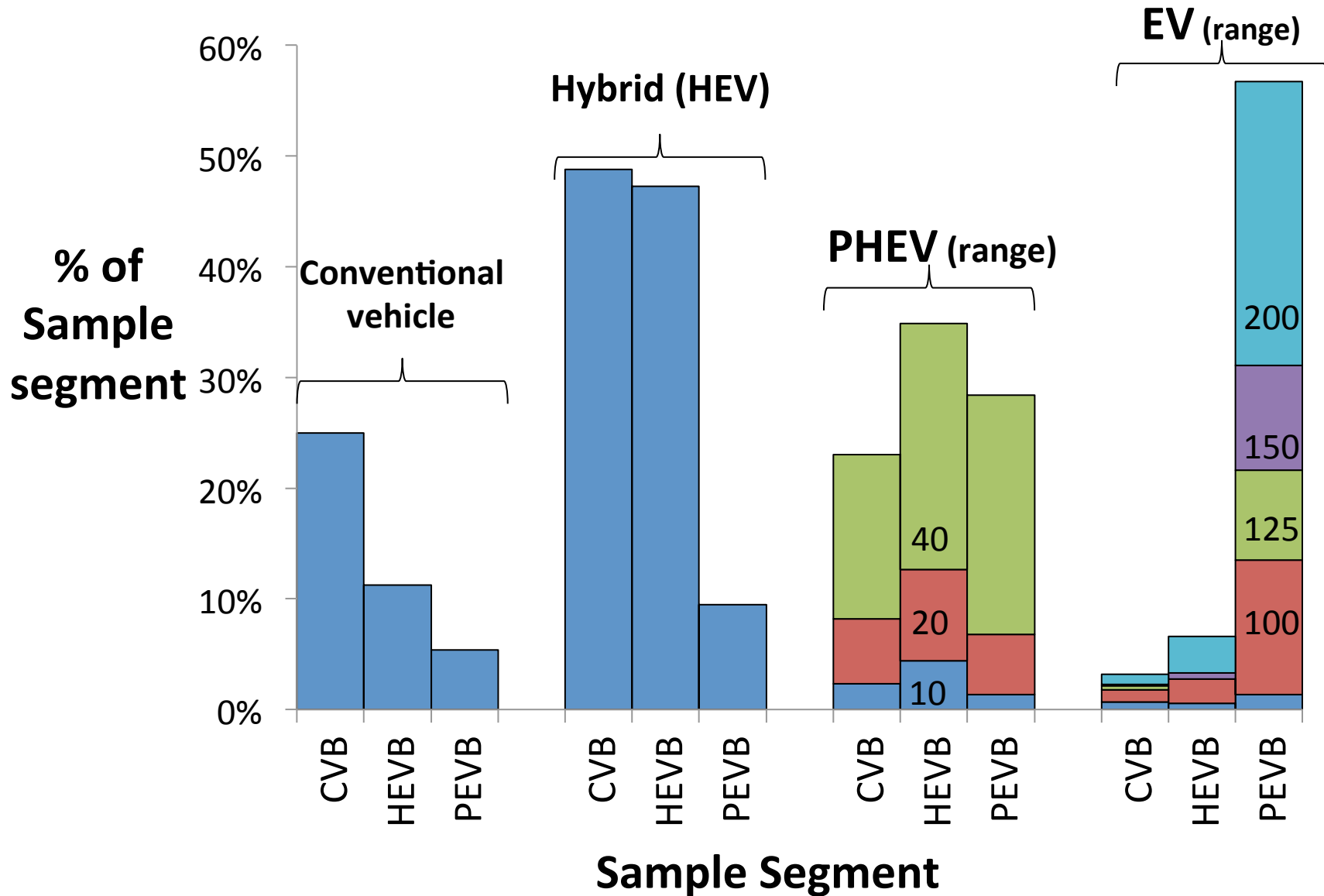
	Battery distance	Gasoline Fuel Economy	Electricity Recharge Time	Purchase Price	
 Regular	None	25 MPG	None	\$20,000	<input type="checkbox"/>
 Hybrid	None	33 MPG	None	\$21,290	<input type="checkbox"/>
 Plug-in Hybrid	All-electric for the first: 40 Miles: + \$5,110	33 MPG	1.8 hours	\$25,110	<input checked="" type="checkbox"/>
 Electric Only	Electric only for: 100 Miles: + \$8,790		6.3 hours	\$28,790	<input type="checkbox"/>

[Contact Us](#)

0% 25% 50% 75% 100%

Game 1: Vehicle Designs

HEVs and PHEVs popular. EVs only popular among PEVBs



Game 2: Green Electricity Design

Game 2: Green Electricity design games

Next, the respondent completed a “Green” electricity design game.

- 1) **No green program:** or current “green” program if already enrolled.
- 2) **Monthly Green Program:** covers **20 -100%** of home electricity use.
[¢1.5 to 3/kWh]
- 3) **2-Year Green Lease:** same as Green, but funds an actual solar/wind project.
[¢1.5 to 3 /kWh]
- 4) **Install residential solar:** purchase a home solar kit (**180-900 kWh** per month), financed as one monthly bill. Also reduced monthly bill.
[\$20 to \$102/month]

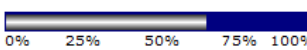
Example Screenshot from Survey

You will be shown two price scenarios:
This is price scenario #1.

Which of the following electricity programs would you select?
Consult other household members if you would normally do so when considering your electricity bill.
(click [here](#) to see program descriptions)

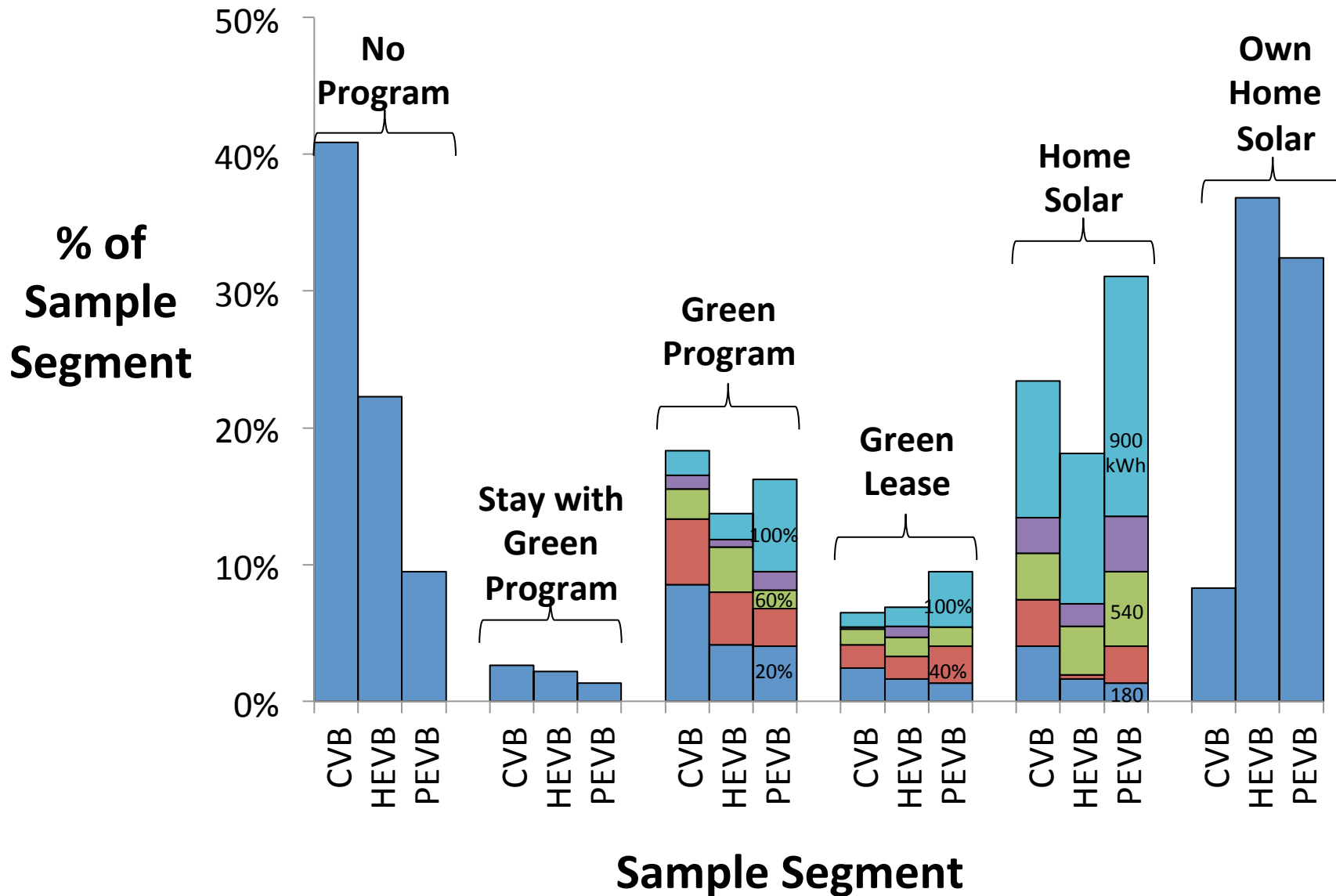
You can only select ONE of the follow electricity options. When you have explored the designs as much as you want, select your option by choosing the button on the right.

	Source of Green Electricity	% of Your Home Electricity and Cost	Electricity Savings	Total Electrical Bill	
No Program	Your existing sources	Unknown		\$100.00/month	<input type="checkbox"/>
Monthly Green Program	Solar	40% Green: \$6.59/month		\$106.59/month	<input type="checkbox"/>
2-Year Green Lease	Click to design	Click to design			<input type="checkbox"/>
Own Rooftop Solar	Solar	33% Solar: \$29/ month	-\$33.00/ month savings	\$96.00/ month	<input type="checkbox"/>

[Contact Us](#) 

Game 2: Green Electricity Designs

Home solar is popular (particularly among HEVBs and PEVBs).



Game 3: Combined offering
(PEV and Green Electricity)

Game 3: Combining vehicle and electricity options


Combined the two previous games. Respondents could design a PEV and a home electricity program. The games were framed just as before, except:

- Monthly electricity bill increased to reflect PEV charging cost.
- Green-E programs showed % of “vehicle charging” covered green sources.

Example Screenshot from Survey

You have selected your vehicle and your electricity source.

Would you like to change either?
If so, click on the box below, and then click next.
Otherwise, just click next.

Click below to design	Click below to design
Your vehicle:	Your electricity:
 Type: Electric Only Battery distance: 100 Miles Fuel economy: None MSRP: \$28,790	Source: Own Rooftop Solar Home electricity: 19% Solar Vehicle electricity: 47% Monthly Savings: -\$31.98/month Total Electric Bill: \$165.33/month
<input type="checkbox"/>	<input type="checkbox"/>

[Contact Us](#)

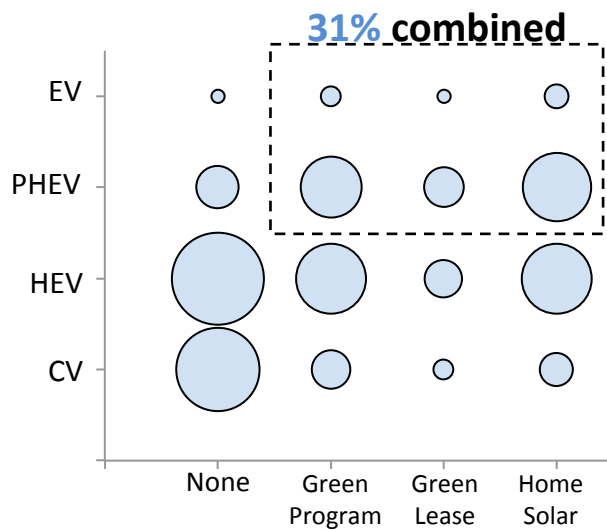
0% 25% 50% 75% 100%

Game 3: Combining vehicle and electricity games

HEVB/PEVB segments are more likely to combine PEV and Green-E.

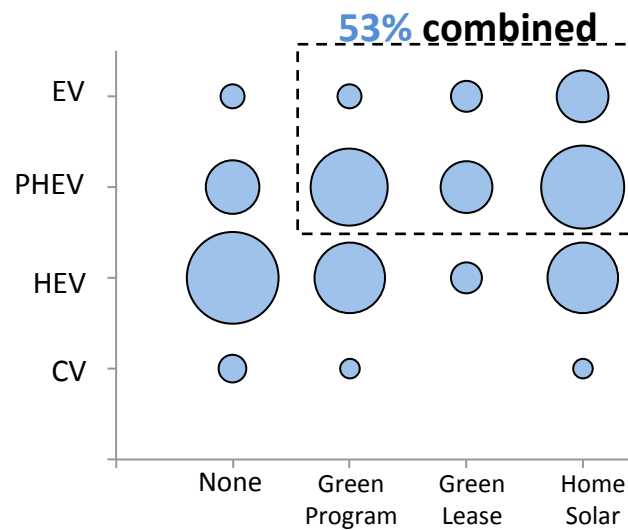
- CVBs/HEVBs combine a PHEV with solar or a green program
- PEVBs combine EV with home solar
- Samples are broadly spread across the possible combinations

Conventional buyers



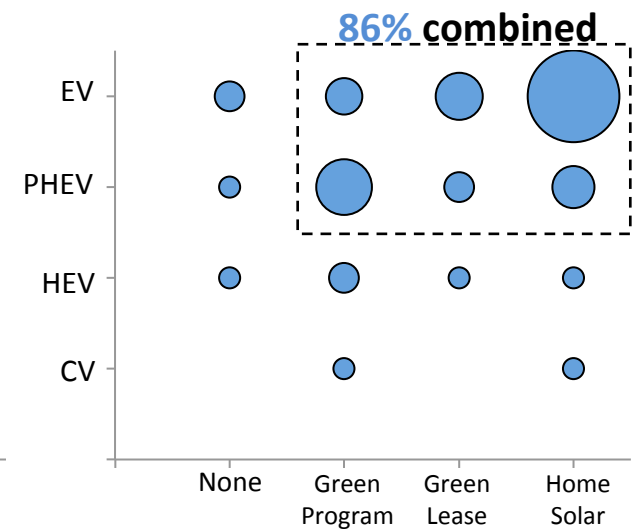
(97% of U.S. market)

Hybrid buyers



(3% of U.S.)

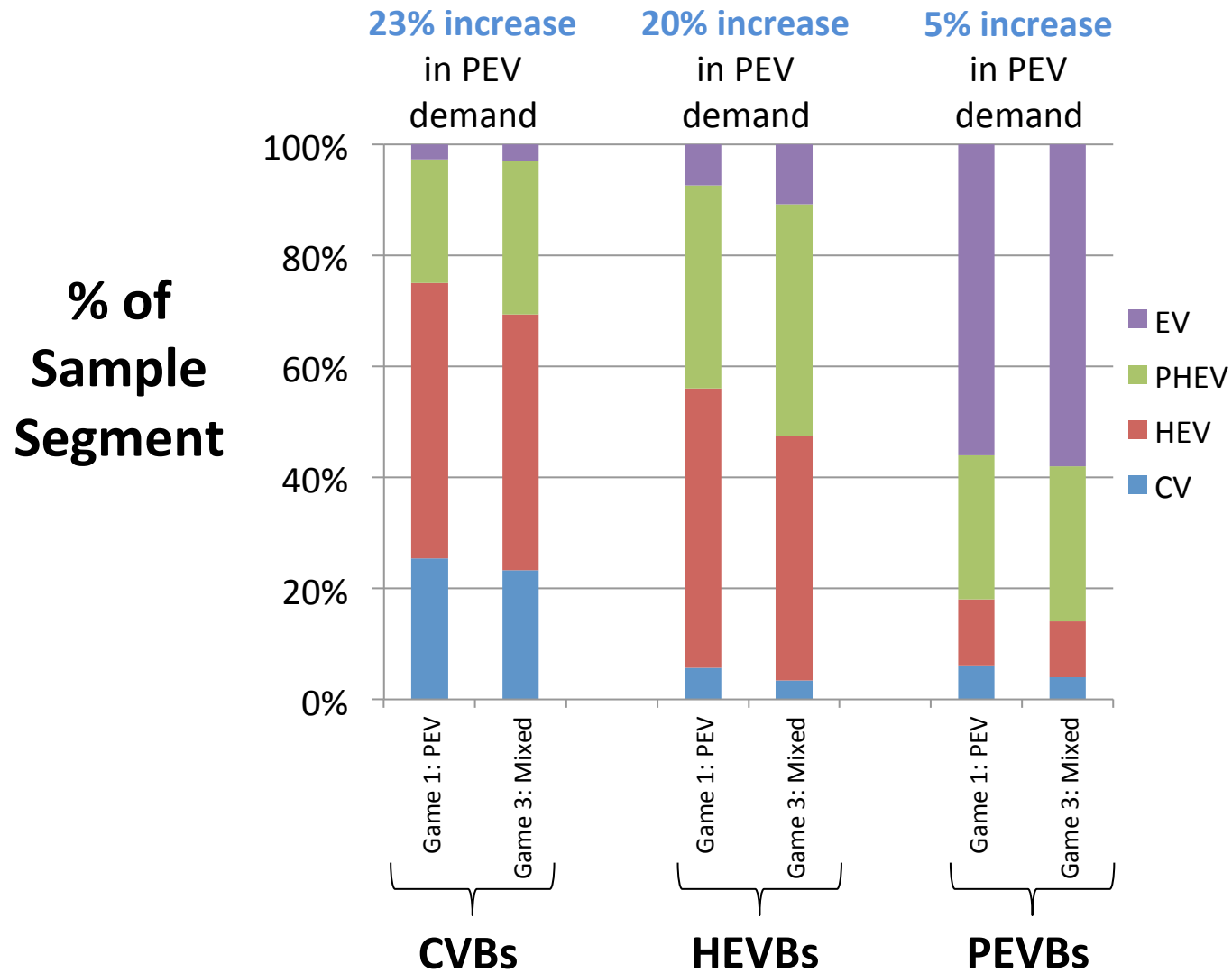
Plug-in buyer



(~0.01% of U.S.)

Game 3: Combining vehicle and electricity games

From Game 1 to Game 3, demand for PEVs increased for each segment



Consumer motivations

Different motivations across samples

Game 1: PEV design

	CVBs	HEVBs	PEVBs
Highest ranked	Gas cost	Gas cost	Enviro.
Second	Enviro.	Enviro	Technology
Third	Vehicle cost	Technology	Gas cost
Fourth	Air pollution	Air pollution	Air pollution

Game 2: Green-E Design

	CVBs	HEVBs	PEVBs
Highest ranked	Bill savings	Bill savings	Renewables
Second	Renewables	Renewables	Enviro.
Third	Enviro.	Control	Technology
Fourth	Control	Enviro.	Oil politics

Game 3: Combination

	CVBs	HEVBs	PEVBs
Highest ranked	Enviro.	Enviro.	Technology
Second	Renewables	Renewables	Renewables
Third	Control	Control	Oil politics
Fourth	Oil politics	Technology	Enviro.

Binary logistic regression helped to explain respondent interest in “combined” product.

Controlling for numerous variables,

Respondents were more likely to combine a PEV and Green-electricity design in Game 3 if they...

...are under 60 years of age.**

...live in a detached home.*

...recently bought an HEV or PEV.**

...engaged in **technology-oriented** lifestyle.**

...had stronger **pro-environmental attitude** (NEP scale).**

* Significant at 95% confidence level ($p < 0.05$)

** Significant at 99% confidence level ($p < 0.01$)

Results yield several important differences between the three segments:

	Conventional (CV) Buyers	Hybrid (HEV) buyers	Plug-in (PEV) buyers
Demographics	Baseline	Younger Higher income More educated Enviro-lifestyle	Older Highest income Open-minded Tech-lifestyle
PEV demand	HEV or PHEV	HEV or PHEV	EV
Green-E demand	Green program	Green program or solar	Solar
Combine PEV and Green-E	31%	53%	86%
PEV demand increase from Green-E offering	+23%	+20%	+5%
Motivations	Cost savings Environment	Cost savings Technology Environment	Technology Environment

Market and Policy Implications

Hopes for combining PEVs and green-electricity?

- Little awareness; most do not inherently link PEVs and Green-E.
- Combined offering increases PEV demand in all three segments.
- Conventional buyers more motivated by cost savings; PEV buyers motivated by technology and environment.

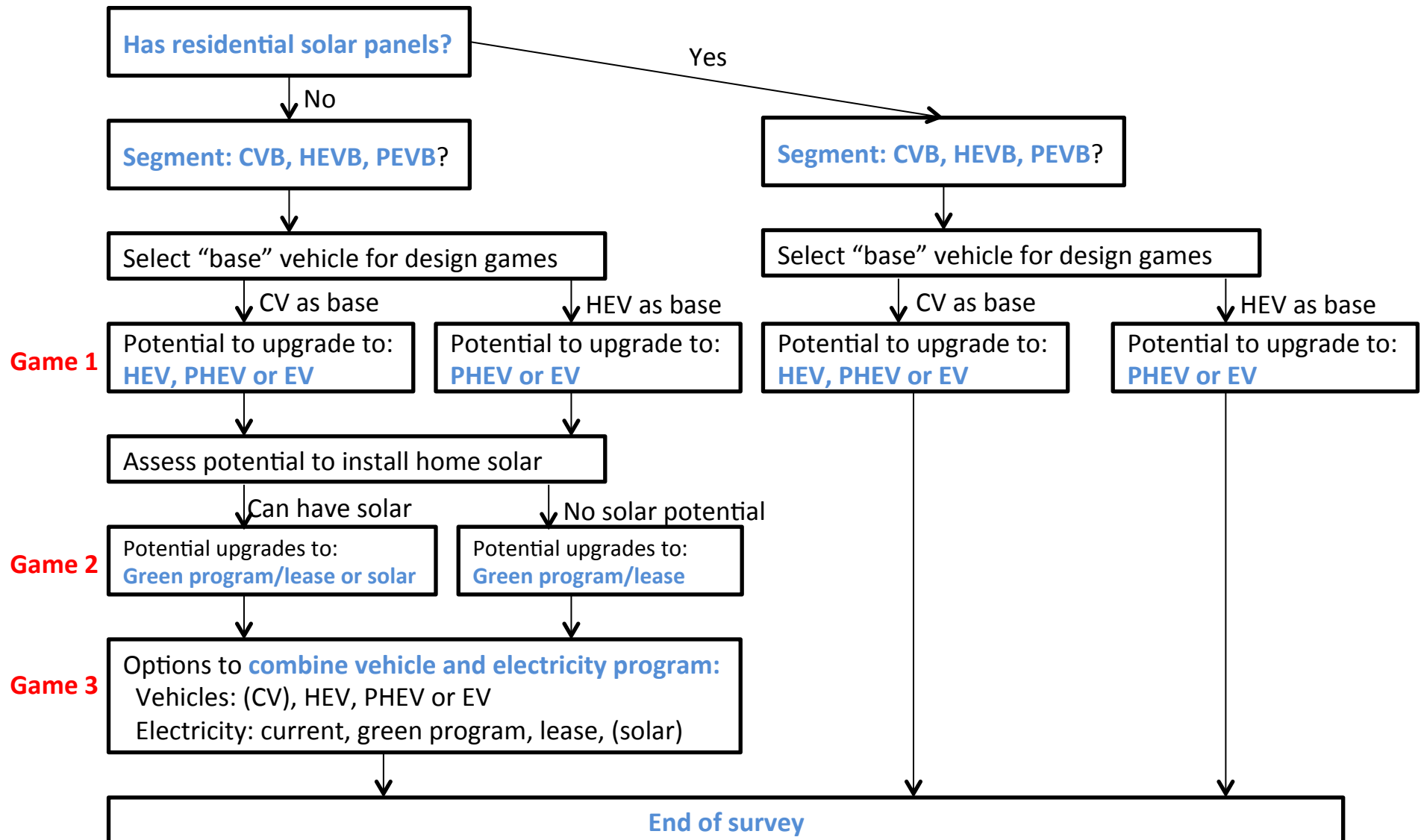
How to stimulate demand for PEV and green-electricity “packages”?

- Short-term: “EV-enthusiasts” and HEV buyers.
- Main stream buyers require more explanation
- Offering Green-E could accelerate PEV demand
- Match benefits to target market:
 - Reduced environmental impact
 - Avoiding oil politics
 - Cost savings
 - Cutting-edge technology
 - Control of fuel/energy sources

Appendices

Method Overview:

The web-based survey instrument required 20-25 minutes to complete. The flow of survey questions was customized based on respondent characteristics, including up to **three design games**: (the survey also included many demographic and attitudinal questions not depicted here.)



Game 1: PEV Design Games

Incremental prices for upgrades are based on technical literature.

- All prices were framed as increments added to the “base” vehicle price (CV or HEV)
- Incremental prices based on simple electric-drive price model:
 - \$/kWh was higher for batteries with higher power-energy ratio (W/Wh)
 - Incremental price includes battery, changes to engine, motor, charger, exhaust and wiring
- Two price scenarios: “Higher” and “lower” battery prices
 - “Higher” battery prices are double those in “lower” scenario
- Base and incremental prices differ by “base” model: compact, sedan, mid-sized SUV/truck or full-sized SUV/truck
 - Incremental prices higher for larger, heavier vehicles

Higher Price Game*					Lower Price Game*				
	Compact	Sedan	Mid-SUV	Full-SUV		Compact	Sedan	Mid-SUV	Full-SUV
HEV	\$1,080	\$1,290	\$1,480	\$1,740	HEV	\$780	\$850	\$920	\$1,000
PHEV-10	\$2,710	\$3,530	\$4,120	\$5,050	PHEV-10	\$2,090	\$2,600	\$2,950	\$3,510
PHEV-20	\$3,160	\$4,060	\$4,830	\$5,880	PHEV-20	\$2,320	\$2,860	\$3,300	\$3,920
PHEV-40	\$4,070	\$5,110	\$6,240	\$7,540	PHEV-40	\$2,770	\$3,380	\$4,000	\$4,760
EV-75	\$5,940	\$6,920	\$8,970	\$10,550	EV-75	\$2,940	\$3,140	\$4,010	\$4,500
EV-100	\$7,570	\$8,790	\$11,490	\$13,510	EV-100	\$3,760	\$4,080	\$5,270	\$5,980
EV-125	\$9,200	\$10,670	\$14,010	\$16,480	EV-125	\$4,570	\$5,020	\$6,530	\$7,460
EV-150	\$10,820	\$12,540	\$16,530	\$19,450	EV-150	\$5,380	\$5,960	\$7,790	\$8,950
EV-200	\$14,070	\$16,290	\$21,570	\$25,380	EV-200	\$7,010	\$7,830	\$10,310	\$11,910

*Price increases relative to the selected “base” vehicle. If respondent selects an HEV as the “base” vehicle, then incremental prices are as shown, but *less* the HEV incremental price.

Game 2: Green Electricity Design Games

- Each respondent's assumed monthly household kWh demand was based on their U.S. State of residence and housing type (detached, attached, apartment or mobile home)
- Green electricity program and lease prices were based on two rates:
 - Higher price scenario: \$0.03 per kWh covered by plan (20 to 100% of monthly kWh)
 - Lower price scenario: \$0.015 per kWh
- Residential solar only offered to respondents with solar potential (rooftop access, and likely would have authority or permission to install)
- Solar installation prices based on:
 - System size (180, 360, 540, 720 or 900 kWh per month)
 - Following economies of scale, \$/watt was lower for larger systems (as detailed by IBNL, 2011)
 - Two price scenarios: Higher (\$5.1 to \$3.6/W) and lower (\$3.6 to \$2.5/W)—gov't incentives included
 - Monthly finance rate based on 5%, 20-year rate

	1. Monthly Program	2. Two-Year Lease	3. Install Home Solar
Source options	Solar, wind, tidal, geothermal, biomass, small hydro, or determined by electric utility	Lease solar panels or wind turbine (somewhere else)	Solar panels installed at home
Higher price scenario	Levels: 20%, 40%, 60%, 80% or 100% of household electricity use Price = \$0.03/kWh	Same as Monthly (#1)	180 kWh: \$29/month (\$5.1/W) 360 kWh: \$58/month (\$5.1/W) 540 kWh: \$68/month (\$4.0/W) 720 kWh: \$86/month (\$3.8/W) 900 kWh: \$102/month (\$3.6/W)
Lower price scenario	Levels: 20%, 40%, 60%, 80% or 100% of household electricity use Price = \$0.015/kWh	Same as Monthly (#1)	180 kWh: \$20/month (\$3.6/W) 360 kWh: \$40/month (\$3.6/W) 540 kWh: \$48/month (\$2.8/W) 720 kWh: \$60/month (\$2.7/W) 900 kWh: \$71/month (\$2.5/W)
Savings on electric bill	None	None	Savings = (% solar) x Household bill

3 Vehicle Segments:

1) CV buyers (CVB)

n = 1064

2) HEV buyers (HEVB)

n = 364

3) PEV buyers/lesers (PEVB)

n = 74

(61 leased a MINI E,
8 now own a Chevy Volt
9 now own a Nissan Leaf
1 owns a Tesla
9 own an Active E)

Green-E information

- Respondents reported much higher participation in green electricity programs (6 to 8%) than NREL estimates for general population (1 to 2%)
- Reported ownership of home solar is also higher than anticipated

* Differences between the three segments are significant at 99% confidence level ($p < 0.01$) for all variables shown here.

Segment*		CVB	HEVB	PEVB
Sample Size		1064	364	74
Electricity	Green Electricity Program	6.3%	7.7%	8.1%
	Home Solar	8.3%	36.8%	32.4%
Luxury Make		9.9%	13.2%	N/A
Number of vehicles	1	23.9%	19.5%	9.5%
	2	56.0%	58.8%	40.5%
	3 or more	20.1%	21.7%	50.0%
Education	High School or less	42.6%	30.5%	12.2%
	University/College Graduate	43.3%	47.3%	45.9%
	Graduate degree	14.1%	22.3%	41.9%
Age	19 to 29	20.4%	30.5%	9.6%
	30 to 39	25.5%	26.4%	9.6%
	40 to 49	16.6%	14.4%	16.4%
	50 to 59	20.3%	15.5%	43.8%
	60 or older	17.3%	13.2%	20.5%
Income	<\$50k	26.9%	20.1%	4.1%
	\$50-69k	24.0%	20.3%	5.4%
	\$70-99k	23.2%	23.4%	12.2%
	\$100-150k	16.4%	24.2%	10.8%
	>\$150k	4.6%	9.1%	50.0%
	No Answer	5.0%	3.0%	17.6%
	Median Income Category	\$60-69k	\$70-79k	\$>150k
Housing Type	Detached House	73.6%	71.7%	91.9%
	Attached House	13.1%	17.0%	1.4%
	Apartment	10.3%	10.2%	4.1%
	Mobile Home	3.0%	1.1%	2.7%
Owns home		80.9%	84.1%	93.2%

Comparing CVB, HEVB and PEVB “segments”

On average, ...

PEVB segment differs from CVB/HEVB segments:

- More vehicles per household
- More likely to have higher education
- Much older
- Much higher household income
- More likely to live in a detached home, and to own home

HEVB segment differs from CVB segment

- Slightly more likely to be more educated, younger and higher income

Segments differ by green electricity use:

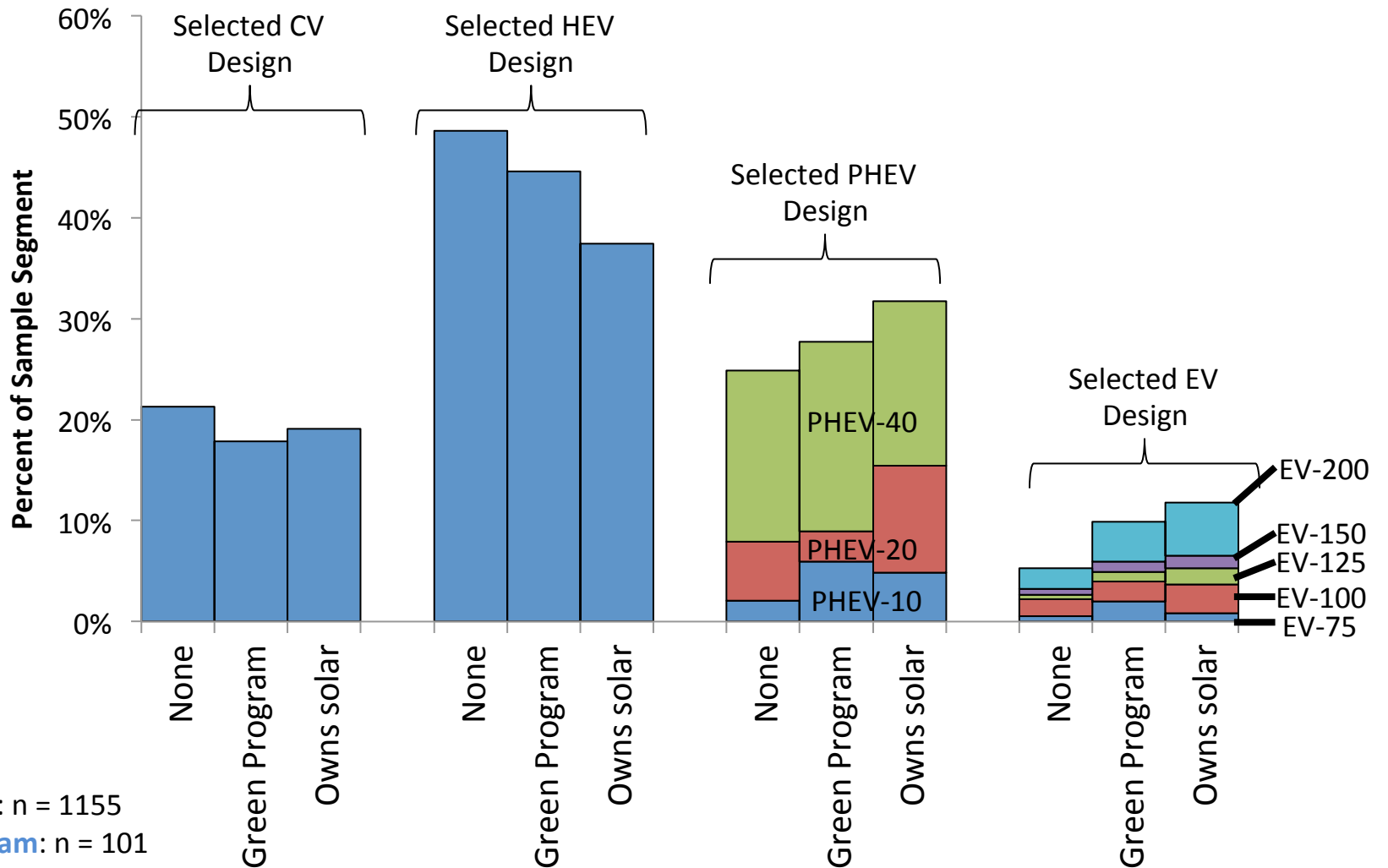
- HEVB/PEVB segments are 4 times as likely as CVB to own home solar
- But, HEVB/PEVB segments are only slightly more likely to subscribe to a green electricity program

Sample Distributions by U.S. State

State	CVB %	HEVB %	PEVB %	Total %
Alabama	18 2%	1 0%	0 0%	19 1%
Alaska	1 0%	0 0%	1 1%	2 0%
Arizona	13 1%	6 2%	1 1%	20 1%
Arkansas	7 1%	1 0%	0 0%	8 1%
California	105 10%	60 16%	35 47%	200 13%
Colorado	10 1%	2 1%	0 0%	12 1%
Connecticut	18 2%	5 1%	0 0%	23 2%
Delaware	2 0%	0 0%	0 0%	2 0%
Florida	76 7%	31 9%	0 0%	107 7%
Georgia	37 3%	11 3%	1 1%	49 3%
Hawaii	0 0%	2 1%	0 0%	2 0%
Idaho	1 0%	1 0%	0 0%	2 0%
Illinois	61 6%	16 4%	1 1%	78 5%
Indiana	20 2%	3 1%	0 0%	23 2%
Iowa	10 1%	3 1%	0 0%	13 1%
Kansas	15 1%	1 0%	0 0%	16 1%
Kentucky	18 2%	2 1%	0 0%	20 1%
Louisiana	8 1%	0 0%	0 0%	8 1%
Maine	3 0%	0 0%	0 0%	3 0%
Maryland	21 2%	7 2%	0 0%	28 2%
Massachusetts	27 3%	10 3%	1 1%	38 3%
Michigan	50 5%	4 1%	2 3%	56 4%
Minnesota	15 1%	8 2%	0 0%	23 2%
Mississippi	6 1%	0 0%	0 0%	6 0%
Missouri	23 2%	4 1%	1 1%	28 2%
Nebraska	6 1%	1 0%	0 0%	7 0%
Nevada	3 0%	3 1%	0 0%	6 0%
New Hampshire	5 0%	3 1%	0 0%	8 1%
New Jersey	37 3%	14 4%	15 20%	66 4%
New Mexico	7 1%	5 1%	0 0%	12 1%
New York	75 7%	40 11%	12 16%	127 8%
North Carolina	37 3%	9 2%	1 1%	47 3%
North Dakota	2 0%	0 0%	0 0%	2 0%
Ohio	46 4%	19 5%	2 3%	67 4%
Oklahoma	9 1%	3 1%	0 0%	12 1%
Oregon	17 2%	5 1%	0 0%	22 1%
Pennsylvania	73 7%	18 5%	0 0%	91 6%
Rhode Island	3 0%	0 0%	0 0%	3 0%
South Carolina	17 2%	10 3%	0 0%	27 2%
South Dakota	2 0%	0 0%	0 0%	2 0%
Tennessee	20 2%	3 1%	1 1%	24 2%
Texas	56 5%	20 5%	0 0%	76 5%
Utah	8 1%	6 2%	0 0%	14 1%
Vermont	1 0%	0 0%	0 0%	1 0%
Virginia	27 3%	9 2%	0 0%	36 2%
Washington	19 2%	10 3%	0 0%	29 2%
West Virginia	6 1%	1 0%	0 0%	7 0%
Wisconsin	23 2%	7 2%	0 0%	30 2%
Total	1064	364	74	1502

Game 1: PEV Designs

Respondents that already have access to “green electricity” (via a utility program or owning residential solar) are slightly more likely to design a PHEV or EV.



Note:

- 1) **No program:** n = 1155
- 2) **Green program:** n = 101
- 3) **Owns solar:** n = 246

Game 1: PEV Designs

Different motivations for respondents that selected PEV designs:

- Similar consideration of **air pollution** among segments.
- CVB/HEVBs driven by **environment** and **cost savings**.
- PEVBs driven even more by **environment** as well as **technology-interest**.

I designed a PEV because I...	CVBs Mean (SD)	HEVBs Mean (SD)	PEVBs Mean (SD)
...think it will save me money on gasoline.*	4.1 (1.6)	3.7 (1.8)	3.2 (1.8)
...am concerned about the environment .*	3.1 (1.9)	2.9 (2.0)	3.5 (1.9)
...think it will save money on the total cost of a vehicle.*	2.7 (2.1)	2.5 (2.1)	1.3 (1.7)
...am concerned about local air pollution .	2.7 (2.0)	2.7 (2.1)	2.8 (2.1)
...am interested in new technology .*	2.6 (2.0)	2.9 (1.9)	3.4 (1.7)

* Significant difference between segments at 95% confidence level ($p < 0.05$)

Game 2: Green Electricity Designs

Different motivations :

- All segments motivated by **environment**, **support for renewable energy** and desire for **control**
- CVB/HEVBs driven more by potential for **costs savings**.
- PEVBs driven more by **technology**, and concern for **politics of oil**.

I joined a green electricity program I...	CVBs Mean (SD)	HEVBs Mean (SD)	PEVBs Mean (SD)
...think it will save money on my electricity bill.*	3.2 (2.1)	3.3 (2.0)	2.0 (2.2)
...want to be part of a movement toward renewable energy.	3.1 (2.0)	3.3 (1.9)	3.6 (1.9)
...am concerned about the environment .	2.9 (2.1)	2.8 (2.1)	3.5 (2.0)
...want some control over my electricity sources.	2.7 (2.1)	2.9 (2.0)	2.3 (2.1)
...am concerned about the politics of oil .*	2.1 (2.1)	2.1 (2.1)	2.9 (2.1)
...am interested in new technology .*	2.0 (2.1)	2.5 (2.1)	2.9 (2.0)

* Significant difference between segments at 95% confidence level ($p < 0.05$)

Game 3: Combining vehicle and electricity games

Respondents reported a variety of motivations for wanting to combine a PEV with a Green E program:

- **Environmental concern** was rated highest among CVBs and HEVBs
- **Technical interest** was rated highest among PEVBs
- Other motives include **support for renewables**, **control** of electricity source and concern for the **politics of oil**.

I would combine the purchase of a PEV with a green electricity program because I...	CVBs Mean (SD)	HEVBs Mean (SD)	PEVBs Mean (SD)
...am concerned about the environment .	2.2 (1.9)	2.4 (2.0)	1.8 (2.1)
...want to be part of a movement toward renewables.	2.1 (1.9)	1.9 (1.8)	2.1 (2.2)
...want to control my PEVs electricity source.	1.8 (1.9)	1.6 (1.8)	1.4 (1.9)
...am concerned about the politics of oil .	1.7 (1.9)	1.4 (1.8)	1.9 (2.2)
...am interested in new technology .	1.5 (1.9)	1.5 (1.8)	2.3 (2.4)

Regression outputs regarding Game 3

Binary logistic regression analyses to assess why some respondents were interested in combining a PEV with green electricity.

Factor	Full Model		Reduced Model	
	Coefficient	Standard Error	Coefficient	Standard Error
Constant	-4.812	0.561***	-4.780	0.529***
Demographics				
Household income (\$k)	-0.001	0.002		
Earned graduate degree	0.001	0.188		
Age 60 or older	-0.772	0.199***	-0.826	0.194***
Detached home	0.364	0.183**	0.324	0.155**
Own Home	-0.087	0.207		
Vehicle owned (CV)				
HEV owner	0.642	0.167**	0.698	0.162***
PEV owner/leaser	2.505	0.447**	2.412	0.383***
Lifestyle/Attitudes				
Environmental lifestyle	0.064	0.082		
Technology lifestyle	0.177	0.075**	0.193	0.071***
Liminality (openness)	0.060	0.035*	0.054	0.034
Pro-environmental (NEP)	0.085	0.014***	0.086	0.013***
Pseudo R² (Cox and Snell)				
	0.123		0.129	
Observations				
	1165		1256	

* p < 0.10
 ** p < 0.05
 *** p < 0.01

Summary of Results

Results from **Game 1** (PEV designs):

- Conventional vehicle buyers most frequently design HEVs (49%) or PHEVs (23-24%).
- Hybrid buyers gravitate to HEVs (40-47%) or PHEVs (35 to 38%).
- Pure EVs designed by 3-7% of conventional buyers, 7-12% of hybrid buyers.
- Plug-in buyers gravitate to PEV designs (28% PHEV, 57% EV).
- Respondents that already have “green electricity” are more likely to design PEV.

Results from **Game 2** (Green Electricity designs):

- Among conventional vehicle buyers, most design some form of green electricity: home solar (23-27%), a green electricity program (18-22%) or lease (6-9%).
- 32-42% of conventional vehicle buyers prefer no green program.
- Most hybrid and plug-in buyers either already own a home solar system (32-37%) or design one (18-35%)

Results from **Game 3** (Combined games):

- 31% of conventional buyers combined a PEV with a Green-E program, as did 53% of hybrid buyers, and 86% of plug-in buyers.
- Adding Green-E options increased overall demand for PEV designs among conventional buyers (23%), hybrid buyers (20%), and PEV buyers (5%). (While the percent increase is low for PEV buyers, it is from a very high base of over 80 percent.)

Consumer Motivations:

- We observe a wide variety of motives across and within respondent segments, including environment, cost, oil politics, renewable support and control of energy.
- Conventional and hybrid buyers are more likely to be motivated by cost savings.
- PEV buyers more strongly motivated by technical interest and as well as environment.