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Consumer Vehicle Technology Data

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Project ID # **VAN003**

This presentation does not contain any proprietary, confidential, or otherwise restricted information.

Overview

Timeline

- **Effort has been ongoing for more than 10 years**

Budget

- **Total FY15 Funding: $135K**
- DOE Share: 100%
- **Funding Received in FY14:** $100K

ANL = Argonne National Laboratory
NREL = National Renewable Energy Laboratory
ORNL = Oak Ridge National Laboratory
SNL = Sandia National Laboratories
UC-Davis = University of California-Davis

Barriers

VTO Multi-Year Program Plan *Outreach, Deployment, and Analysis* barriers addressed:

- Consumer reluctance to purchase new technologies
- Consumer sentiments inform VTO research, modeling, and priorities

Partners

- Project lead: NREL
- NREL, ORNL, ANL, SNL
- UC-Davis, Navigant Research
- Opinion Research Corporation (ORC) International

Relevance

Objective: Gather, analyze, and observe consumer preference information to understand key aspects of consumer decision making on advanced vehicle technologies to inform VTO activities and ultimately penetrate the market with VTO technologies

Relevance: An informed understanding of the consumer allows VTO to achieve petroleum-use reduction goals through:

- Robust assumptions for consumer modeling, analysis, and research efforts
- Improved prioritization of tight program budgets to reflect opportunities that exist in the marketplace

Milestones

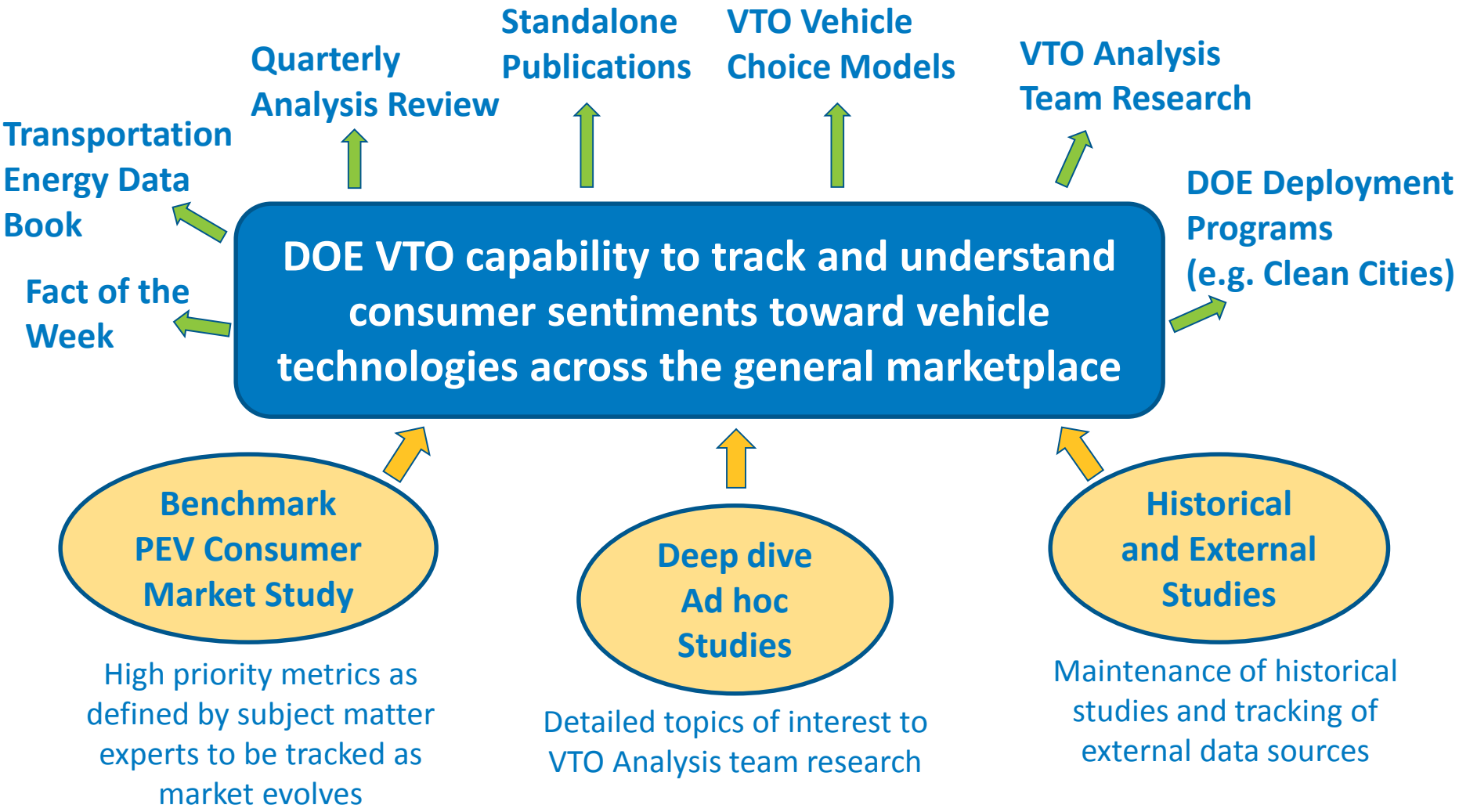
Month/ Year	Milestone or Go/No-Go Decisions Description	Status
September 2014	**Milestone:** Compilation of unpublished study findings (December 2005 – June 2014)	**On Schedule** Draft report completed; Final publication to follow
September 2015	**Milestone:** Develop report of initial primary PEV sentiments study (study completed February 2015)	**On Schedule**

Upcoming FY 2015 Studies

Study topic	# of Questions	Targeted Date	Primary Lab Involved
Fuel Type Preferences	4-6	June 2015	ORNL
Vehicle Attribute Preferences	1		
PEV Exposure	5	July 2015	ORNL
Range	4		
Willingness to Pay	7		

PEV = plug-in electric vehicle

Approach



Primary mechanism:
Subcontract with ORC International for Caravan omnibus telephone survey of 1,000 adults

Approach: National benchmark studies

Draw from subject matter experts to develop a national benchmark study defining high-level consumer market metrics associated with PEV technology acceptance to be tracked as the market evolves

Consumer setting—vehicle purchasing aspects that are technology independent
- What are vehicle segment preferences?
- When did consumers last purchase a vehicle?
- When do consumers expect to buy again?

Consumer technology acceptance—favorability of vehicle technologies
- How do PEVs compare to traditional vehicles?
- Will consumers consider/purchase a PEV?

Consumer barriers—specific to vehicle technology acceptance
- What is the necessary range?
- What is the perceived availability of electric vehicle supply equipment (EVSE)?
- Are consumers willing to pay an incremental cost?
- Are consumers able to plug in their vehicle(s) at home?

FY 2015 milestone: Initial 22 question study completed in February 2015 with draft report on schedule for September 2015

Approach: Deep dive and historical studies

Provide deep dive studies as appropriate to support ongoing VTO analysis team research and relevant hot-topic investigations

- PEV exposure, range concerns, willingness to pay increased costs, workplace charging, wireless charging, policy impacts, PEV ownership
- Prioritize efforts based on level of interest from VT Analysis team

Maintain past study results, use historical and new data to understand the market, and make data available as appropriate

- Publish NREL technical report of historical findings (Dec 2005 - Jun 2014)

FY 2014 milestone: Draft report completed with final publication to follow

- Make VT analysis team aware of available data, including topline summaries as well as demographic breakouts
  - Available demographics include age, geographic region, income level, size of household, education level, etc.

Accomplishments

Compiled historical data publication (2005-2014)

- Examples of recent results and findings

National benchmark PEV sentiments study (initial study Feb 2015)

- Development of the study
- Select preliminary findings

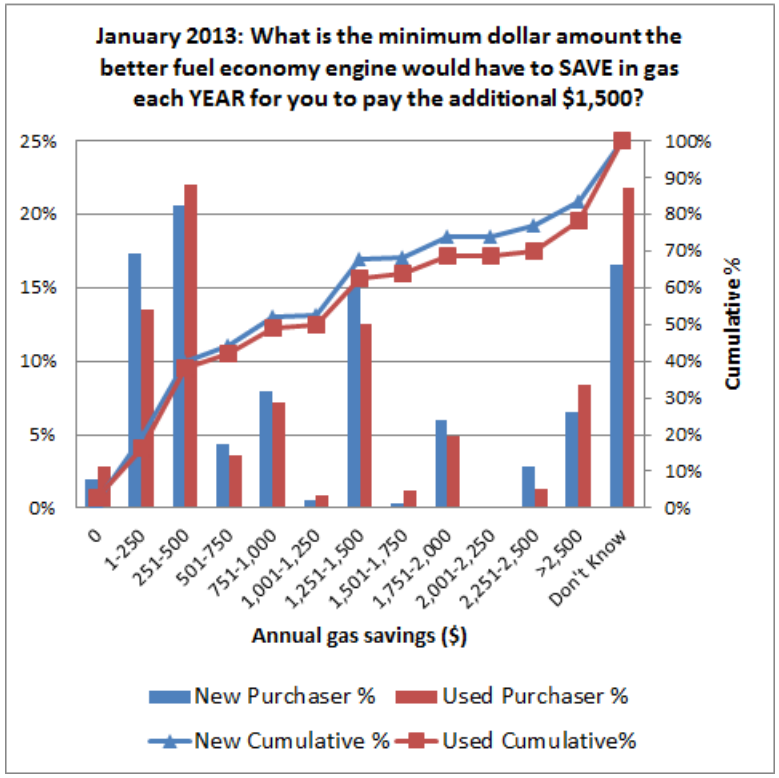
2005- 2014 Historical studies	2015 Benchmark and deep dive studies	2016 → Benchmark and deep dive studies
-Vehicle attribute preferences -Best alternative to gasoline -Fuel economy sentiments -Ethanol perceptions -Perceptions of future technologies -Purchasing habits -Home parking alignment with PEVs -PEV awareness and acceptance -Affects of increased vehicle costs	-Consumer setting -PEV awareness/acceptance -Barriers to PEV adoption -PEV exposure -PEV range concerns -Willingness to pay -Workplace charging -Wireless charging -Policy -PEV ownership	-Consumer setting -PEV awareness/acceptance -Barriers to PEV adoption -Continued PEV deep dives -??CNG sentiments?? -??Biofuel sentiments?? -??New hot topics??

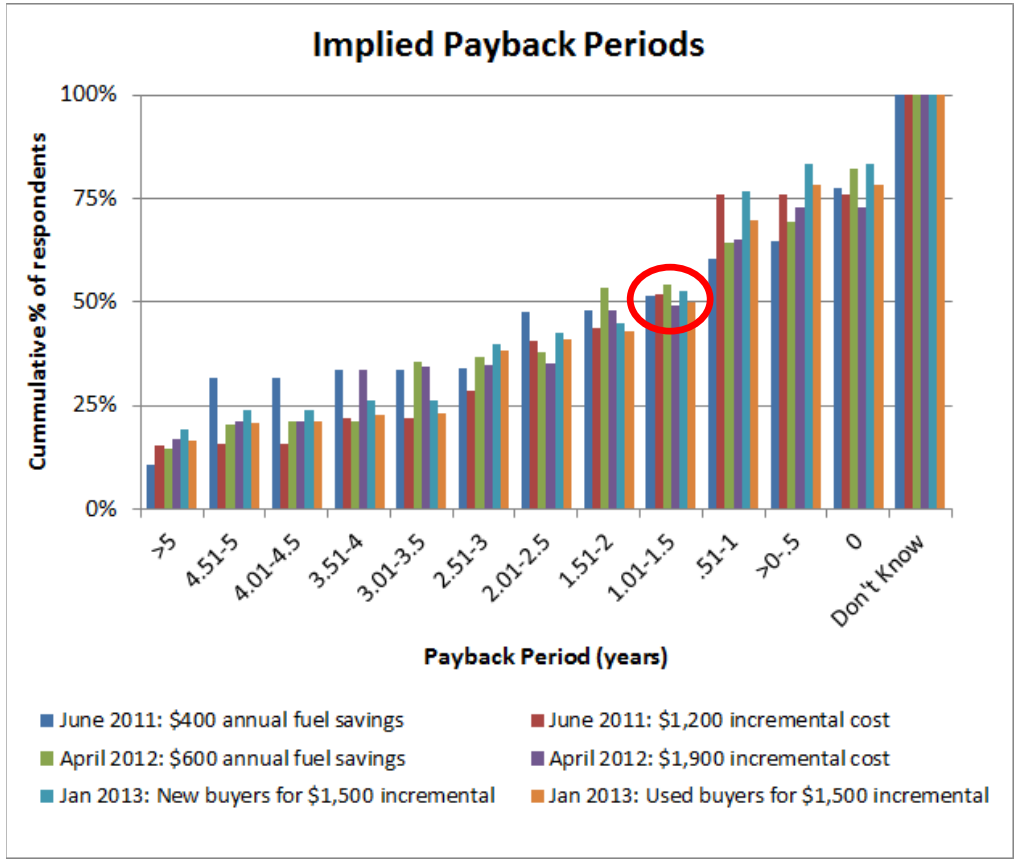
Accomplishments: Historical Studies

Are consumers willing to pay for improved fuel economy?

(Price Elasticity Studies for ORNL and FY15 NREL Technical Report)

Example:





50% of respondents would accept a 1- to 1.5-year or longer payback period for a willingness to pay an upfront cost for a fuel economy improvement.

Accomplishments: PEV Sentiments Study

Created national benchmark study to define and track metrics associated with market acceptance and uptake of PEVs

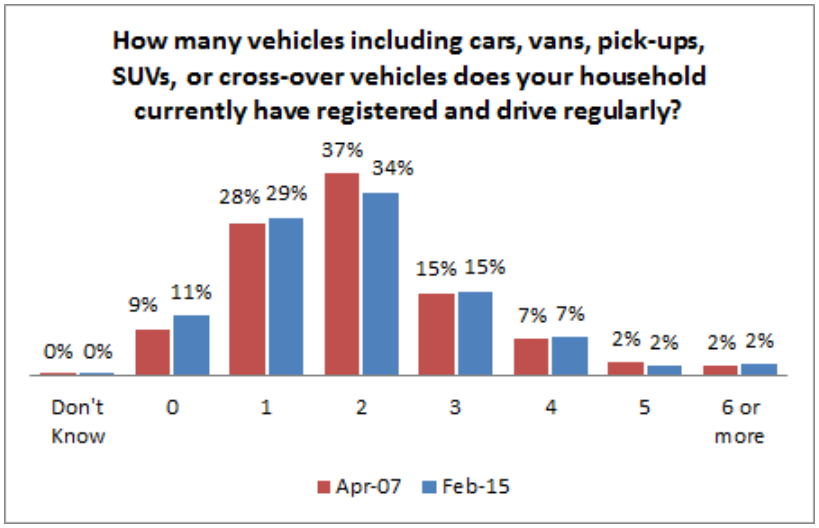
- Consumer setting
- Consumer technology acceptance
- Consumer barriers

The study question set was vetted in working group discussions with subject matter experts

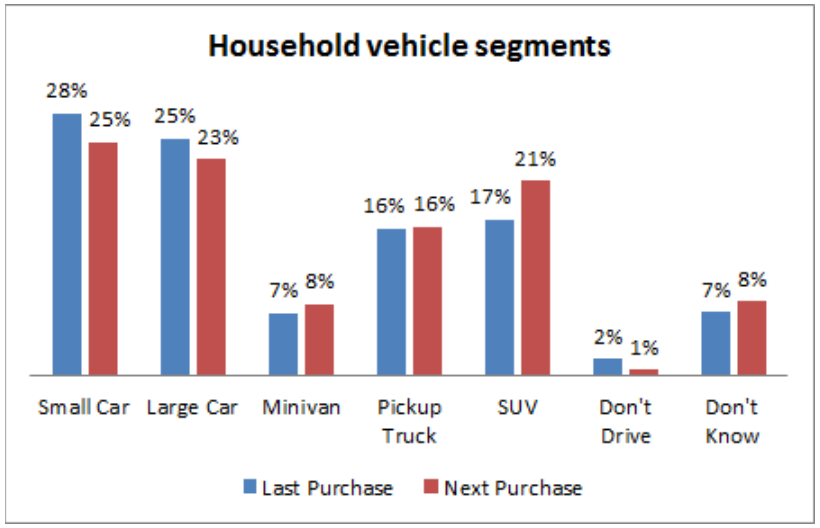
- ORNL, NREL, ANL, SNL, UC-Davis, Navigant Research, California Air Resources Board
- Continue to grow extensive list of additional questions

Select examples follow from initial study completed in February 2015

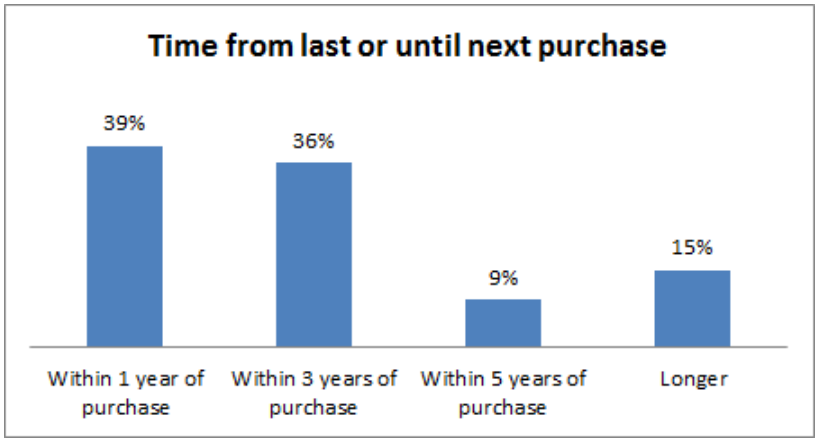
Accomplishments: Consumer Setting Feb 2015



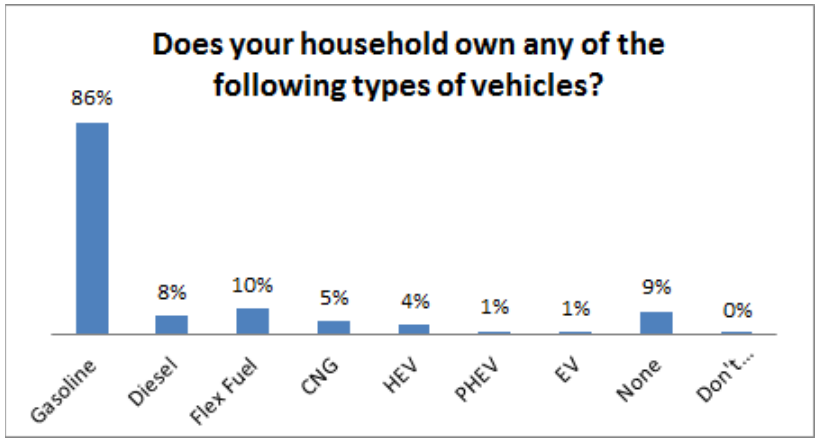
Do households have fewer vehicles?



Are segment preferences shifting?



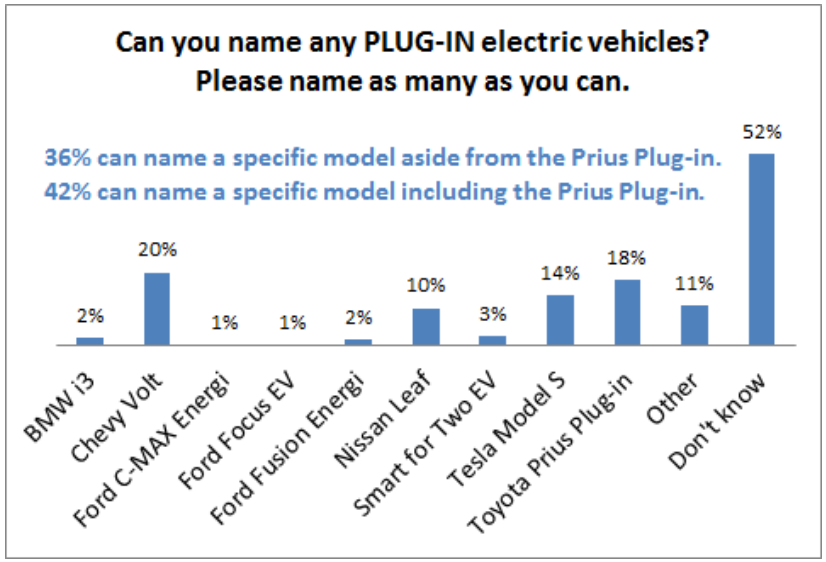
What households are active in the market?



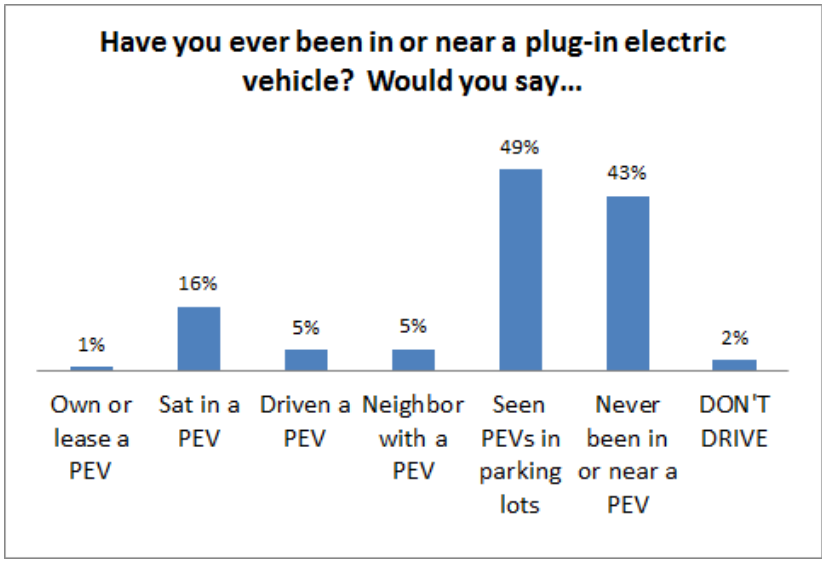
Do households own advanced technologies?

CNG = compressed natural gas; HEV = hybrid electric vehicle; PHEV = plug-in hybrid electric vehicle; EV = electric vehicle

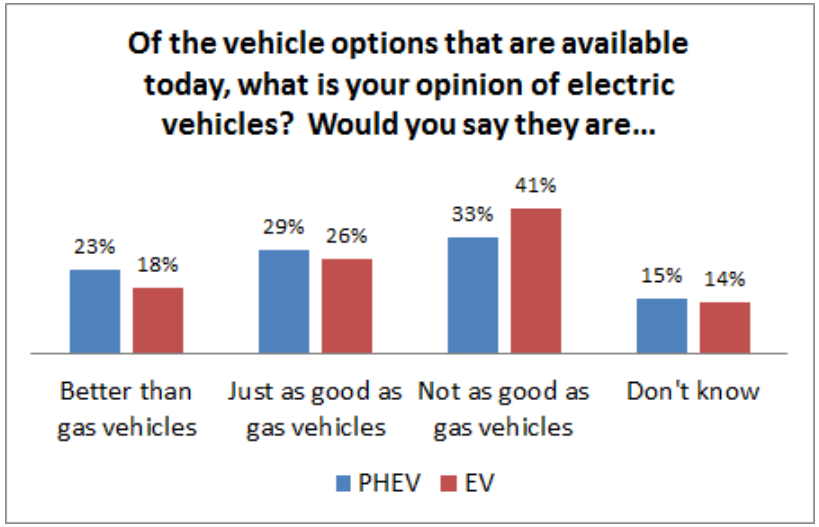
Accomplishments: Technology Acceptance Feb 2015



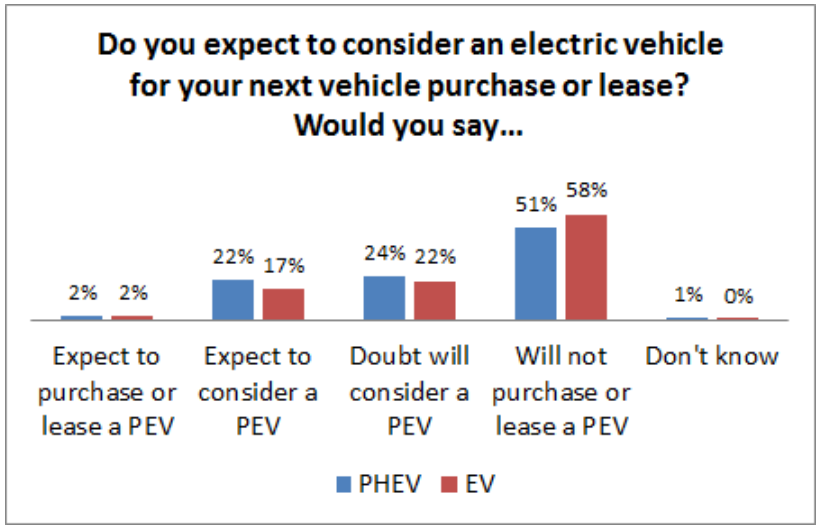
Are respondents aware of PEVs?



What is the level of exposure to PEVs?

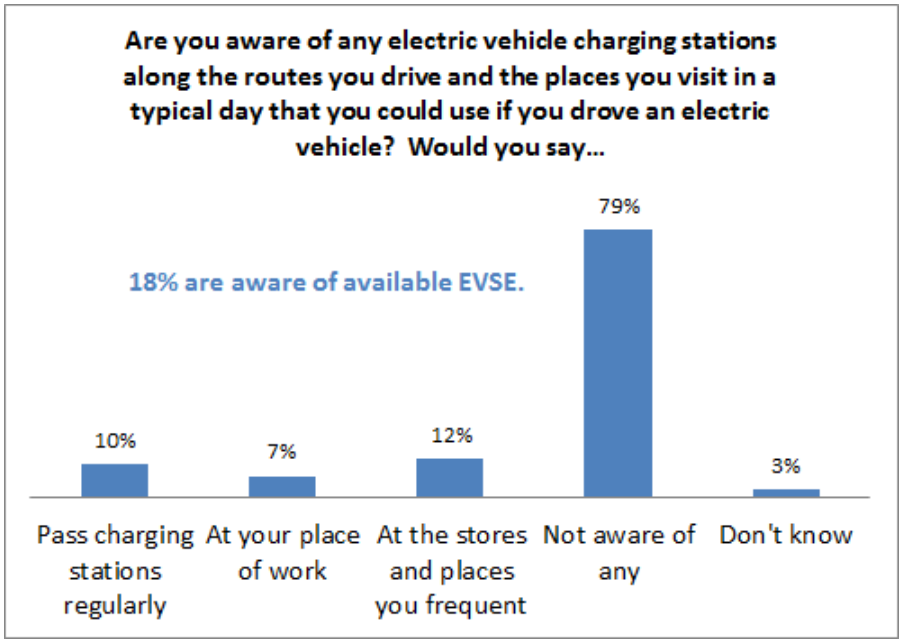


How do PEVs compare to conventional cars?

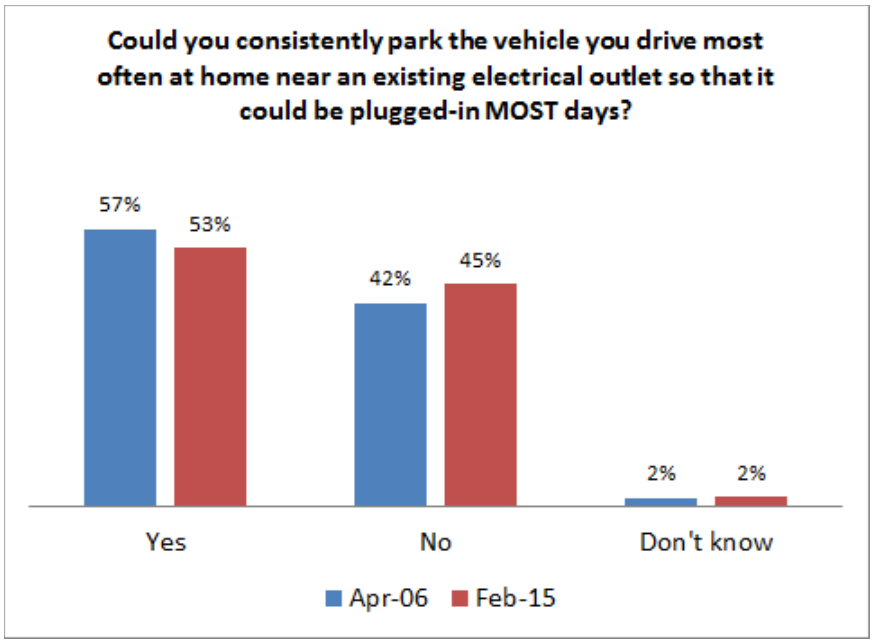


Are consumers considering PEVs?

Accomplishments: Barriers Feb 2015

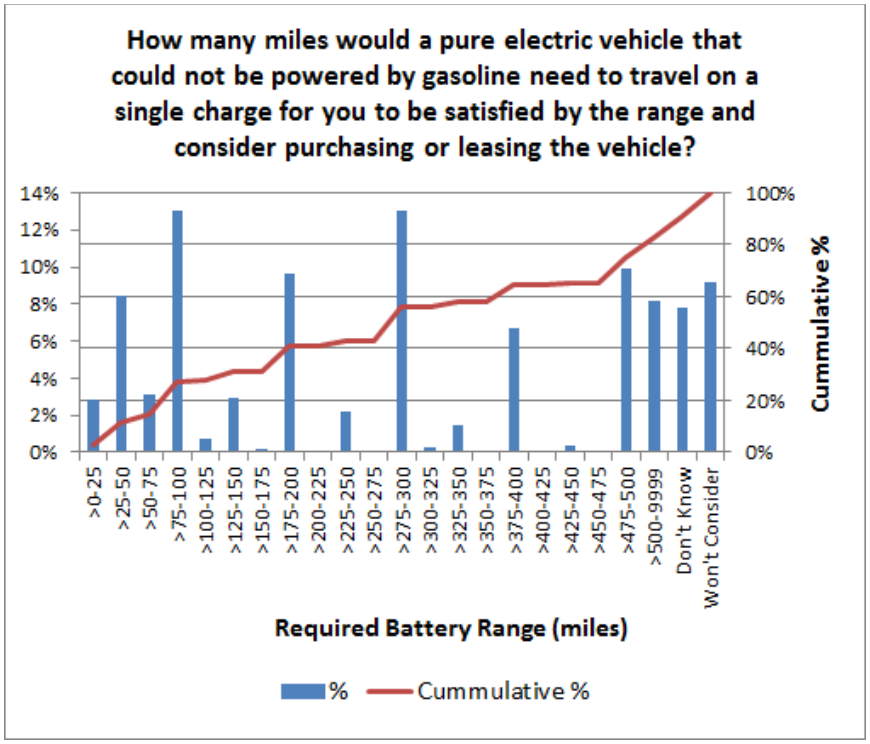


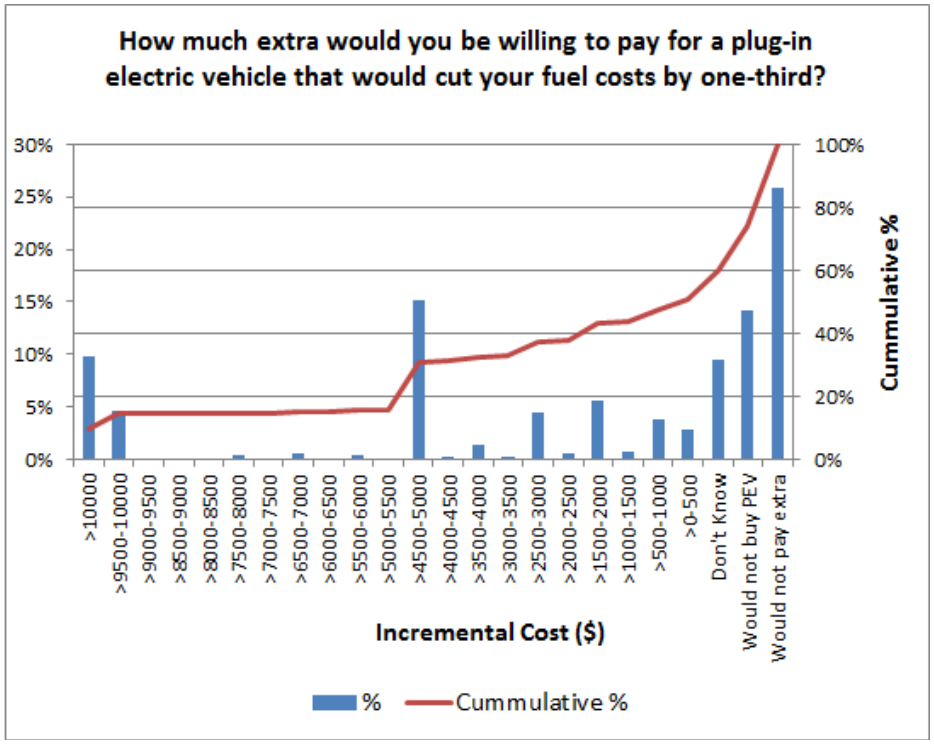
Do consumers perceive available electric vehicle charging equipment?



Are households able to park their vehicles near an existing outlet?

Accomplishments: Barriers Feb 2015





What battery range is sufficient for consumers to consider purchasing an EV?

- 27% accept 100 miles or less
- 41% accept 200 miles or less
- 56% accept 300 miles or less
- 65% accept 400 miles or less

Are consumers willing to pay more for PEV technologies if they lead to fuel cost savings?

- 14% willing to pay $10,000 or more
- 31% willing to pay $5,000 or more
- 43% willing to pay $2,000 or more
- 49% willing to pay $500 or more

Response to Previous Year Reviewers' Comments

The Consumer Vehicle Technology Data Project was not reviewed in 2014.

Collaboration and Coordination with Other Institutions

The Consumer Data task provides DOE an additional data source to validate existing sources and a new data source when none currently exists leading to improved estimates of current consumer sentiments and improved models of future consumer choice.

VT Analysis Team research efforts have benefited from:

- ORNL price elasticity studies
- NREL wireless charging studies
- Study results in Fact of the Week (FOTW), Transportation Energy Data Book (TEDB), and Quarterly Analysis Review (QAR)

The effort benefits from collaboration in survey development and refinement:

- Working group comprised of experts from ANL, ORNL, SNL, UC–Davis, Navigant Research, California Air Resources Board, EPA, and University of Michigan
- Subcontract with ORC, data collection provider with expertise in consumer data study development

The effort benefits from and shares learnings with DOE deployment efforts:

- Clean Cities, the State and Alternative Fuel Provider Fleet Program, and the Federal Energy Management Program

Remaining Challenges and Barriers

The relationship between survey results and actual consumer behavior is not fully understood.

- Results can be improved with question refinement
  - Account for the specific data collection method (national level study vs. a focus group)
  - Ground questions in common respondent knowledge
  - Incorporate feedback from experts in question formulation

- Recognizing trends of consumer sentiments will help identify ***how*** and ***when*** specific consumer sentiments change. Investigating those changes through additional pointed studies and correlations of trends with external data sets can help explain ***why*** sentiments change.

In many instances, subsegments of the general population can drive large-scale market behaviors.

- When appropriate, it may be helpful to use alternative survey methods to target and learn about these specific populations.

Proposed Future Work

Planned for FY 2015:

- Publish NREL technical report of historical findings (Dec 2005 - Jun 2014)
- Develop the first annual report from the February 2015 PEV sentiments national benchmark study that will introduce consumer sentiment metrics to be tracked in future-year studies as the market for PEVs evolves
  - Include comparisons to existing data (R.L Polk, etc.) where appropriate to ground findings
- Support additional deep dive investigations in support of VT Analysis Team research
  - PEV exposure, range concerns, willingness to pay incremental costs, wireless charging, workplace charging, policy, PEV ownership characteristics

Proposed FY 2016:

- Refine and repeat study of primary PEV sentiments and complete follow-up report from FY 2015 that will create trends of the primary PEV sentiments
  - Refinement based on result learnings and feedback from working group
- Continue to support deep dive investigations
- Expand collaboration and coordination efforts with interested parties across different technology areas and from national to local levels

Consumer Data Summary

Investigation of consumer sentiments allows VTO to inform and contextualize efforts to deploy advanced vehicle technologies and support efficient transportation behaviors in an evolving marketplace.

- ✓ **Relevance** → Provides robust assumptions for consumer choice research and supports the alignment of program budget priorities with marketplace opportunities
- ✓ **Approach** → Define and track the consumer market in benchmark study, conduct deep dive analyses as the market shifts and hot topics arise, and synthesize learnings and make consumer data available
- ✓ **Accomplishments** → Completion of initial PEV sentiments national benchmark study, completion of report on unpublished historical studies, continued support to VT analysis team research as well as TEDB, FOTW, and QAR
- ✓ **Collaborations** → Studies build on input from a broad working group of subject matter experts and support VT Analysis team research efforts as well as inform DOE vehicle technology deployment efforts
- ✓ **Future Work** → Publish initial report on PEV sentiments national benchmark study, refine and repeat study to develop trends, conduct deep dive studies, and expand collaboration and outreach to make findings available

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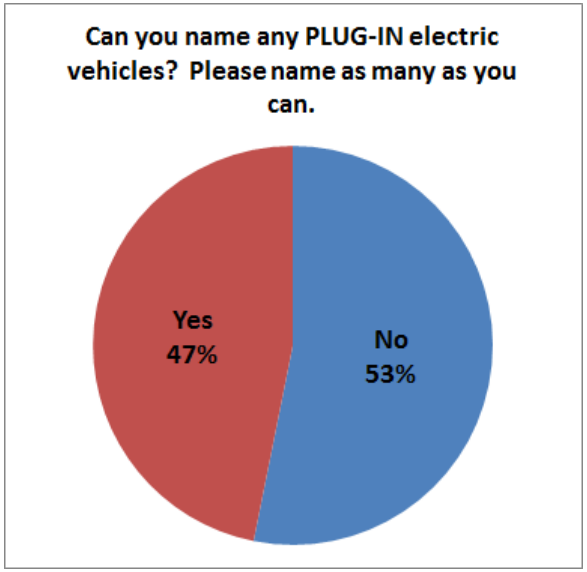
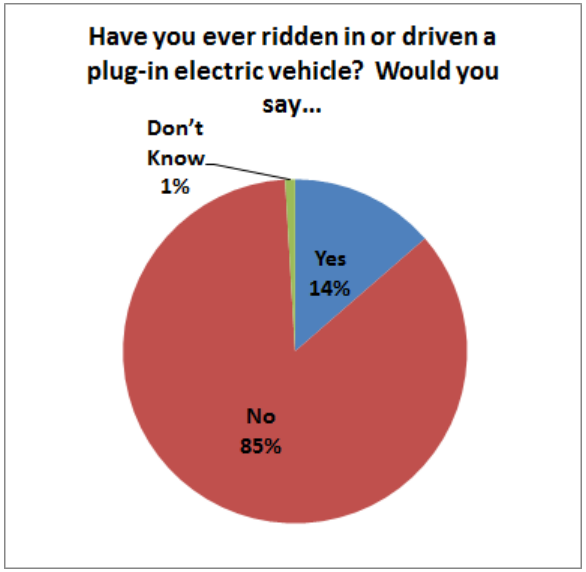
Technical Back-Up Slides

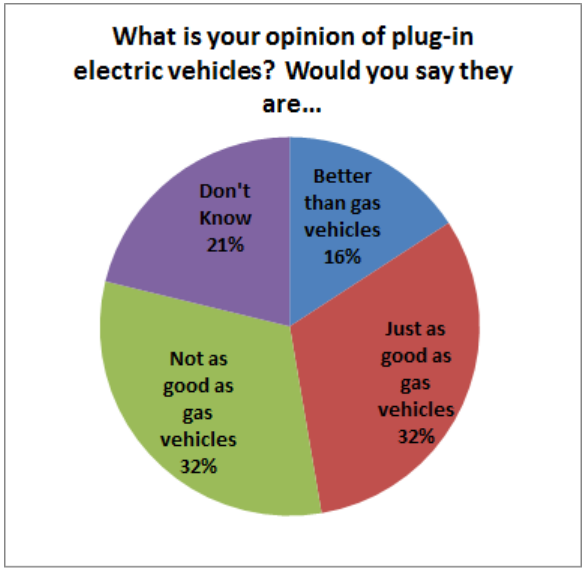
(Note: please include this “separator” slide if you are including back-up technical slides (maximum of five). These back-up technical slides will be available for your presentation and will be included in the DVD and Web PDF files released to the public.)

Accomplishments: Results

June 2013: EV Awareness







Awareness of specific PEV models

- Nearly half of respondents could name a specific PEV.
- Note: 20% named the Toyota Prius Plug-In.

Exposure to PEVs

- 14% of respondents have been in a PEV.

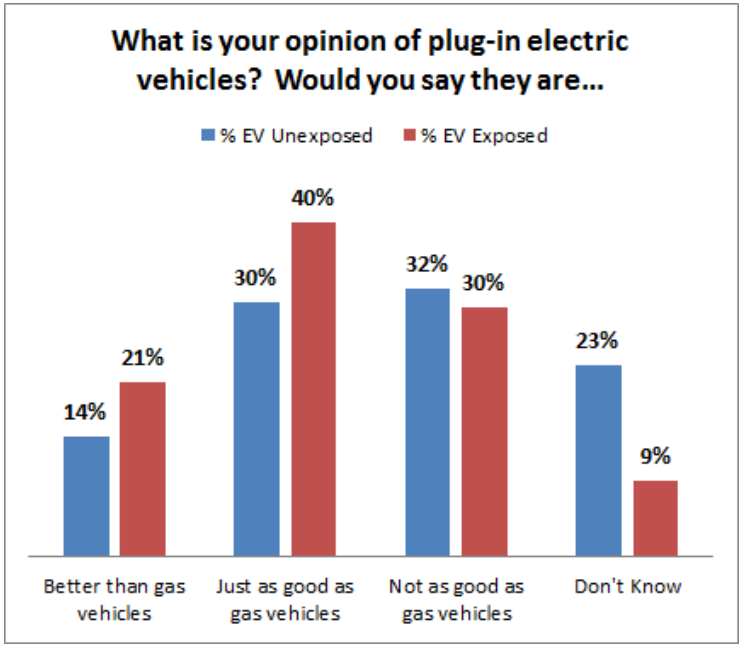
General Opinion of PEVs

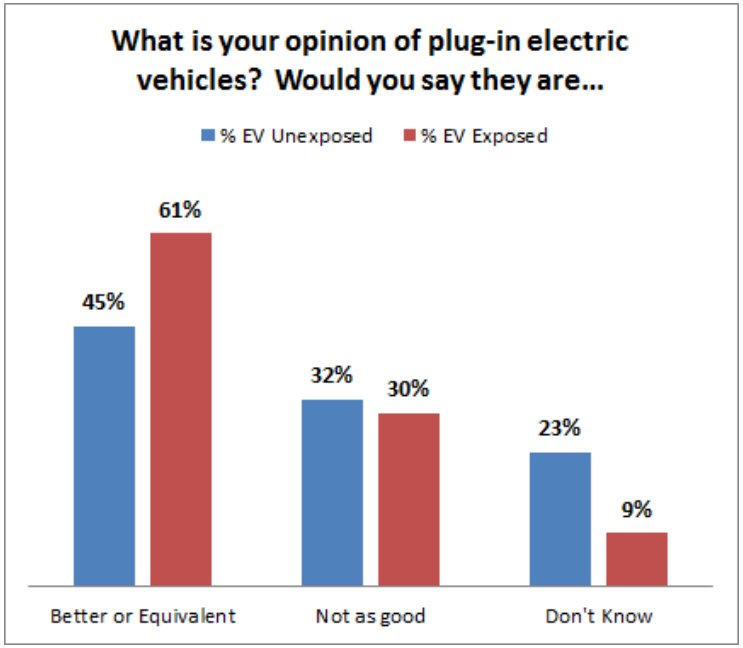
- 47% view PEVs as being just as good as or better than traditional gasoline vehicles.
- 21% are still undecided.
- 32% have a negative view of PEVs.

Note: segment percentages may not sum to 100% due to rounding

Accomplishments: Results

June 2013: EV Awareness – continued





Respondents who have been exposed to PEVs:

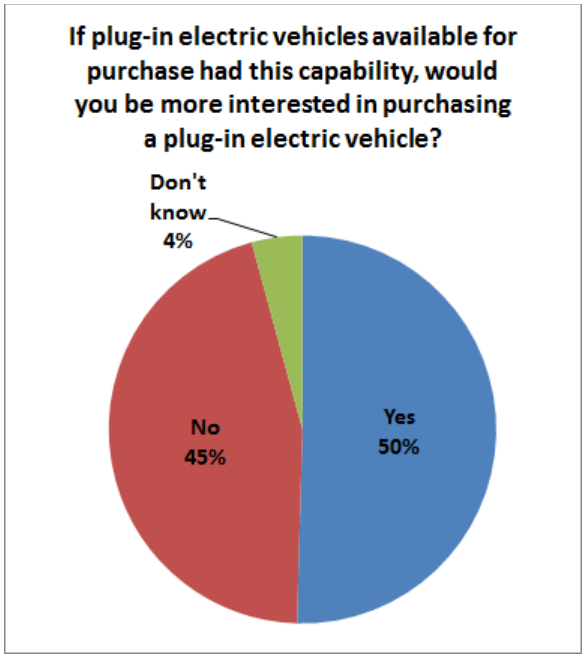
- Are more likely to have an opinion of PEVs
- Are more likely to have a positive or neutral view of PEVs
- Are slightly less likely to have a negative view of PEVs.

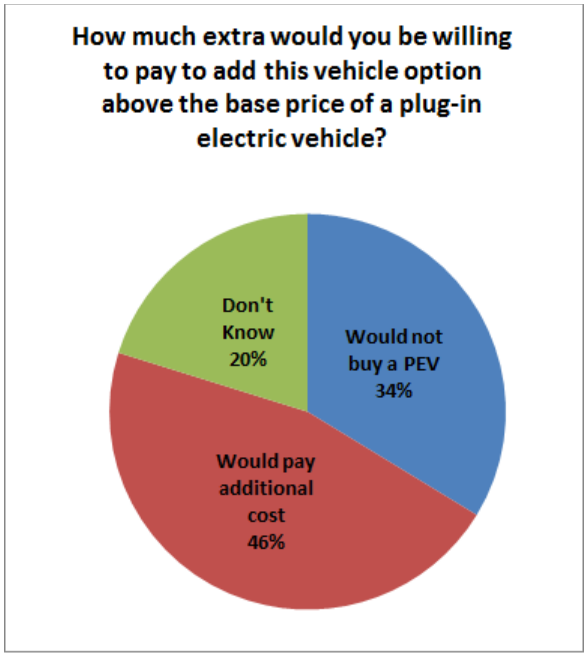
Note: Results do not confirm that the exposure impacted respondents' views. It is unknown what the respondents' perceptions were prior to exposure.

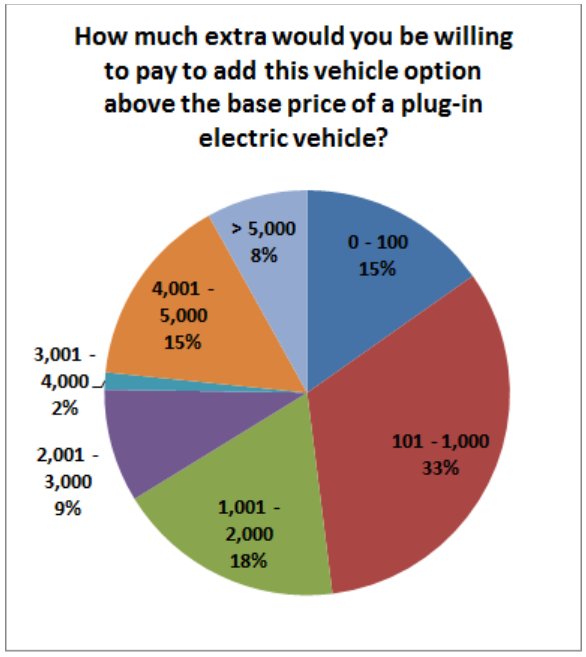
Note: segment percentages may not sum to 100% due to rounding

Accomplishments: Results

June 2013: Technical advances are making it possible to charge PEVs without physically plugging them in.







Impact on PEV interest

- 50% would be more interested in a PEV.
- Roughly the same percentage that had a neutral to positive view of PEVs.

Willingness to pay for wireless charging

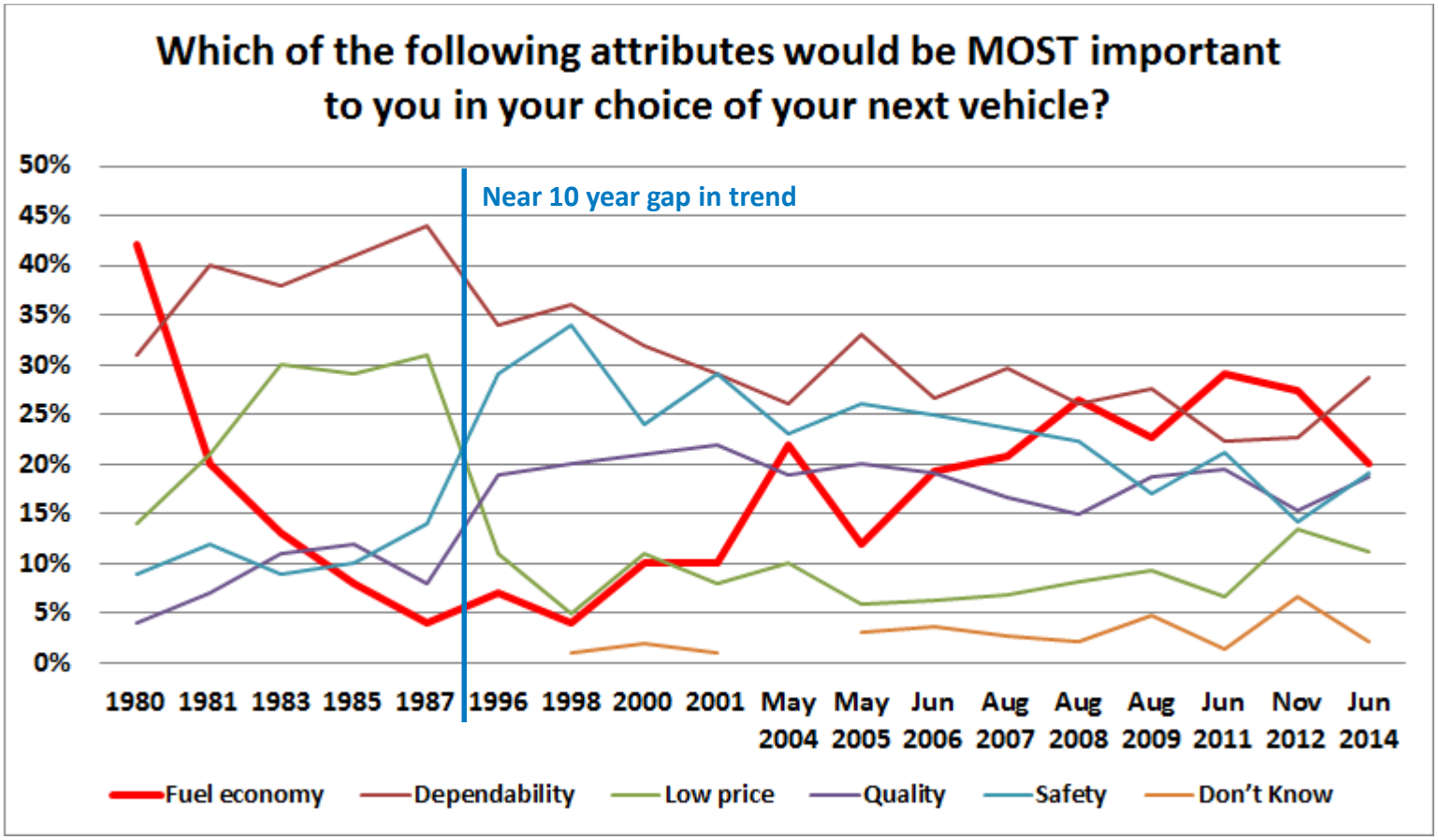
- 46% would be willing to pay an incremental cost.

Reported incremental cost range for the 46% willing to pay

- 48% of those willing to pay an incremental would only be willing to pay ≤ $1,000.

Note: segment percentages may not sum to 100% due to rounding

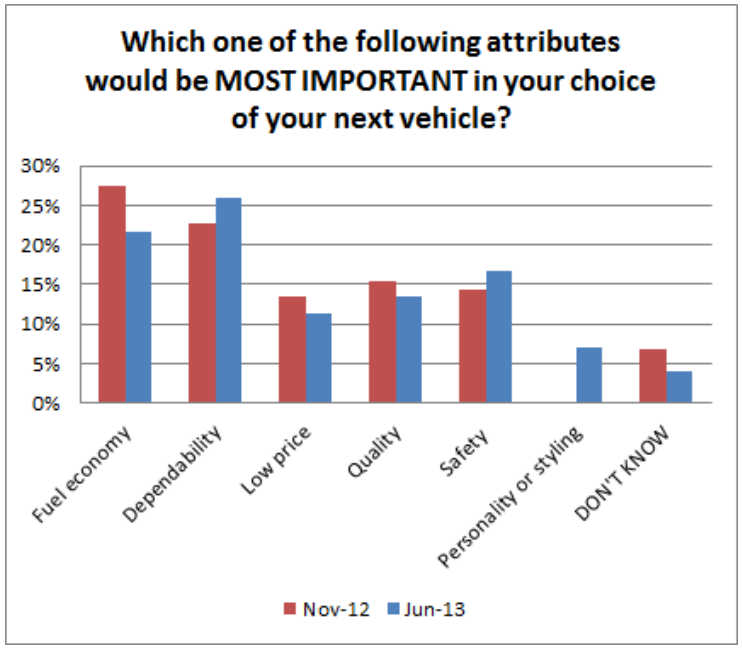
Accomplishments: Results

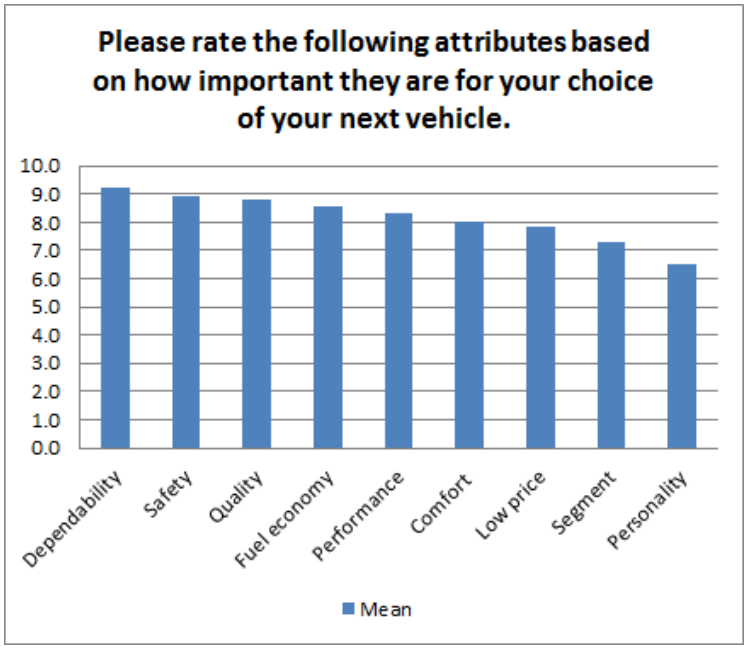


- Fuel economy is highly rated, but…
- How is fuel economy considered during the purchase process?

Accomplishments: Results

June 2013: Vehicle Attribute Preference Detail





Addition of Vehicle Personality/Styling

- All attributes shift, fuel economy shows the greatest change.
- Dependability becomes highest rated.
- Personality/styling is the lowest rated attribute.

When asked to rate attributes independently:

- Fuel economy falls to the 4th-rated attribute.
- Dependability, safety, and quality all have tight distributions.
- Lowest rated four attributes have much flatter distributions.