NREL
NATIONAL RENEWABLE ENERGY LABORATORY

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 Project Funding: $100K**
  DOE Share: 100%
- **Funding Received in FY13:** $25K
- **Funding for FY14:** $100K

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

- NREL
- ANL
- ORNL
- Opinion Research Corporation (ORC)

VTO = Vehicle Technologies Office

Relevance

Objective: Gather, analyze, and observe consumer preference information using third-party reports and polling tools 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 Decision	Description	Status
September 2014	Milestone	NREL Technical Report: Compilation of unpublished survey findings (December 2005 – June 2013)	On Schedule

Approach

Provide VT analysis team a capability to track and understand consumer sentiments toward vehicle technologies across the general marketplace.

- Define and track primary consumer market settings and understand sentiments associated with vehicle technologies.
- Maintain past survey results and make data available as appropriate.
- Conduct deep-dive studies as appropriate to support ongoing VT analysis team research and relevant hot topic investigations.

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

Approach

Define and track primary consumer market settings and understand sentiments associated with vehicle technologies.

- **Consumer setting** – key aspects of the vehicle purchasing that are independent of the technology
  - Vehicle segment preferences
  - When did consumers last purchase a vehicle?
  - When do consumers expect to buy again?

- **Consumer barriers** – barriers specific to vehicle technology acceptance
  - Necessary range
  - Perceived EV supply equipment availability
  - Willingness to pay an incremental cost
  - Are consumers able to plug in their vehicle at home?

- **Consumer PEV/PHEV acceptance** – favorability of vehicle technologies
  - How do EVs compare to traditional vehicle technologies?
  - Will consumers consider/purchase a PEV or PHEV?

EV = electric vehicle; PEV = plug-in electric vehicle; PHEV = plug-in hybrid electric vehicle

Approach

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

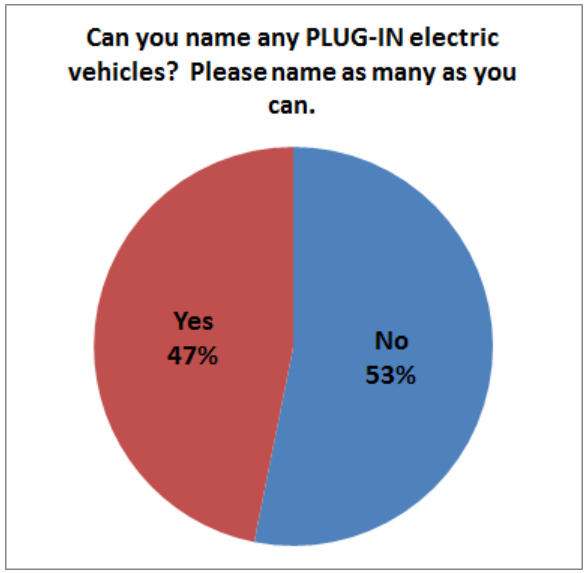
- Publish NREL technical report of historical (12/05 – 6/13) survey findings.
- Make VT analysis team aware of available survey data including topline summaries as well as demographic breakouts
  - Available demographics include age, geographic region, income level, size of household, education level, etc.

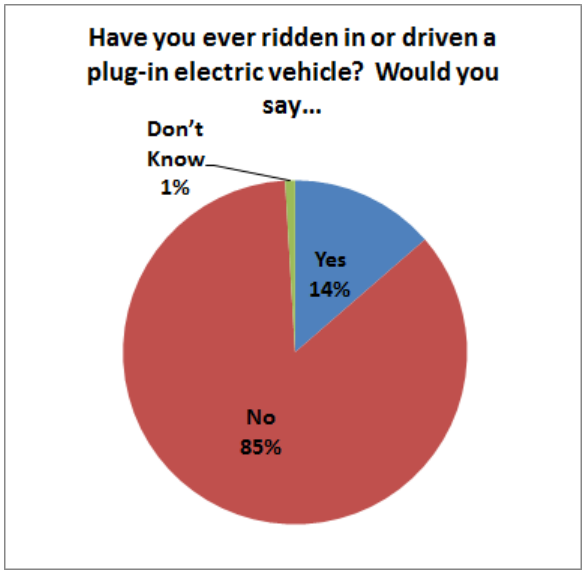
Conduct deep-dive studies as appropriate to support ongoing vehicle technology analysis team research and relevant hot topic investigations.

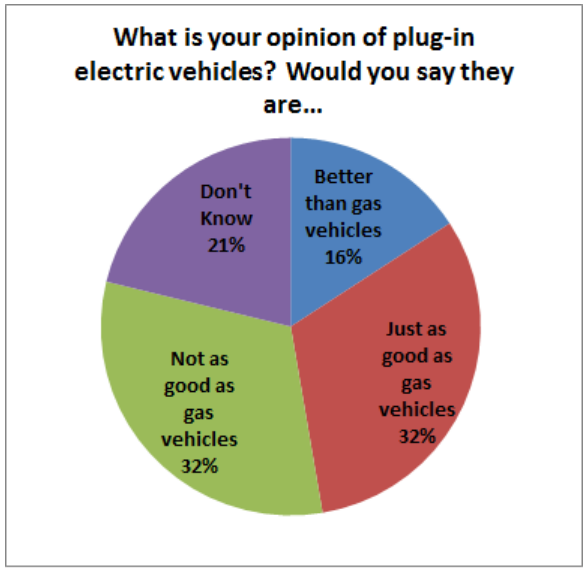
- Provide capability to quickly define content and turn around results of more involved studies:
  - Price elasticity
  - Interest in wireless charging.

Accomplishments – Survey 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

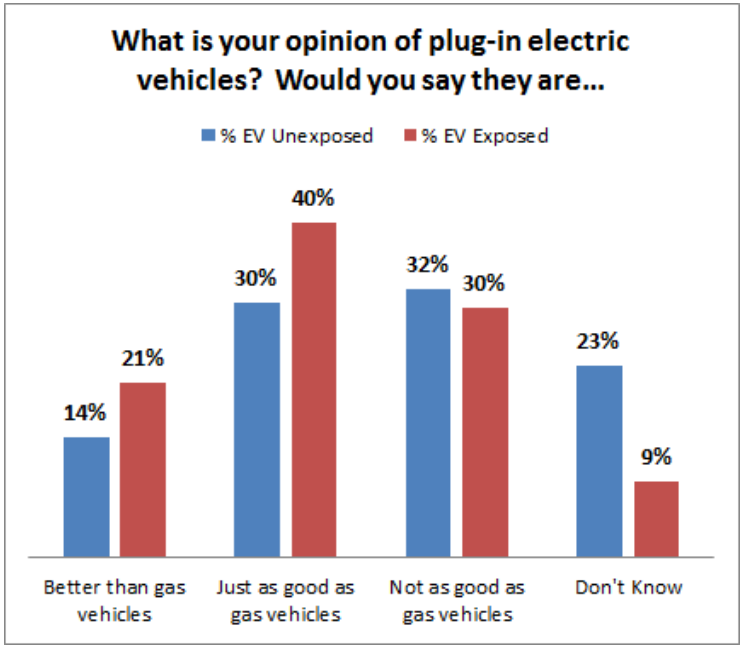
- 14% of respondents have been in a PEV.

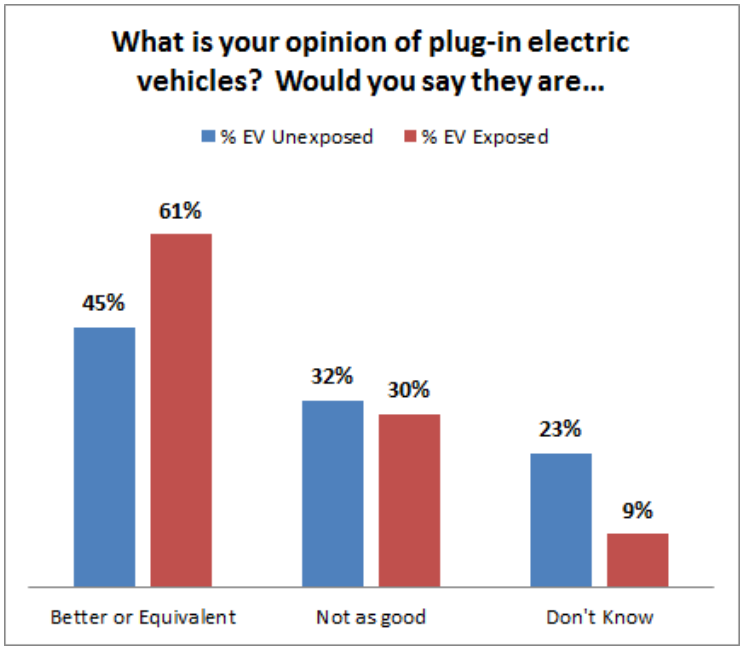
General Opinion of PEVs

- 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.

Accomplishments – Survey Results

June 2013: EV Awareness – continued





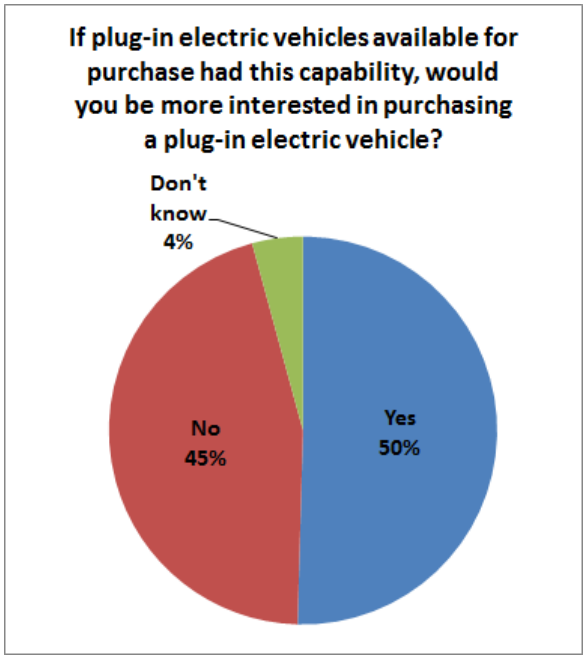
Respondents who have been exposed to PEVs:

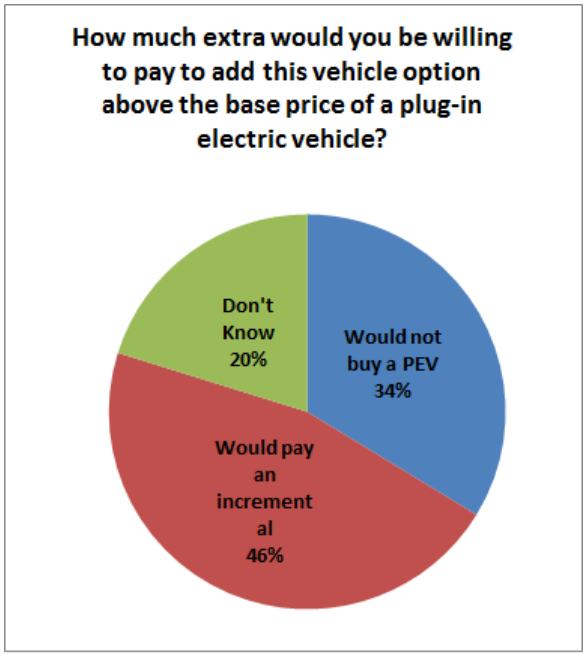
- Are more likely to have an opinion of PEVs.
- Are more likely to have a positive or neutral view of PEVs.
- Are slightly less likely to have a negative view of PEVs.

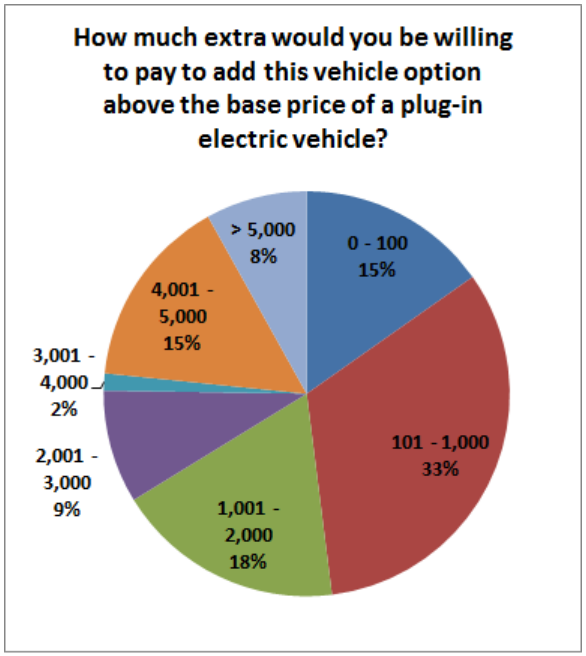
Note: Results do not confirm that the exposure impacted respondents' views. It is unknown what the respondents' perceptions were prior to exposure.

Accomplishments – Survey 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

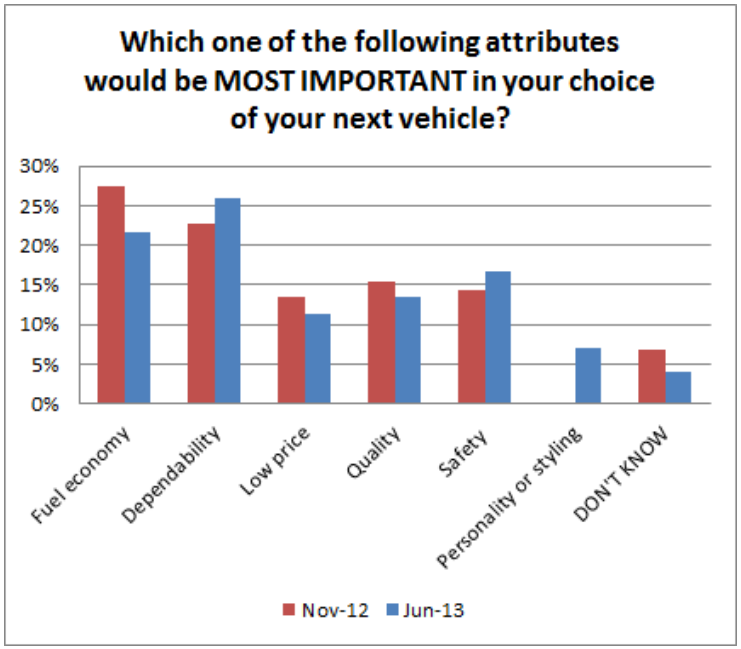
- 46% would be willing to pay an incremental cost.

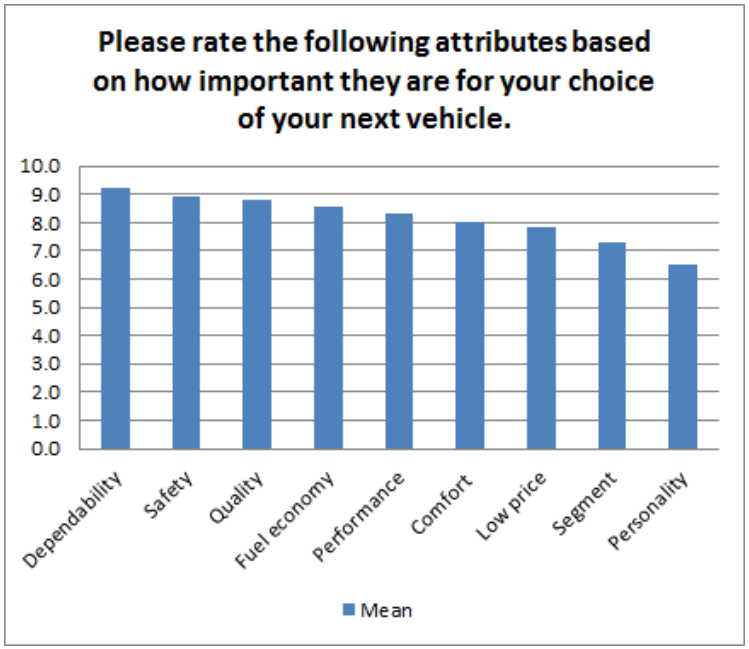
Reported incremental cost range for the 46% willing to pay

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

Accomplishments – Survey 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.

Responses to Previous Year Reviewers' Comments

Reviewers repeatedly stated the project outputs were valuable and relevant to DOE goals, but that more recent data, including trends of sentiments, would improve the effort. Additionally there was concern that existing results had not been published.

- "The reviewer commented that the study **appears completely relevant to DOE objectives** of petroleum displacement through analysis of historical trends and projections to the future."
- "The reviewer indicated that gathering data on consumer purchases was **highly valuable, especially if trends can be tracked over time.** The reviewer felt that the survey **could be more useful if it also asked customers about recent purchase decisions**; however, given the $25,000 budget, the approach was great."
- "The reviewer felt that some of the **survey data was too out of date to be useful;** also the reviewer indicated that **a trend analysis would be necessary** to make the data very useful."
- "The reviewer noted that the trends over time were useful; however, the fact that the **results had not been published in eight years was disturbing**. The reviewer felt that asking about what customers were intending to do yielded highly biased results, indicating that this was well known phenomenon. The reviewer suggested that asking customers about factors that influenced their **purchase of a new vehicle in the past six months** would be more accurate and provide more useful information."

Response: The project plans to increase the frequency of questions and to ask core questions periodically to generate trends in sentiments over time. All available unpublished data are on track to be published in FY 2014.

Reviewers stated that increased collaboration could benefit the project.

- "The reviewer felt that collaborating with other polling entities and research organization outside of DOE could help."

Response: The project has begun to reach out to organizations with subject matter expertise and intends to increase collaboration both in the generation of questions and the reporting of results.

Reviewers stated that the project could benefit from increased resources.

- "The reviewer commented that, given the outdated nature of many of the survey results, it seemed that **additional funding would be required.**"

Response: The project received a significant increase in funding for FY 2014.

Collaboration and Coordination with Other Institutions

- **VT vehicle choice modeling and research efforts conducted by ORNL, ANL, and NREL scientists have benefited from the effort:**
  - ORNL studies investigating price elasticity associated with acquiring and operating advanced vehicle technologies.
  - NREL studies investigating impacts of the availability of wireless charging on consumer choice.
- **Outside collaboration in survey development:**
  - Subcontract with ORC – survey provider with expertise in survey data collection and survey development.
  - Intending to collaborate with the University of California–Davis, the University of Michigan, and Navigant Research on question development to benefit from subject matter experts.
- **Coordination with DOE vehicle deployment efforts:**
  - Clean Cities, State and Fuel Providers, and the Federal Energy Management Program.
  - The effort will benefit from and share learnings with DOE deployment efforts.

Remaining Challenges and Barriers

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

- Refinement of questions for specific survey methodologies can better ensure respondents relate to the questions and provide responses that reflect their expected behaviors, sentiments, etc.
- Developing trends of consumer sentiments will help identify ***how*** and ***when*** specific consumer sentiments change. Investigating those changes through additional pointed survey investigations and correlations of trends with external datasets 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 2014:

- Complete and publish NREL technical report of survey findings covering December 2005 through June 2013.
- Define/refine questions addressing the primary consumer market settings and sentiments to be trended over time – begin collecting data.
  - Collaborate with survey subject matter experts on question formulation and importance (examples: the University of California–Davis, the University of Michigan, Navigant Research).
- Support deep-dive investigations in new surveys, and when beneficial expand demographic investigations of existing data.

Proposed FY 2015:

- Develop and publish an annual/semiannual report of primary consumer market settings and sentiments trends.
- Investigate alternative survey methods that could target specific market segments in support of more detailed investigations (example: focus groups of early adopters).
- Support deep-dive investigations in new surveys and when beneficial expand demographic investigations of existing 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.

The existing survey capability is flexible and can react to quick turnaround requests to address questions that arise from changes in marketplace dynamics and/or research focus areas.

Developing trends of consumer sentiments will help the program track the progress of market change in the acceptance of vehicle technologies.

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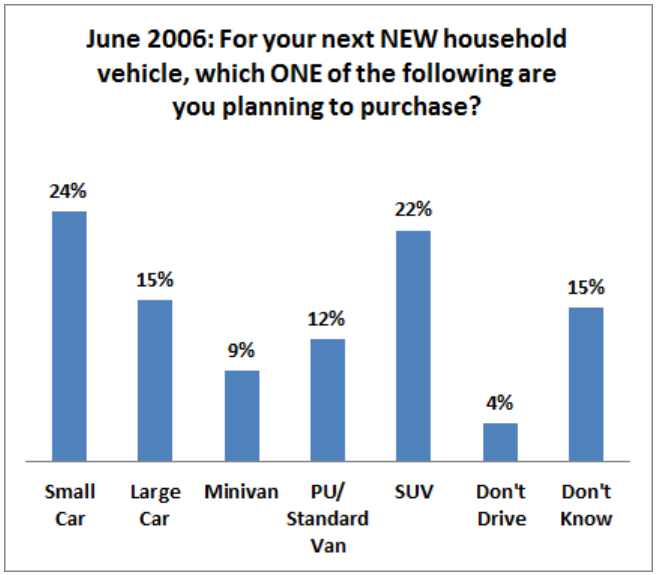
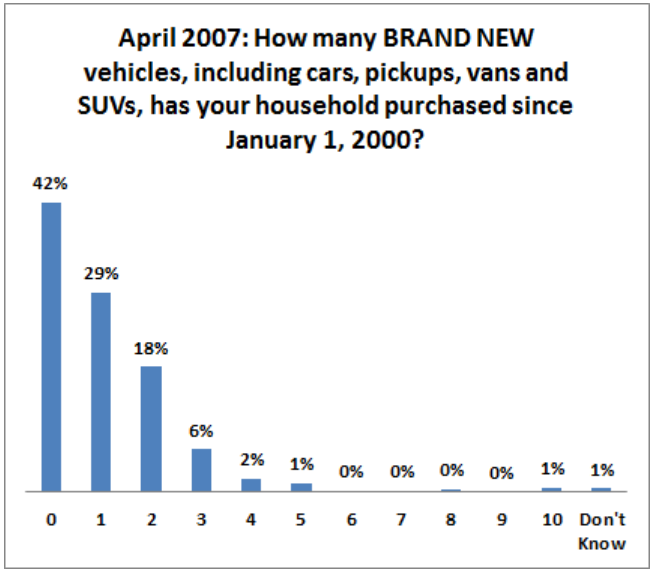
Technical Back-Up Slides

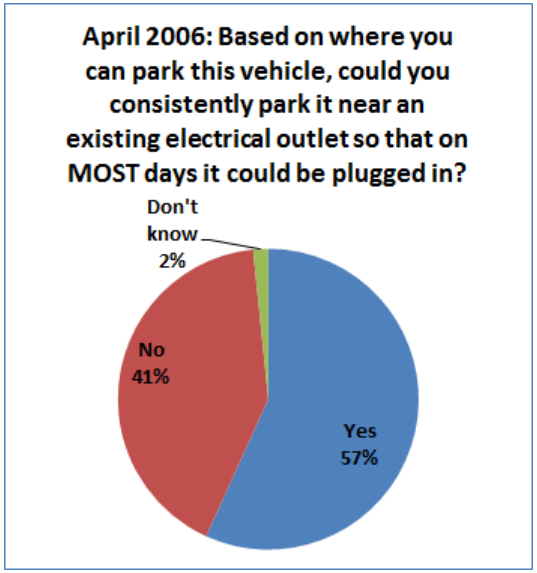
(Note: please include this “separator” slide if you are including back-up technical slides (maximum of five). These back-up technical slides will be available for your presentation and will be included in the DVD and Web PDF files released to the public.)

Prior Survey Results

Consumer Settings: Define market potential







Types of vehicles purchased

- Only 24% planned to purchase a small car.
- How big of an impact can advanced small cars have?

Frequency of purchases

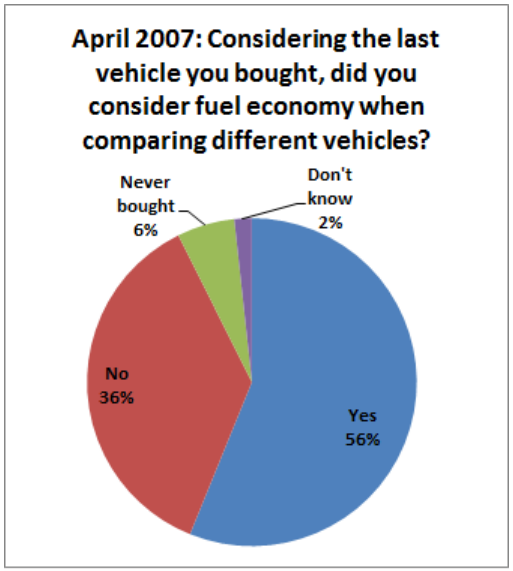
- 42% had not purchased a new car during the last seven years.
- Are consumers keeping cars longer?

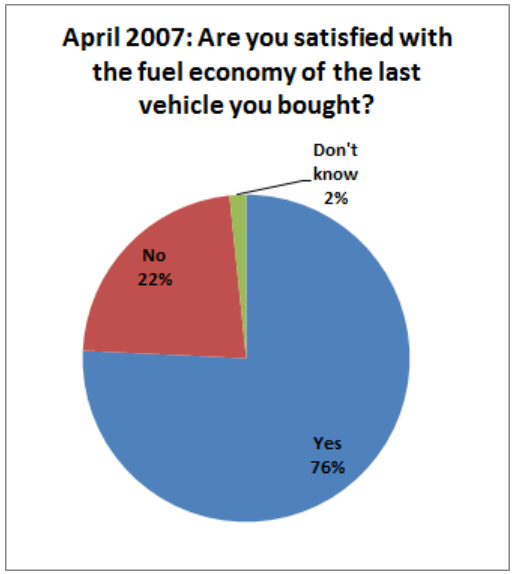
Viability of an advanced technology

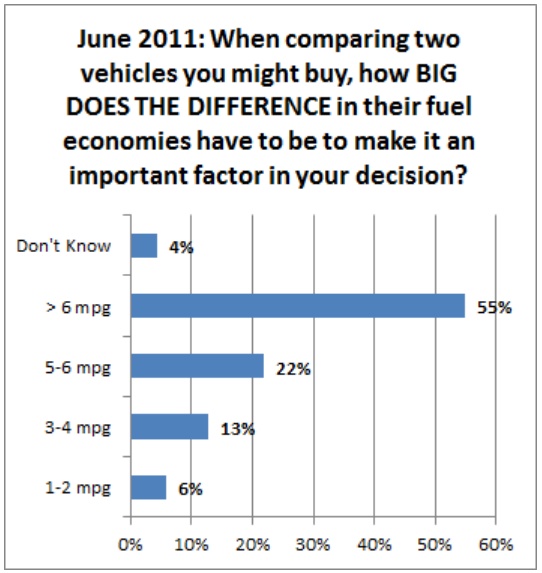
- 57% park near an outlet.

Prior Survey Results

Market Perceptions: How do consumer views relate to observed behavior?







Is fuel economy considered?

- A majority consider fuel economy.

But is current fuel economy a problem?

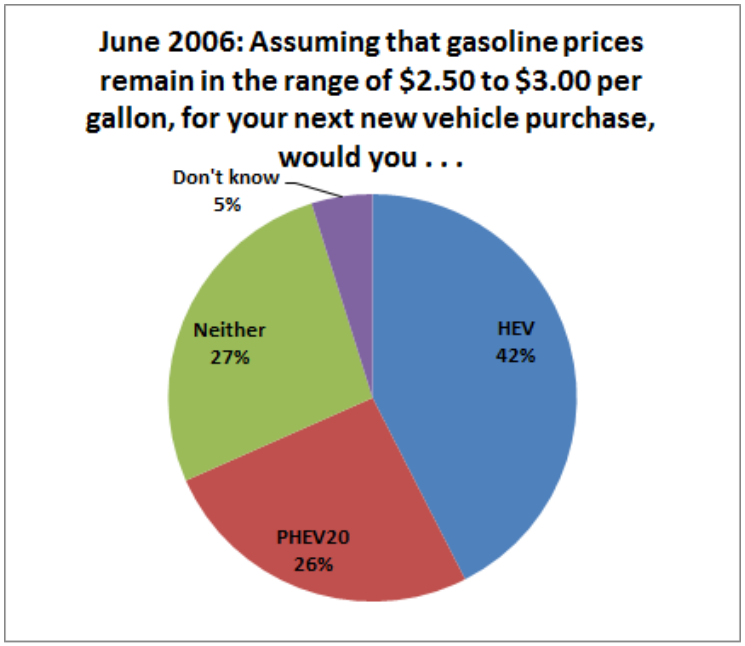
- A larger majority are satisfied with current fuel economy.

Consumer expectations are high

- Consumers require a large difference in fuel economy to affect their behavior.
- Most would require a fuel economy improvement that could be achieved only by a vehicle segment change.

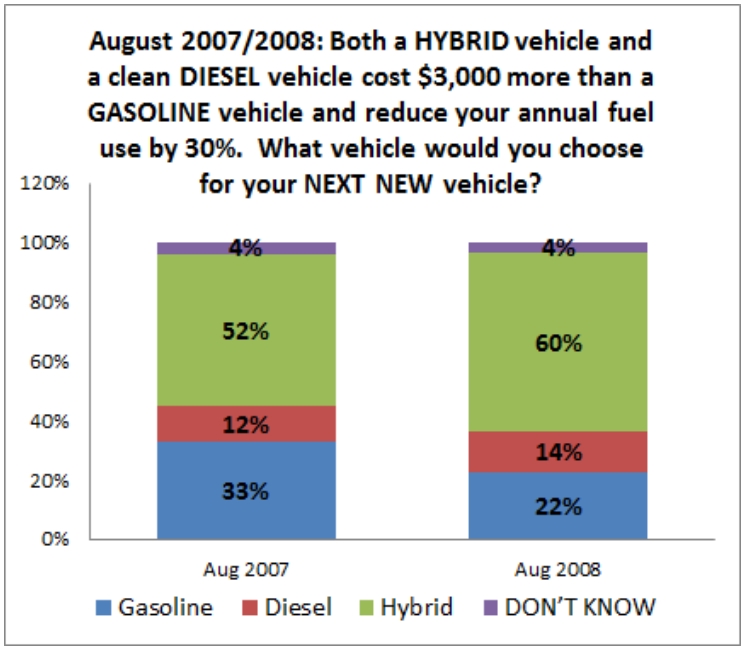
Prior Survey Results

Consumer sentiments toward specific technologies



Given 2006 fuel prices, would you consider an HEV or a PHEV?

- 68% would consider an HEV or a PHEV.
- 27% would *not* consider these vehicles.

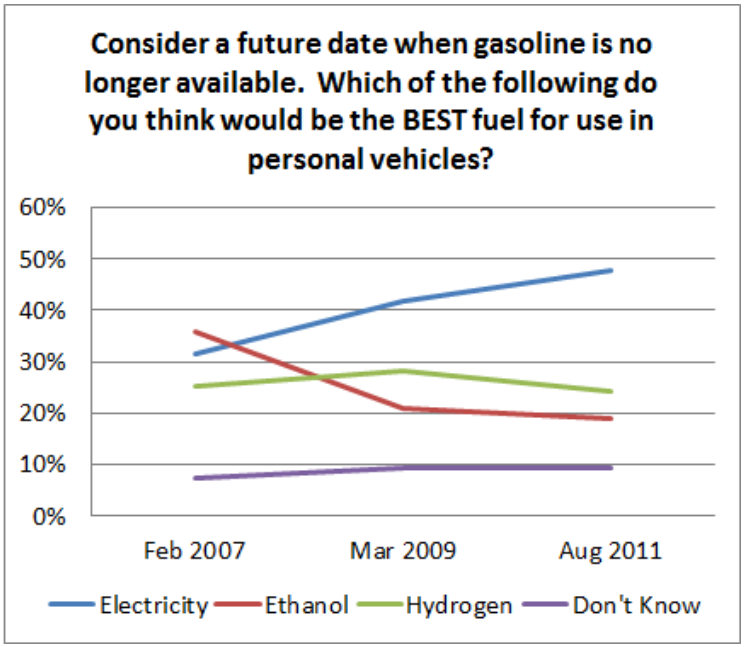


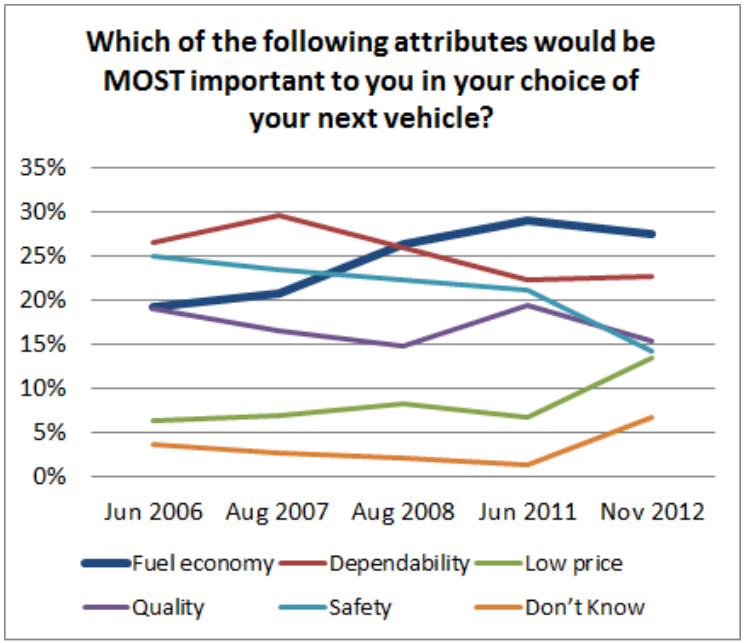
How would you choose from available technologies?

- Significant majority would prefer a hybrid vehicle to a diesel vehicle.
- Time period covers the beginning of the economic downturn.

Prior Survey Results

How do consumer views change over time?





Which technologies have public support?

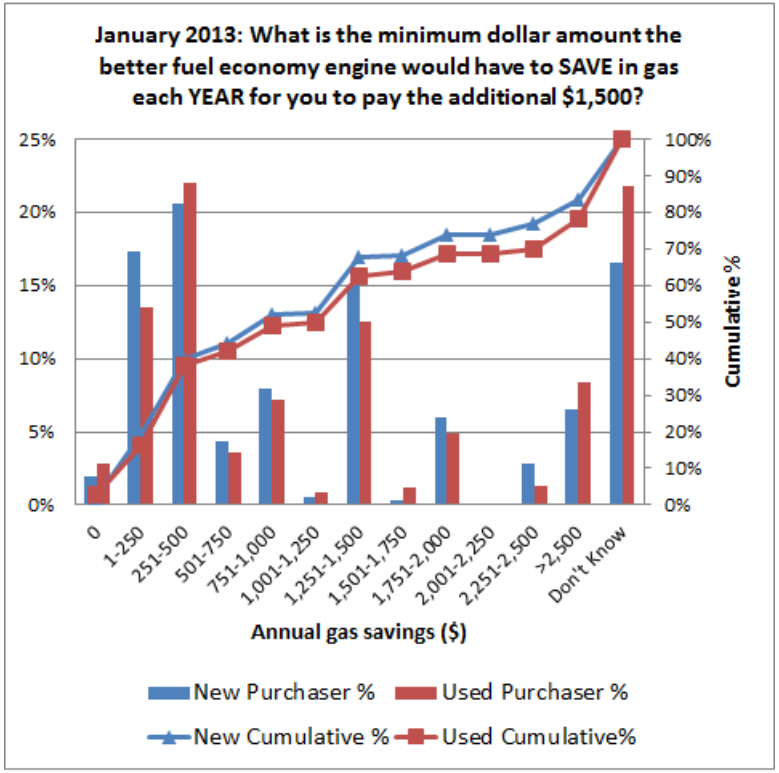
- Interest in electricity is increasing.
- Interest in ethanol is declining.

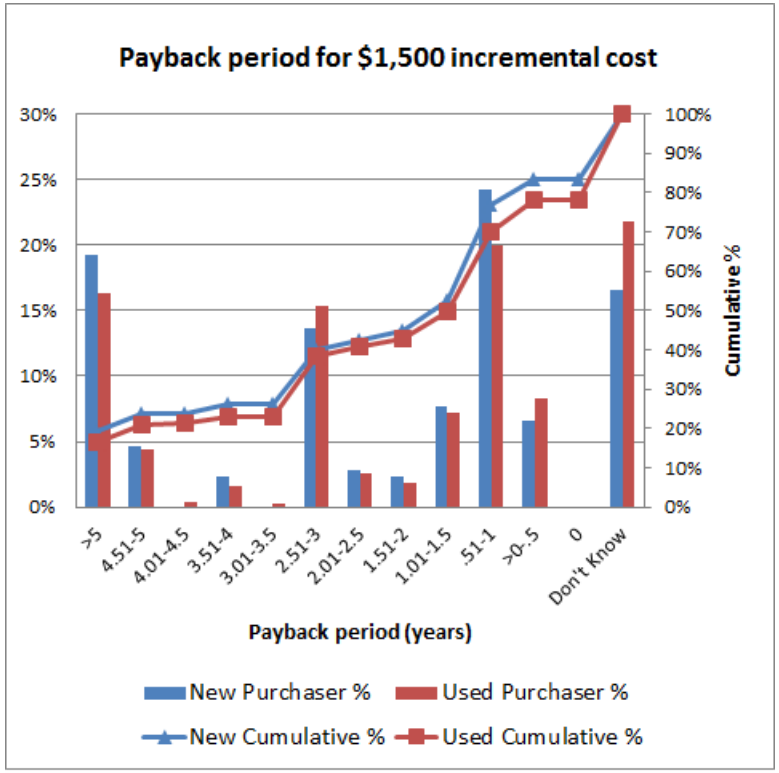
Which vehicle attributes are most important?

- Fuel economy is highly rated, but…
- At what point in the purchase process do consumers consider fuel economy, relative to other attributes?

Prior Survey Results

Are consumers willing to pay for improved fuel economy?





- About 50% of consumers would be willing to pay $1,500 upfront to achieve an annual savings of $1,000 to $1,200 or less.
- Roughly 50% of consumers are willing to pay upfront costs if the payback period is about 1–1.5 years or longer.