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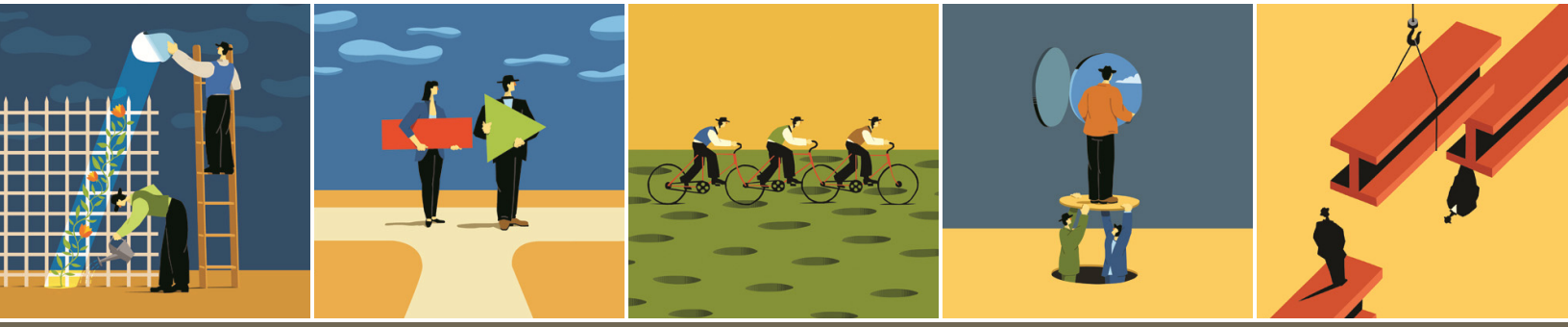

WHITE PAPER

Energy and Environment Consumer Survey

Consumer Attitudes and Awareness toward 10 Smart Energy Concepts

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Section 1
EXECUTIVE SUMMARY

1.1 Introduction

Navigant Research conducted a consumer survey of 1,084 U.S. adults, based on a nationally representative and demographically balanced sample, during the third quarter of 2013. The survey included questions on a variety of energy topics, as well as a thorough examination of consumer demand for electric vehicles and smart grid technologies.

Analysis of consumer demand for electric vehicles and smart grid technologies is featured in greater detail in two separate Navigant Research white papers: *Electric Vehicle Consumer Survey* and *Smart Grid Consumer Survey*.

The 2013 consumer survey also included a question aimed at ascertaining a more general view of consumer attitudes toward the following energy and environmental concepts:

- **Clean Energy**
  - Solar energy
  - Wind energy
  - Nuclear power
- **Clean Transportation**
  - Hybrid vehicles
  - Electric cars
  - Natural gas vehicles
  - Biofuels
- **Smart Grid**
  - Smart grid
  - Smart meters
- **Building Efficiency**
  - LEED certification

In order to create this broad view of consumer opinions, Navigant Research presented the following question and possible responses to respondents:

Please indicate your impression of each of the following concepts related to energy and the environment. If you are not familiar with a term, please choose N/A.

» Strongly unfavorable

» Somewhat unfavorable

» Neutral

» Favorable

» Very favorable

» N/A – Not sure/not familiar

This white paper presents all of the responses to this question as a basis for comparing consumer views of these topics to one another. In addition to favorable and unfavorable opinions, Navigant Research analyzes the number of respondents unfamiliar with a concept to compare the levels of consumer awareness within each topic.

Demographic breakouts by gender, age, income, and level of education are also included for each energy and environment topic. In some instances, specific demographic breakouts have sample sizes that are less than 50 respondents. Data from Asian Americans with a sample of 43 respondents, 49 respondents with incomes of $125,000 or more, and 38 respondents age 65 and above should be interpreted as directionally informative.

1.2 Key Findings

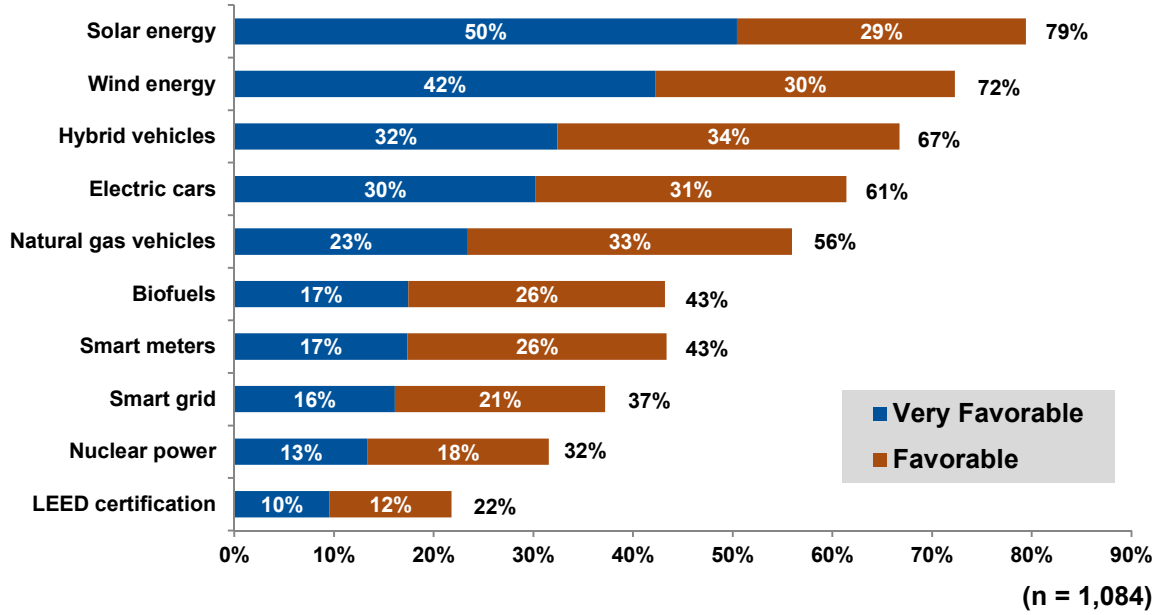
Chart 1.1 shows the percentage of favorable and very favorable responses to each of the 10 topics presented in the survey with the following noteworthy findings:

» Close to 80% of respondents favored the concept of solar energy, which led all concepts in favorable responses, followed by wind energy (72%).

» Consumers also held favorable views of alternative fuel vehicles including hybrid vehicles (67%), electric cars (61%), and natural gas vehicles (56%).

» LEED certification showed the least level of favorability (22%), largely due to low awareness of the topic.

Chart 1.1 Favorable Impressions of Energy and Environment Concepts, United States: 2013



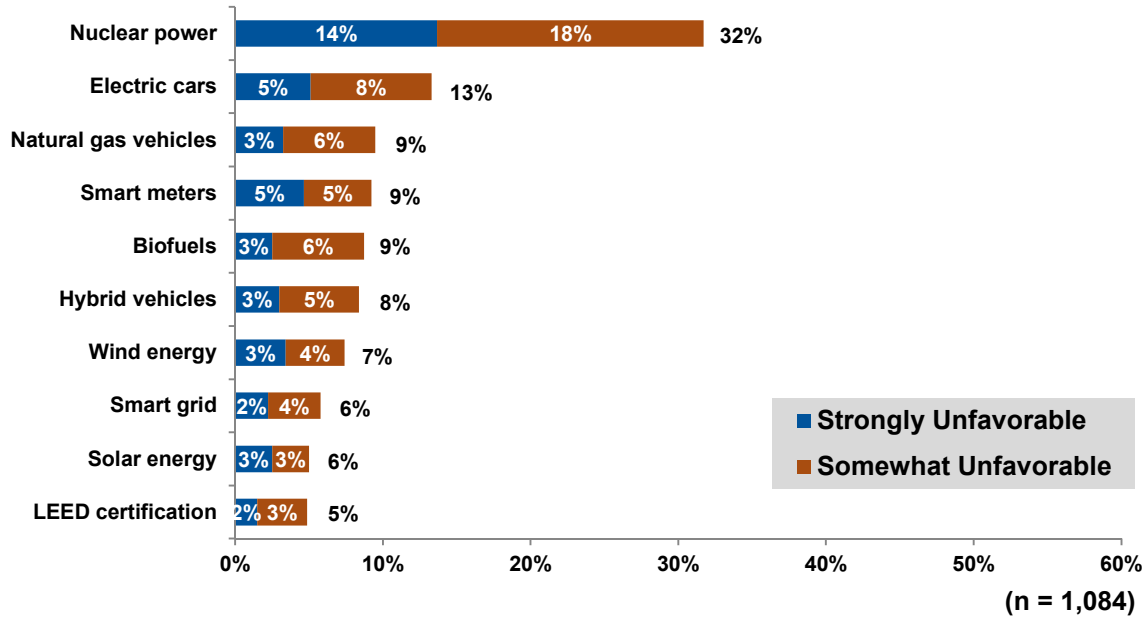
(Source: Navigant Research)

Chart 1.2 includes the percentage of unfavorable responses, while Chart 1.3 indicates the percentage of respondents who were unfamiliar with or neutral on each topic. These summary charts reveal the following key results:

» Nuclear power had the most unfavorable impression among respondents (32%), followed by electric cars. All other energy and environment concepts had negative favorability below 10%.

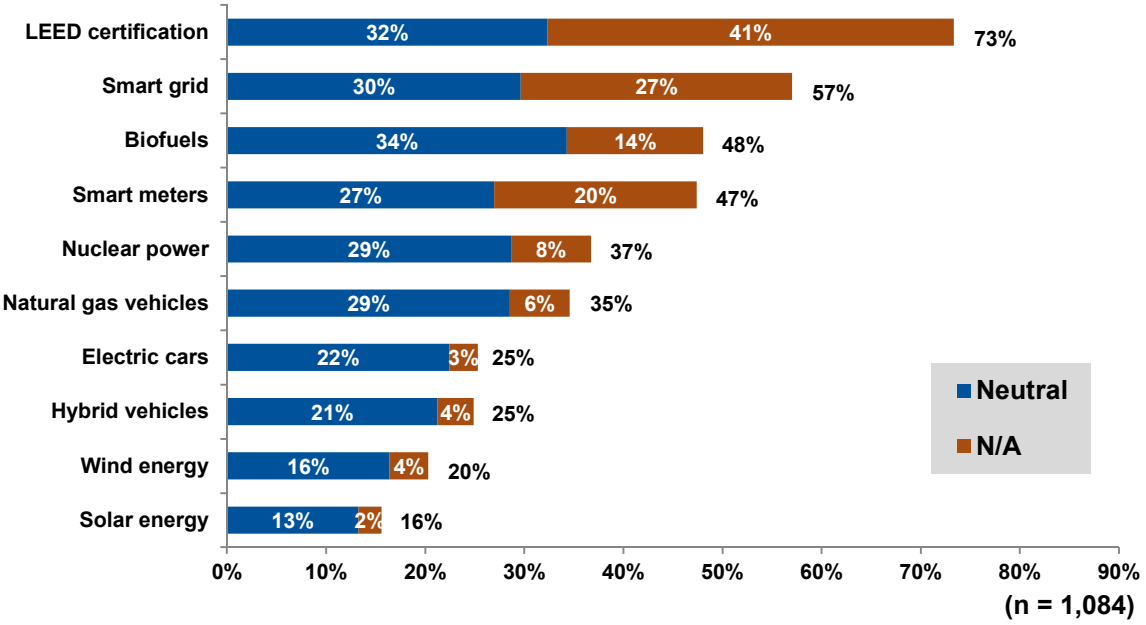
» Consumers were the least familiar with LEED certification; nearly three-fourths of respondents reported that they were not familiar with or neutral on the concept. Solar energy and wind were recognizable to most consumers, with 16% of consumers selecting the not familiar/neutral option for solar energy and 20% selecting the not familiar/neutral option for wind energy.

Chart 1.2 Unfavorable Impressions of Energy and Environment Concepts, United States: 2013



(Source: Navigant Research)

Chart 1.3 Neutral Impression/No Opinion of Energy and Environment Concepts, United States: 2013



(Source: Navigant Research)

Table 1.1 summarizes the favorable impressions (top two boxes) of energy and environmental concepts for each year, based on Navigant Research's annual survey results, between 2009 and 2013. For concepts where there is a year-over-year change that falls beyond the 3% margin of error an up or down arrow is shown, indicating that these concepts have seen a change from the previous year. Not all concepts were asked about from the start of the survey, and those that were not in earlier surveys are indicated with an N/A.

Between 2009 and 2012, there were steady declines in favorability for some concepts, particularly the most favorable concepts such as solar energy, wind energy, hybrid vehicles, and electric cars. However, results in the 2013 survey indicated a rebound in consumer favorability for a number of concepts, along with a significant increase in average favorability to 51%, the highest level since 2010.

Table 1.1 Favorable Impressions of Energy and Environment Concepts, United States: 2009-2013

Concept	2009	2010	2011	2012	2013
Solar Energy	81%	79%	77%	↓ 69%	↑ 79%
Wind Energy	79%	↓ 75%	↓ 71%	↓ 66%	↑ 72%
Hybrid Vehicles	70%	↓ 64%	61%	↓ 54%	↑ 67%
Electric Cars	62%	57%	↓ 55%	↓ 49%	↑ 61%
Natural Gas Vehicles	N/A	N/A	51%	49%	↑ 56%
Biofuels	56%	↓ 47%	↓ 39%	39%	↑ 43%
Smart Meters	N/A	37%	38%	39%	↑ 43%
Smart Grid	47%	↓ 37%	37%	36%	37%
Nuclear Power	47%	↓ 42%	40%	41%	↓ 32%
LEED Certification	16%	19%	18%	20%	22%
Average Favorability	57%	↓ 51%	49%	↓ 44%	↑ 51%

(Source: Navigant Research)

Arrows indicate a significant increase or decrease from the previous year outside the +/- 3% margin of error for this survey.

Table 1.2 shows the unfavorable responses (bottom two boxes) to the 10 energy and environment concepts covered by the survey. In 2013, respondents' unfavorable impressions of hybrid vehicles and electric cars decreased significantly, while unfavorable views of nuclear power increased significantly. Overall, there was no significant change in the average level of unfavorable views across the 10 concepts between 2012 and 2013.

Table 1.2 Unfavorable Impressions of Energy and Environment Concepts, United States: 2009-2013

Concept	2009	2010	2011	2012	2013
Solar Energy	3%	4%	6%	7%	6%
Wind Energy	4%	5%	8%	10%	7%
Hybrid Vehicles	8%	9%	10%	↑ 14%	↓ 8%
Electric Cars	9%	10%	↑ 16%	17%	↓ 13%
Natural Gas Vehicles	N/A	N/A	9%	10%	9%
Biofuels	8%	9%	9%	12%	9%
Smart Meters	N/A	7%	9%	9%	9%
Smart Grid	7%	5%	6%	8%	6%
Nuclear Power	16%	19%	↑ 23%	20%	↑ 32%
LEED Certification	5%	5%	↑ 9%	8%	5%
Average Unfavorability	8%	9%	11%	12%	11%

(Source: Navigant Research)

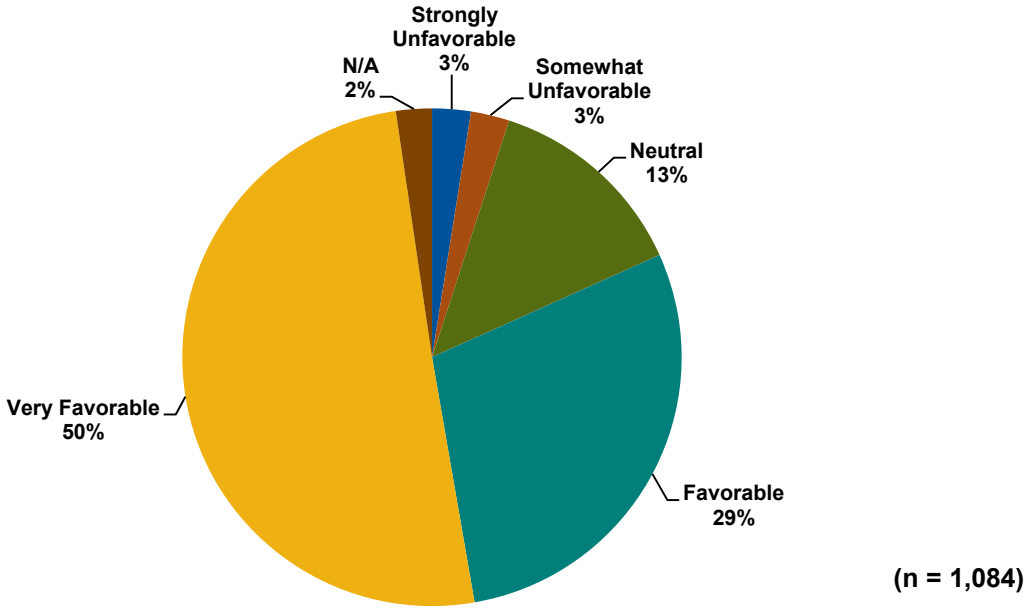
Arrows indicate a significant increase or decrease from the previous year outside the +/- 3% margin of error for this survey.

Section 2
CLEAN ENERGY

2.1 Solar Energy

As shown in Chart 1.1 and Chart 1.2 in the previous section, solar energy possesses both the highest percentage of favorable opinions (79%) and one of the lowest percentages of unfavorable opinions (6%) among all energy and environmental concepts covered. Furthermore, half of all respondents indicated a very favorable impression of the solar energy concept; it is one of the least controversial green technologies in the eyes of consumers.

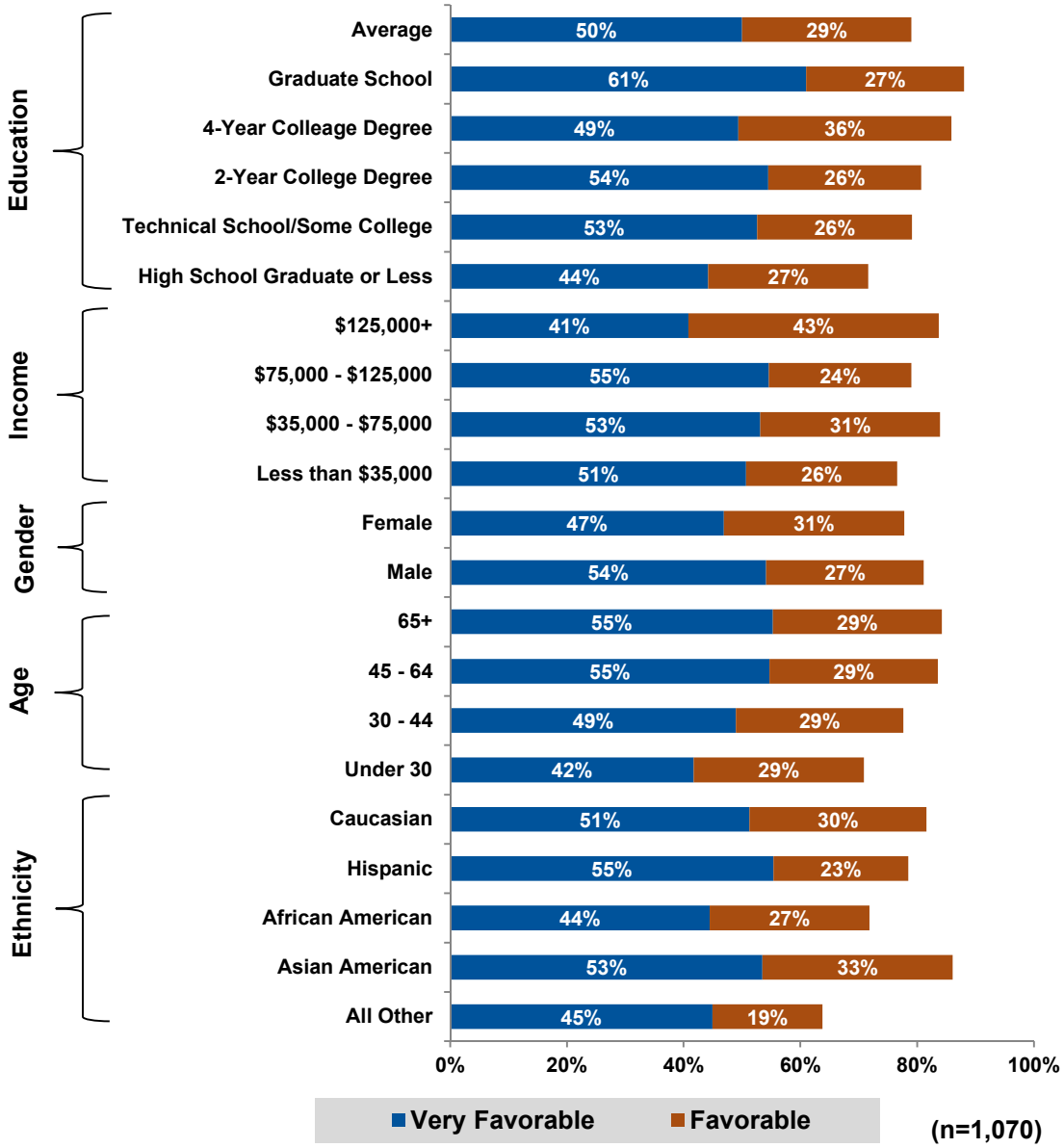
Chart 2.1 Consumer Favorability for Solar Energy, United States: 2013



(Source: Navigant Research)

From a demographic perspective, consumers that were older and those with 4-year degrees or graduate school degrees held higher than average favorable views of solar energy. Navigant Research attributes solar energy's high level of consumer acceptance to its relatively long history in the market, strong renewable energy reputation, and the variety of applications that utilize solar energy.

Chart 2.2 Consumer Favorability for Solar Energy by Demographics, United States: 2013

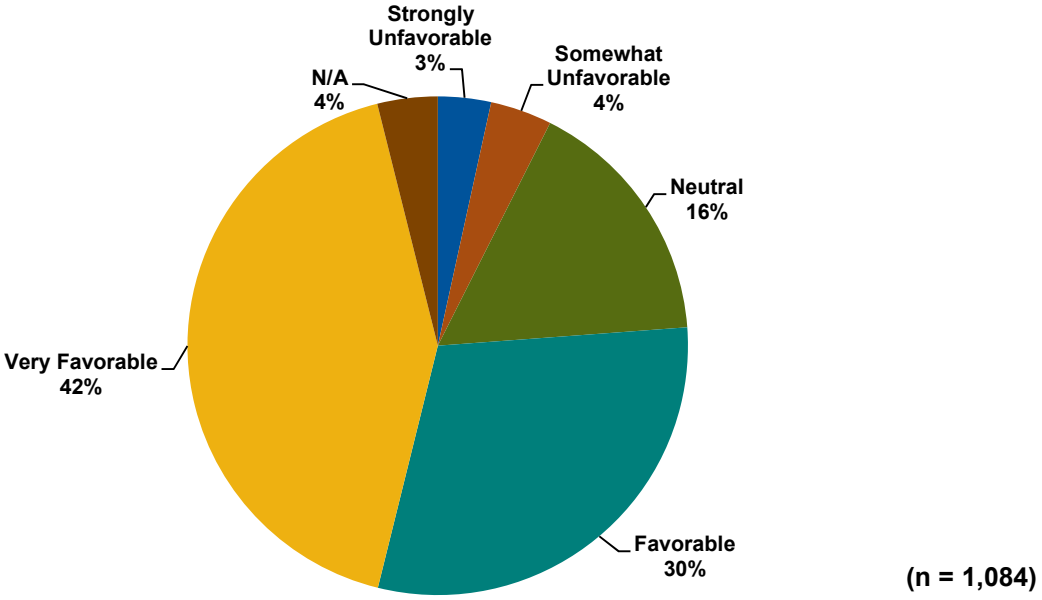


(Source: Navigant Research)

2.2 Wind Energy

Only slightly less popular than solar energy, wind energy was viewed as either favorable or very favorable by 72% of respondents. Only 7% of respondents held unfavorable opinions of wind energy. Approximately one in five respondents were neutral or had no opinion on wind energy.

Chart 2.3 Consumer Favorability for Wind Energy, United States: 2013

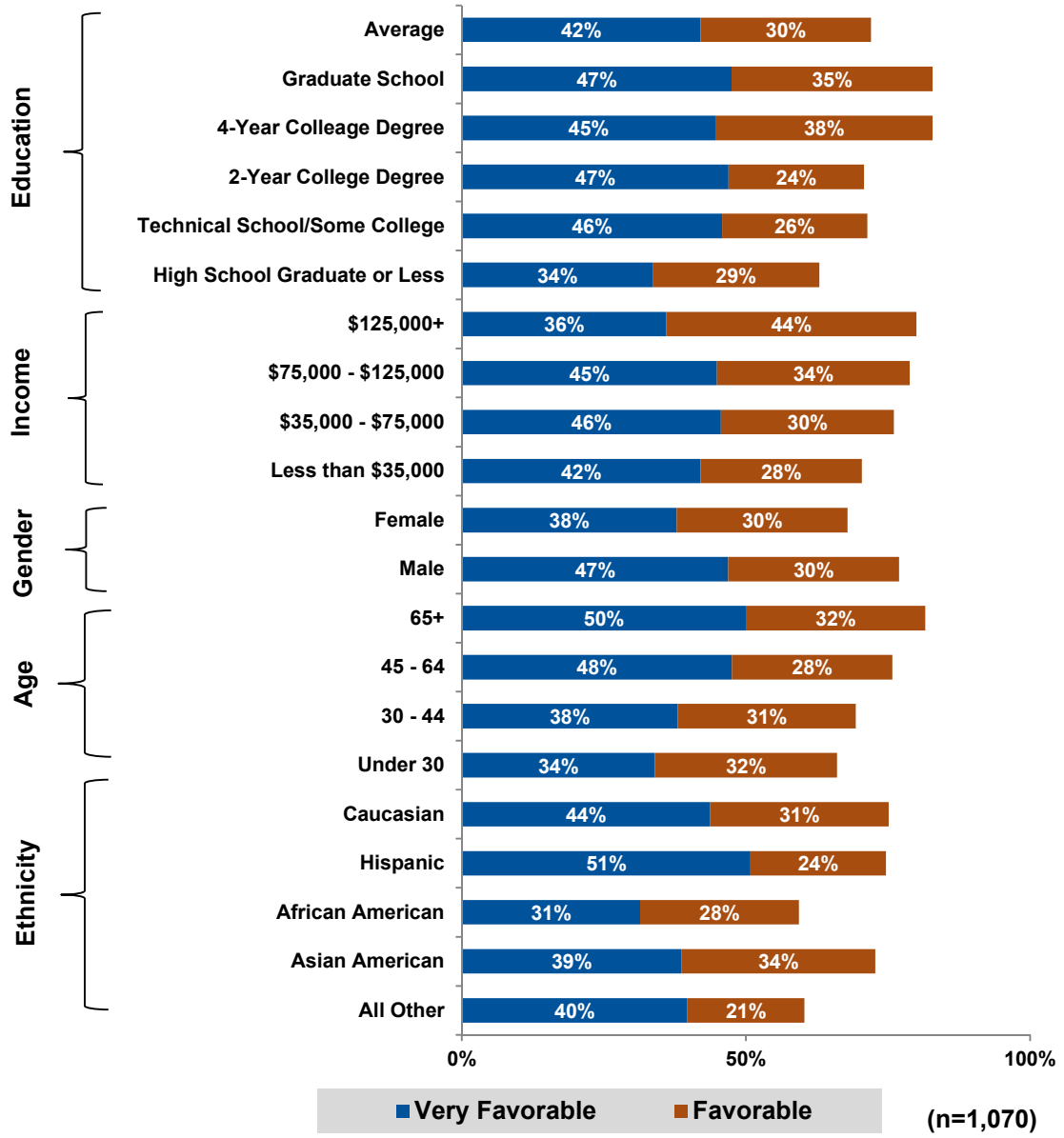


(Source: Navigant Research)

In regard to demographics, there was a 9% difference in favorability between men and women, although this difference was close to the margin of error in each direction. Consumers with incomes of $75,000 or higher, respondents 45 years of age and older, and those with 4-year college degrees and graduate school held more favorable views of wind energy as well.

The similarly high levels of favorable views toward solar and wind energy indicates that consumers are generally supportive of the more established renewable energies that harness naturally occurring power sources. Since these two concepts have retained their most favored status year after year, Navigant Research asserts that consumers consider these renewable energies to be important pieces in the power generation portfolio of the future.

Chart 2.4 Consumer Favorability for Wind Energy by Demographics, United States: 2013



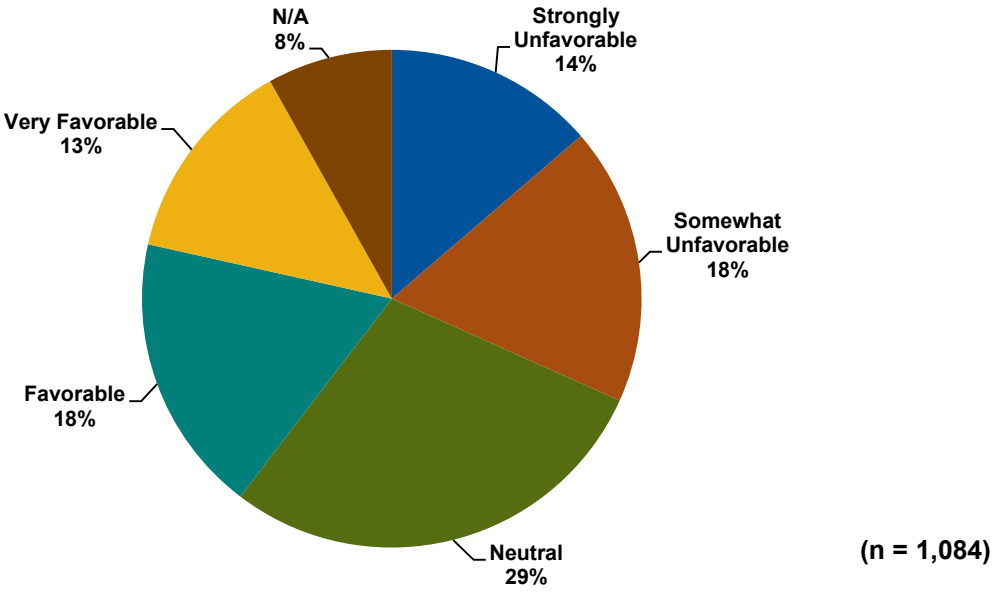
(Source: Navigant Research)

2.3 Nuclear Power

Among the clean energy concepts covered in this report, nuclear power received the smallest percentage of favorable responses; less than one-third rated their opinion of it as very favorable or favorable. It also garnered a similar percentage of unfavorable responses (32%), with unfavorable responses well above those for other energy and environment topics.

Nuclear energy is the only topic surveyed to see ratings decrease from the *Energy and Environment Consumer Survey* in 2012 (32% favorability in 2013 down from 41% in 2012). The low rating for nuclear energy may be due to a combination of events, such as the continued alerts from the Fukushima nuclear plant in Japan to severe weather events, which raise the concern about another possible nuclear disaster.

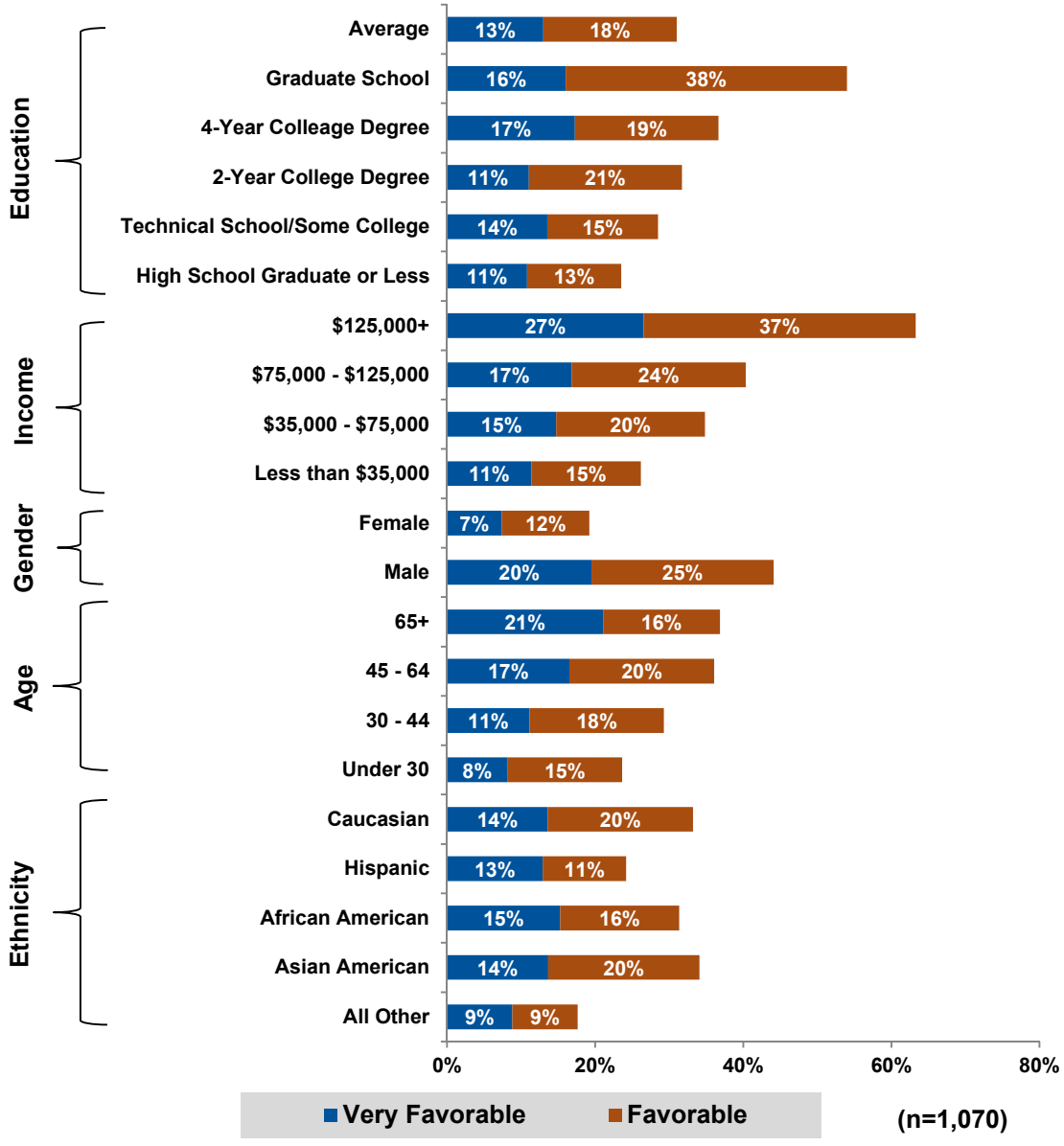
Chart 2.5 Consumer Favorability for Nuclear Energy, United States: 2013



(Source: Navigant Research)

Favorability by demographic did vary to a greater extent for nuclear power versus the clean energy concepts of solar and wind. Women had lower favorability ratings for nuclear power than men (19% versus 45%) as did younger consumers.

Chart 2.6 Consumer Favorability for Nuclear Energy by Demographics, United States: 2013



(Source: Navigant Research)

Section 3
CLEAN TRANSPORTATION

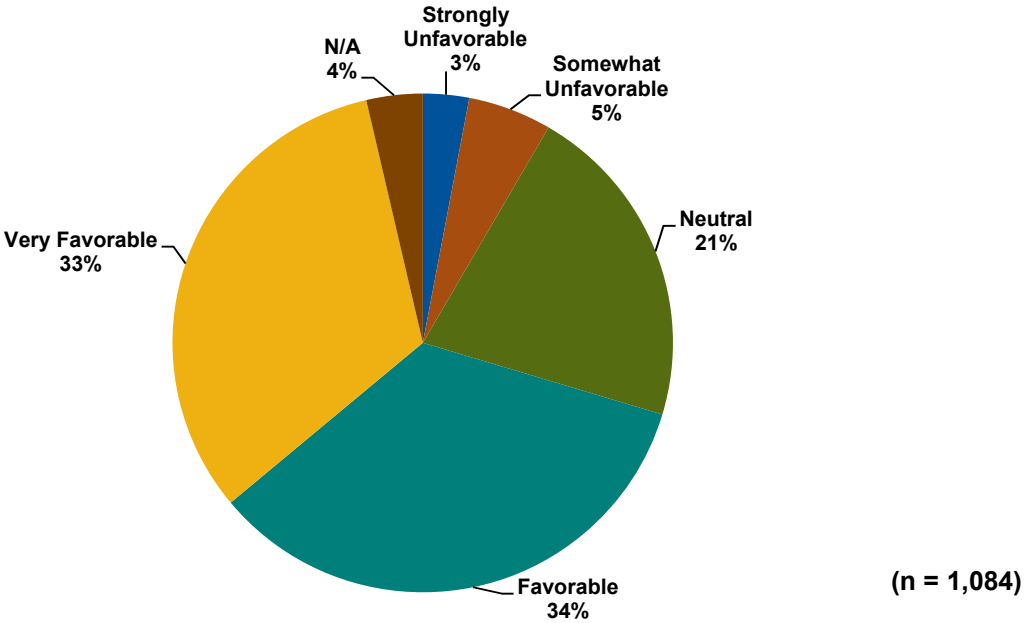
3.1 Overview

Navigant Research also asked respondents about their views on several clean transportation topics including hybrid vehicles, electric cars, natural gas cars, and biofuels. This section summarizes the high-level findings for clean transportation; however, more detailed findings on electric vehicles are discussed in the *Electric Vehicle Consumer Survey* published in November 2013.

3.2 Hybrid Vehicles

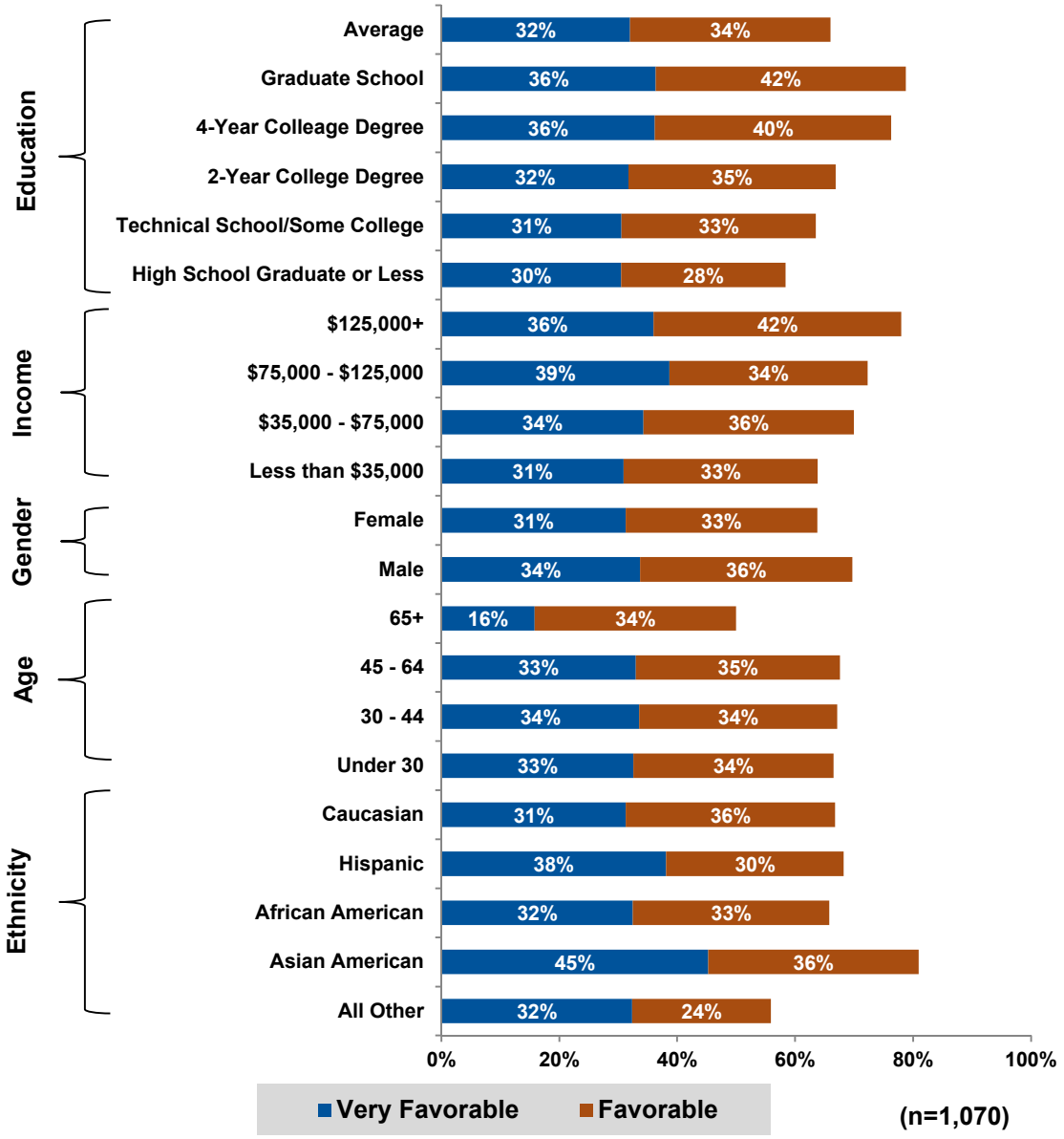
Following the two clean energy concepts of solar and wind, hybrid vehicles received the highest percentage of favorable responses at 67%. With only 8% holding somewhat unfavorable or strongly unfavorable opinions of hybrid vehicles, this is another widely accepted clean technology topic among consumers. Respondents with high school degrees or less had a lower favorability rating for hybrid vehicles, while those with higher education levels and higher incomes had a greater favorability for hybrids. While the sample size for Asian Americans is small with a greater margin of error, this group seems more favorable of hybrid vehicles than other ethnicities. The full breakdown of responses to the hybrid vehicle concept can be found in Charts 3.1 and 3.2 below.

Chart 3.1 Consumer Favorability for Hybrid Vehicles, United States: 2013



(Source: Navigant Research)

Chart 3.2 Consumer Favorability for Hybrid Vehicles by Demographics, United States: 2013

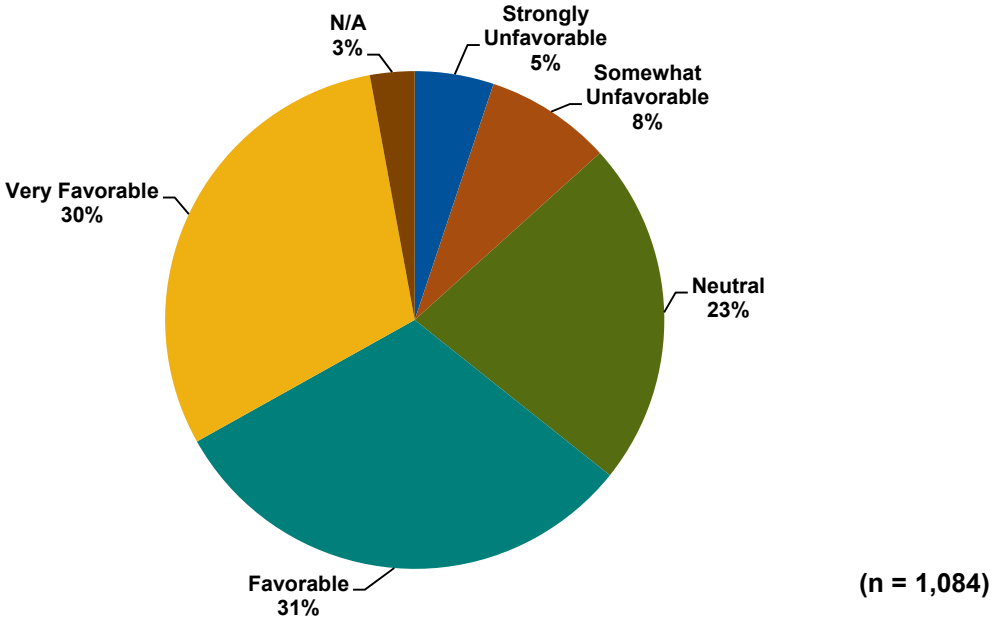


(Source: Navigant Research)

3.3 Electric Cars

As new electric vehicles increasingly become available to consumers, the concept of electric cars is fourth in terms of having the most favorable responses at 61%. Chart 3.4 illustrates that only 13% of respondents had unfavorable views of electric cars.

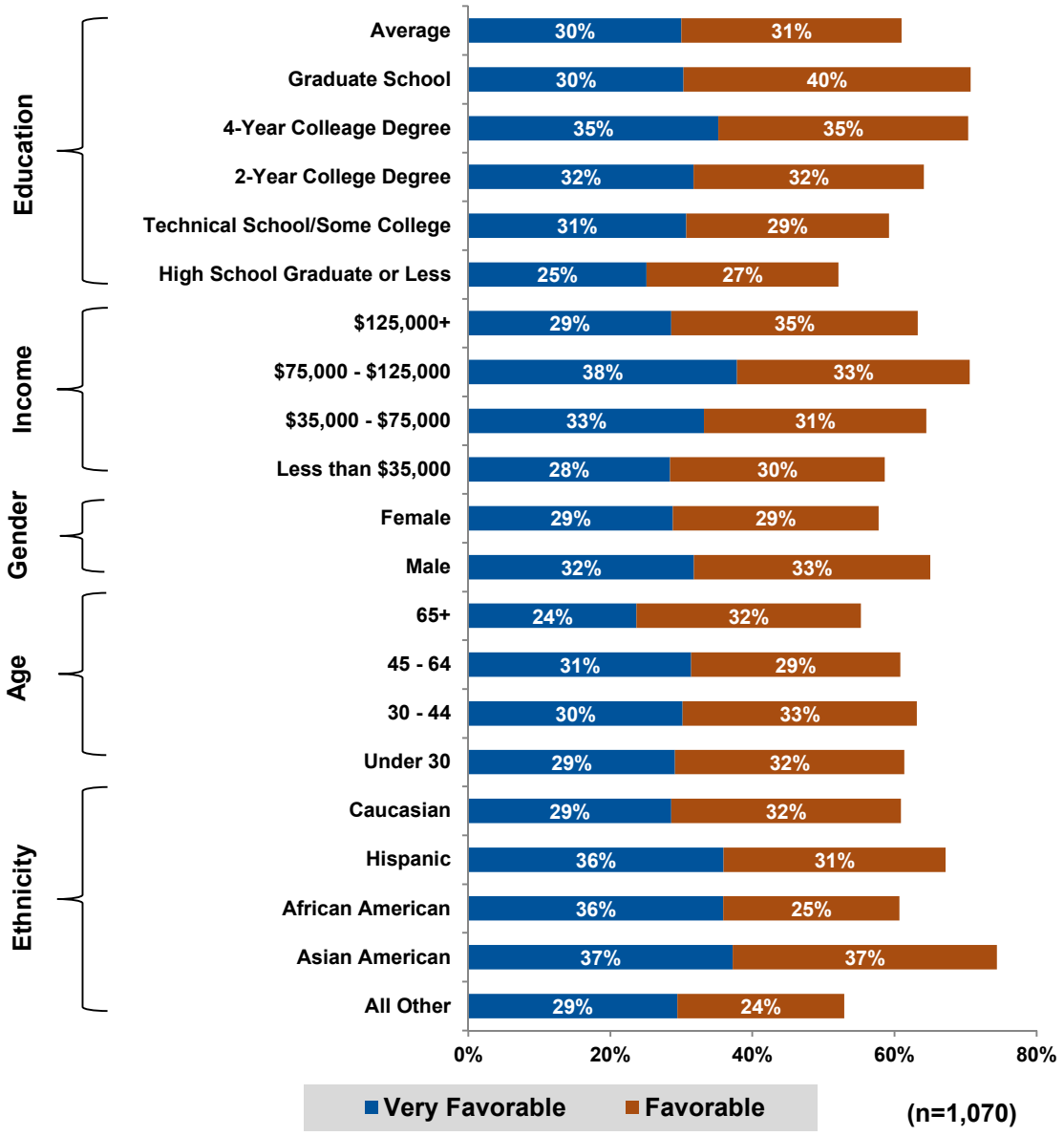
Chart 3.3 Consumer Favorability for Electric Cars, United States: 2013



(Source: Navigant Research)

As with hybrid vehicles, older and less educated consumers tend to report lower favorability for electric cars, while Hispanics, those with higher incomes, and those with higher levels of education had higher levels of favorability for electric cars.

Chart 3.4 Consumer Favorability for Electric Cars by Demographics, United States: 2013

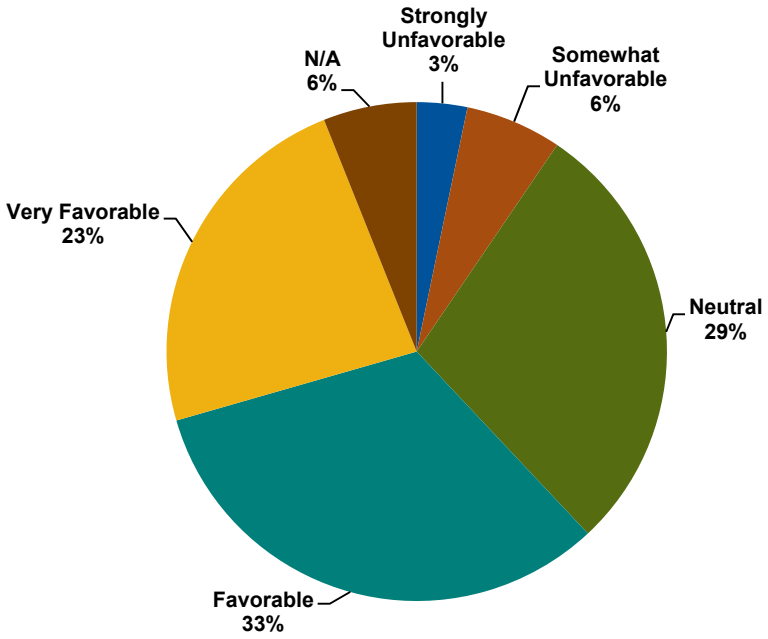


(Source: Navigant Research)

3.4 Natural Gas Vehicles

As with hybrid vehicles and electric cars, favorability for natural gas vehicles was above 50%. Slightly more than one-quarter of respondents had a neutral opinion or no opinion on this topic (35%), and 9% had unfavorable views of natural gas vehicles. This is interesting since natural gas vehicles in the United States are mostly focused on fleet vehicle markets rather than the consumer market.

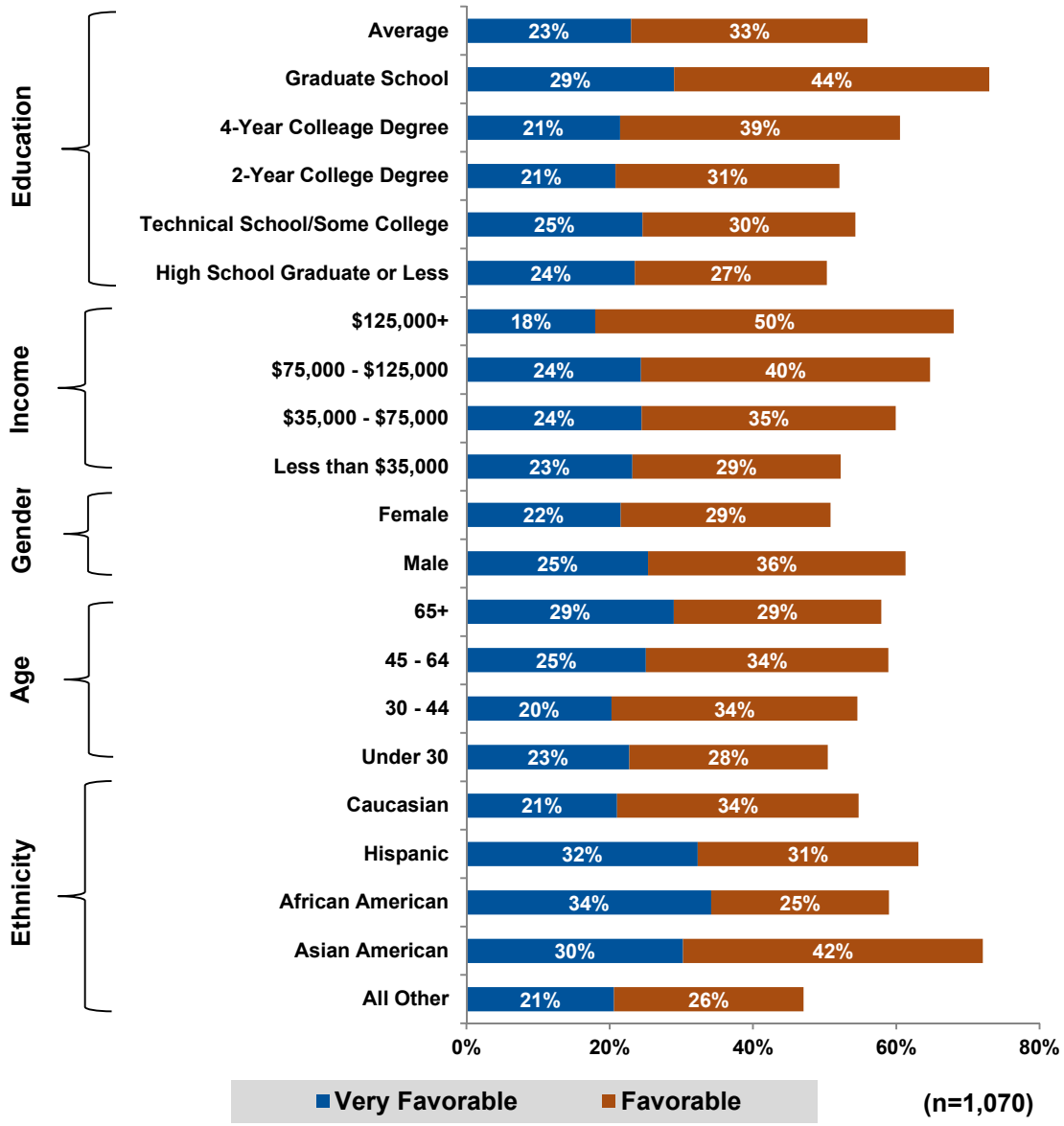
Chart 3.5 Consumer Favorability for Natural Gas Cars, United States: 2013



(Source: Navigant Research)

In terms of demographics, men were 10% more likely than women to hold favorable impressions of natural gas vehicles, and favorability increased steadily with age. As with other alternative fuel vehicles, consumers with higher levels of education and that identified as Hispanic were more likely to describe their views on natural gas vehicles as favorable or very favorable.

Chart 3.6 Consumer Favorability for Natural Gas Cars by Demographics, United States: 2013

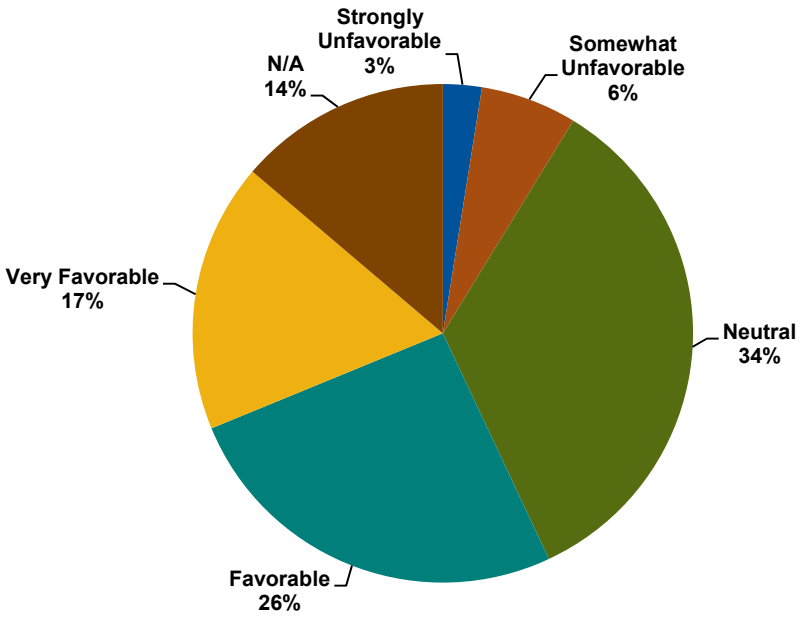


(Source: Navigant Research)

3.5 Biofuels

Biofuels garnered the lowest favorability ratings of the clean transportation concepts. Of survey respondents, 43% believed biofuels were very favorable or favorable, and 9% held negative views of biofuels. As Chart 3.8 shows, there was a wide gap in favorability between men and women (54% vs. 32%). While those with a 4-year or graduate degree have favorable opinions, respondents under the age of 30, those with high school degrees or less, as well as Hispanics and African Americans, held the lowest favorable opinions of biofuels.

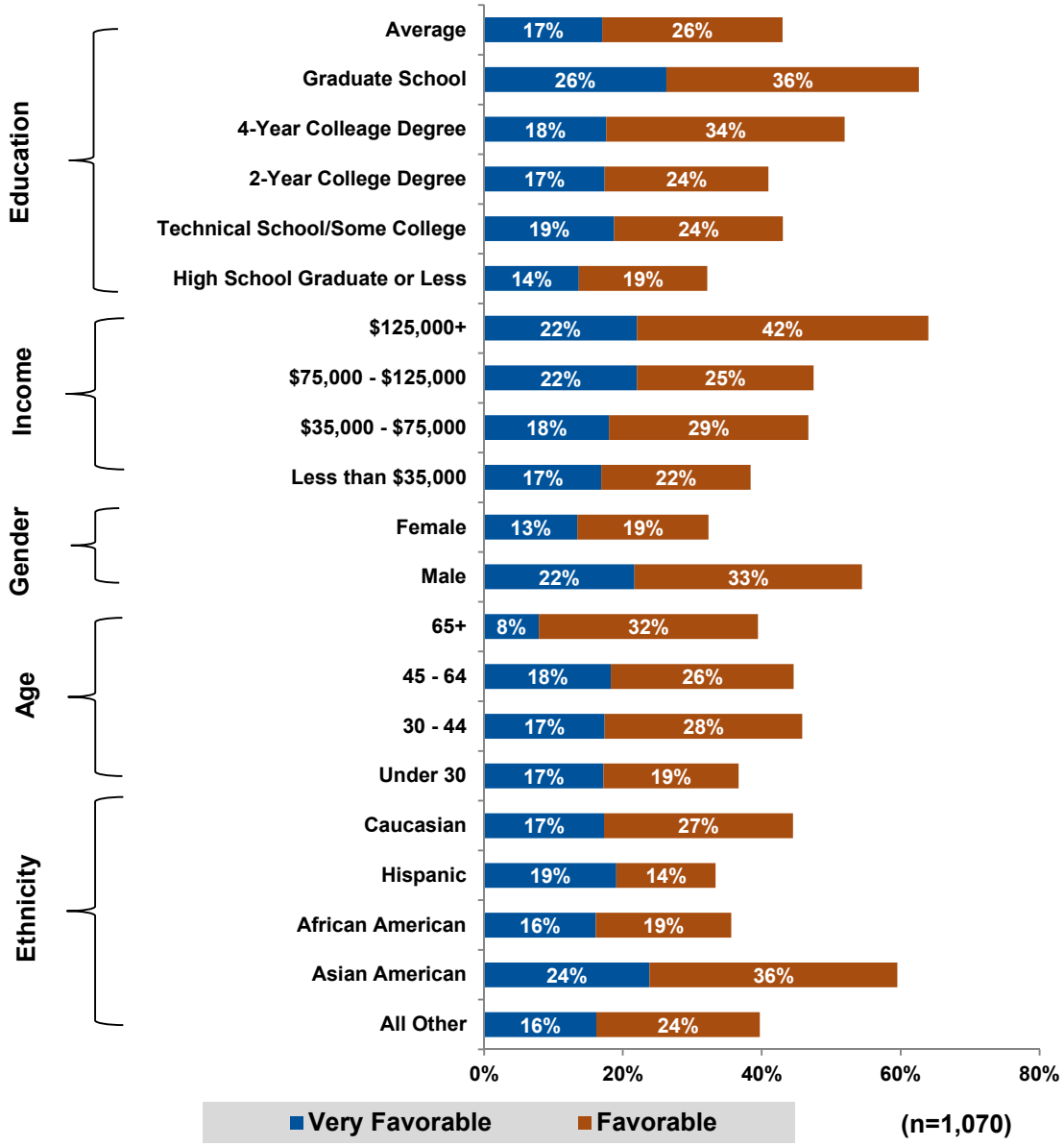
Chart 3.7 Consumer Favorability for Biofuels, United States: 2013



(Source: Navigant Research)

As shown in Chart 3.8, there was a wide gap in favorability between men and women (55% vs. 32%). While those with a 4-year or graduate degree have favorable opinions, respondents under the age of 30, those with high school degrees or less, Hispanics, and African Americans held the lowest favorable opinions of biofuels.

Chart 3.8 Consumer Favorability for Biofuels by Demographics, United States: 2013



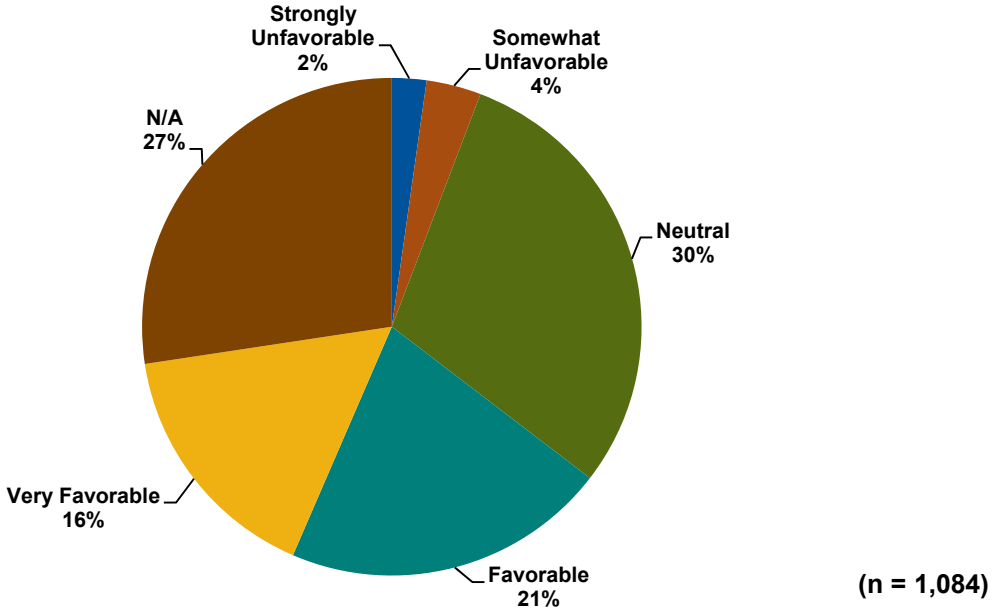
(Source: Navigant Research)

Section 4
SMART GRID

4.1 Smart Grid

Chart 4.1 shows that 37% of respondents stated their opinion of smart grids were favorable or very favorable, which is about half of the favorability rating of solar energy. Interestingly, the percentage of unfavorable responses to smart grids was similar to that of solar energy (6%). Perhaps most telling is that the largest percent of consumers (57%) were either neutral or had no opinion on the concept of smart grids, which may indicate a lack of consumer education on the benefits of smart grid.

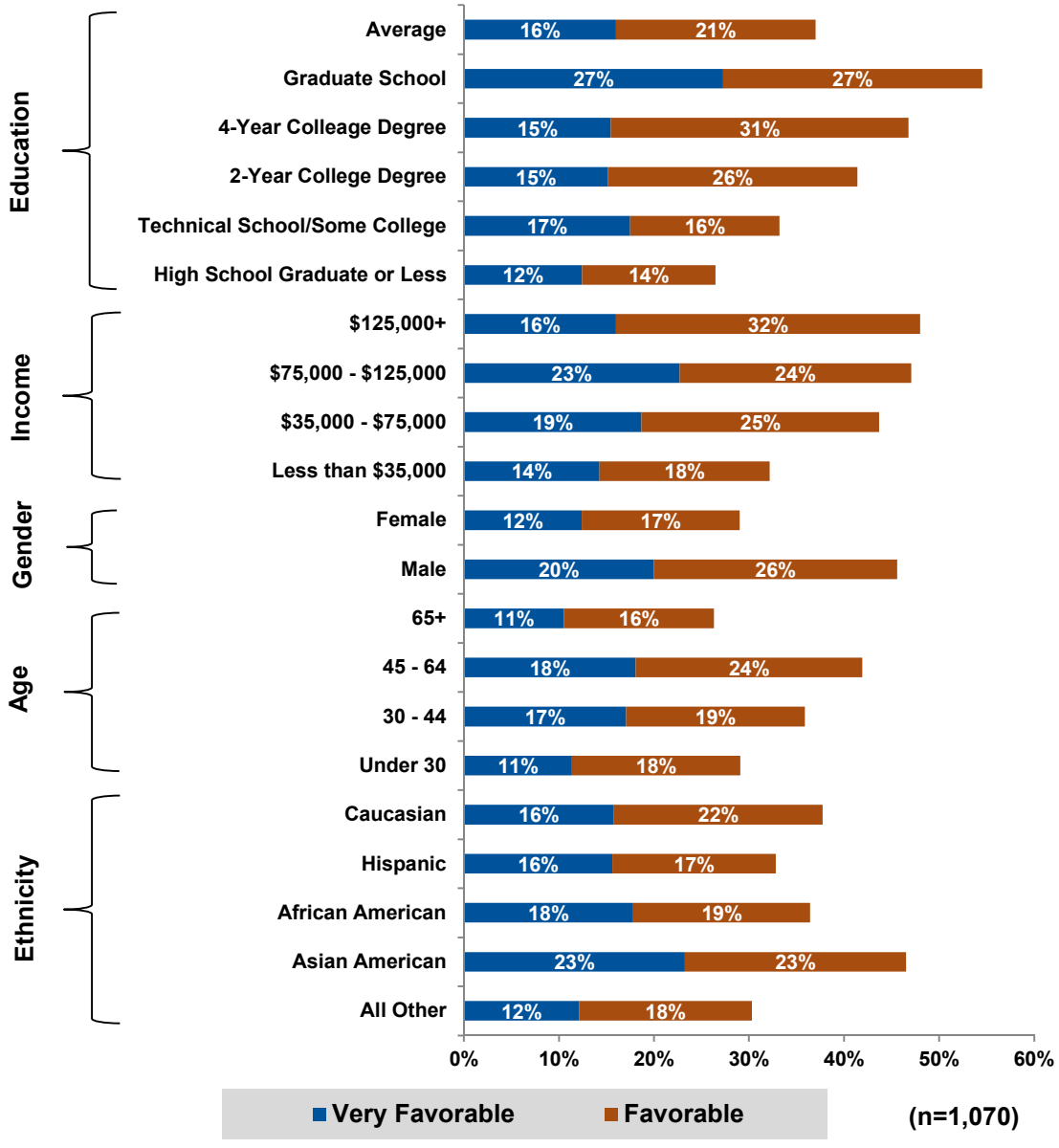
Chart 4.1 Consumer Favorability for Smart Grid, United States: 2013



(Source: Navigant Research)

In regard to demographic breakouts, there was a 17% difference in favorability between men and women (46% vs. 29%). Lower favorability for smart grid was also reported by those less than 30 years of age and those with a high school degrees or less. Higher favorability was reported by respondents with 4-year degrees and graduate degrees and those between the ages of 45 and 64. Directionally, those over 65 share an unfavorable opinion of smart grids with their younger (under 30) compatriots.

Chart 4.2 Consumer Favorability for Smart Grid by Demographics, United States: 2013

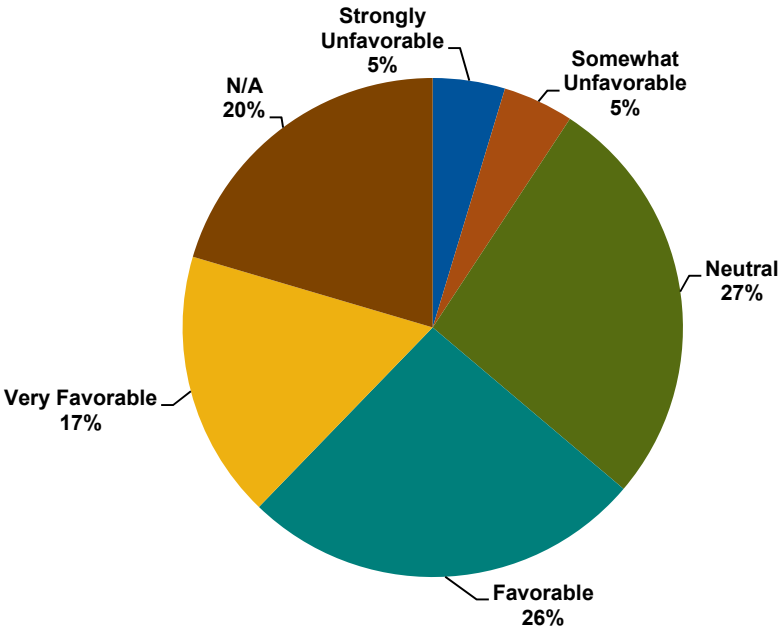


(Source: Navigant Research)

4.2 Smart Meters

The breakdown of responses to the concept of smart meters is close to that of smart grid, as seen in Chart 4.3. Smart meters have a higher percentage of favorable responses (43% for smart meters compared to smart grid at 37%), few unfavorable responses (10%), and a relatively large percentage of unfamiliar or neutral responses (47%).

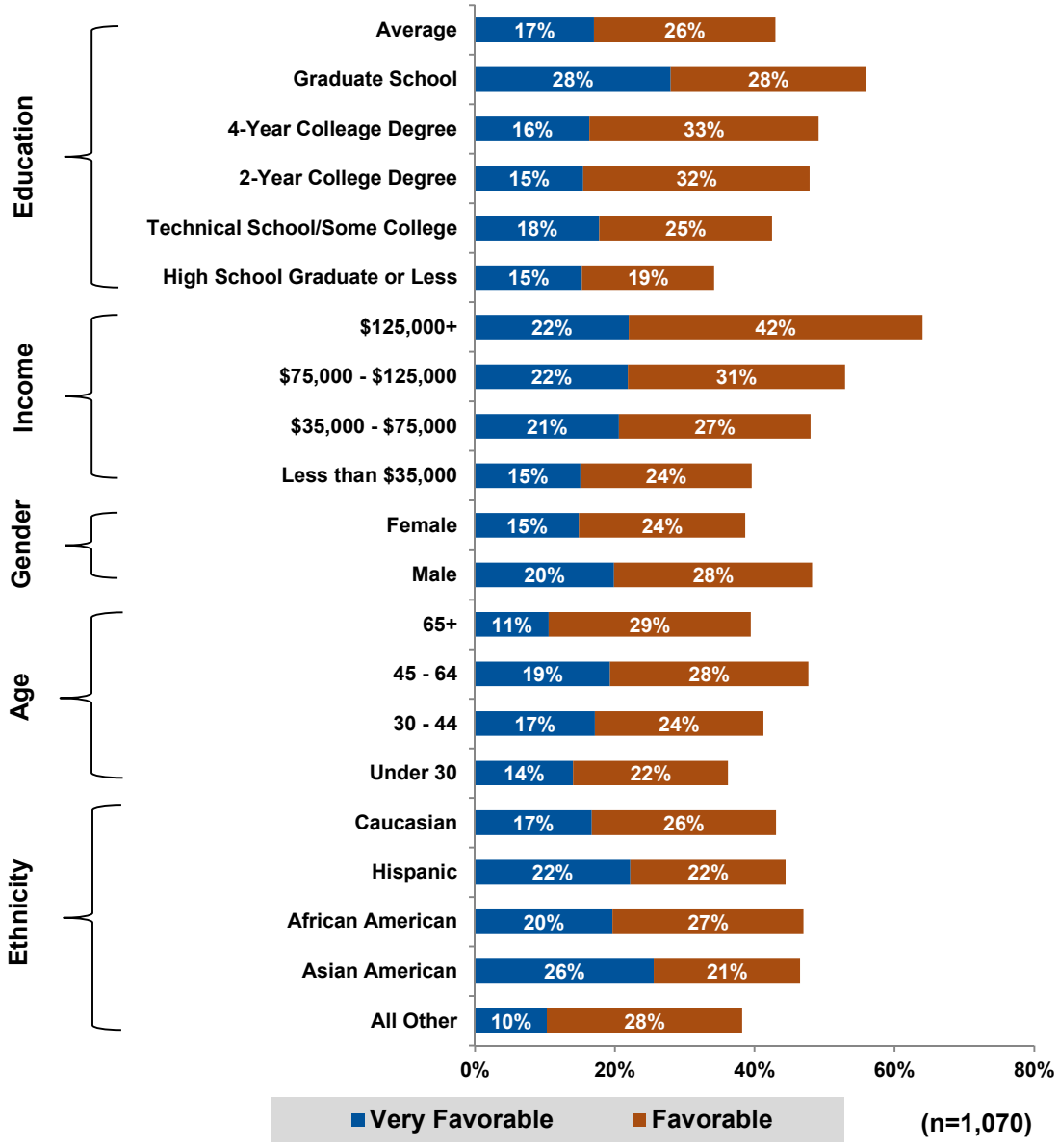
Chart 4.3 Consumer Favorability for Smart Meters, United States: 2013



(Source: Navigant Research)

Although smart meters had a similar overall favorability as smart grid, there was a smaller gap in favorability (9%) between men and women for smart meters. Favorability increased steadily with income, education level, and with age until 65.

Chart 4.4 Consumer Favorability for Smart Meters, United States by Demographics: 2013



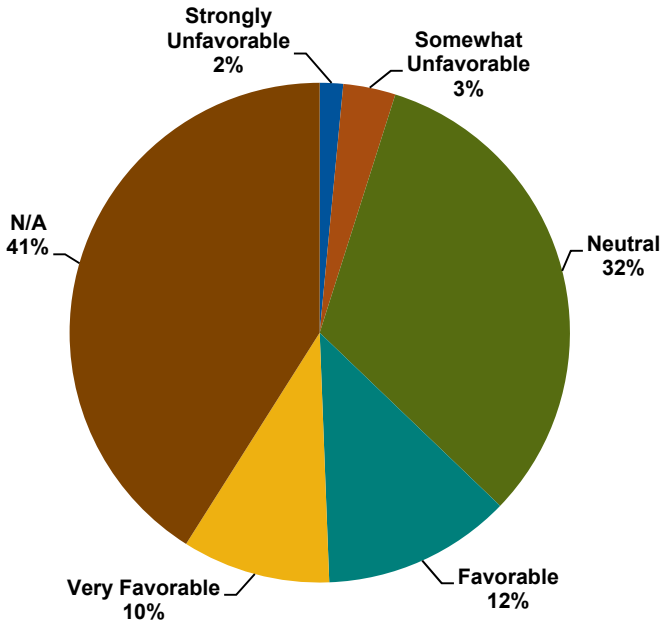
(Source: Navigant Research)

Section 5
BUILDING EFFICIENCY

5.1 LEED Certification

With less than one-quarter of respondents indicating a favorable or very favorable impression of LEED certification, it would appear that this building efficiency concept is relatively unappealing to consumers. However, Chart 5.1 paints a more accurate picture of how consumers view the concept. The majority of consumers (72%) are simply unfamiliar with or have no opinion of this green building certification program. As seen in previous years, LEED certification was unfamiliar to more consumers than any other energy or environmental concept identified in the survey.

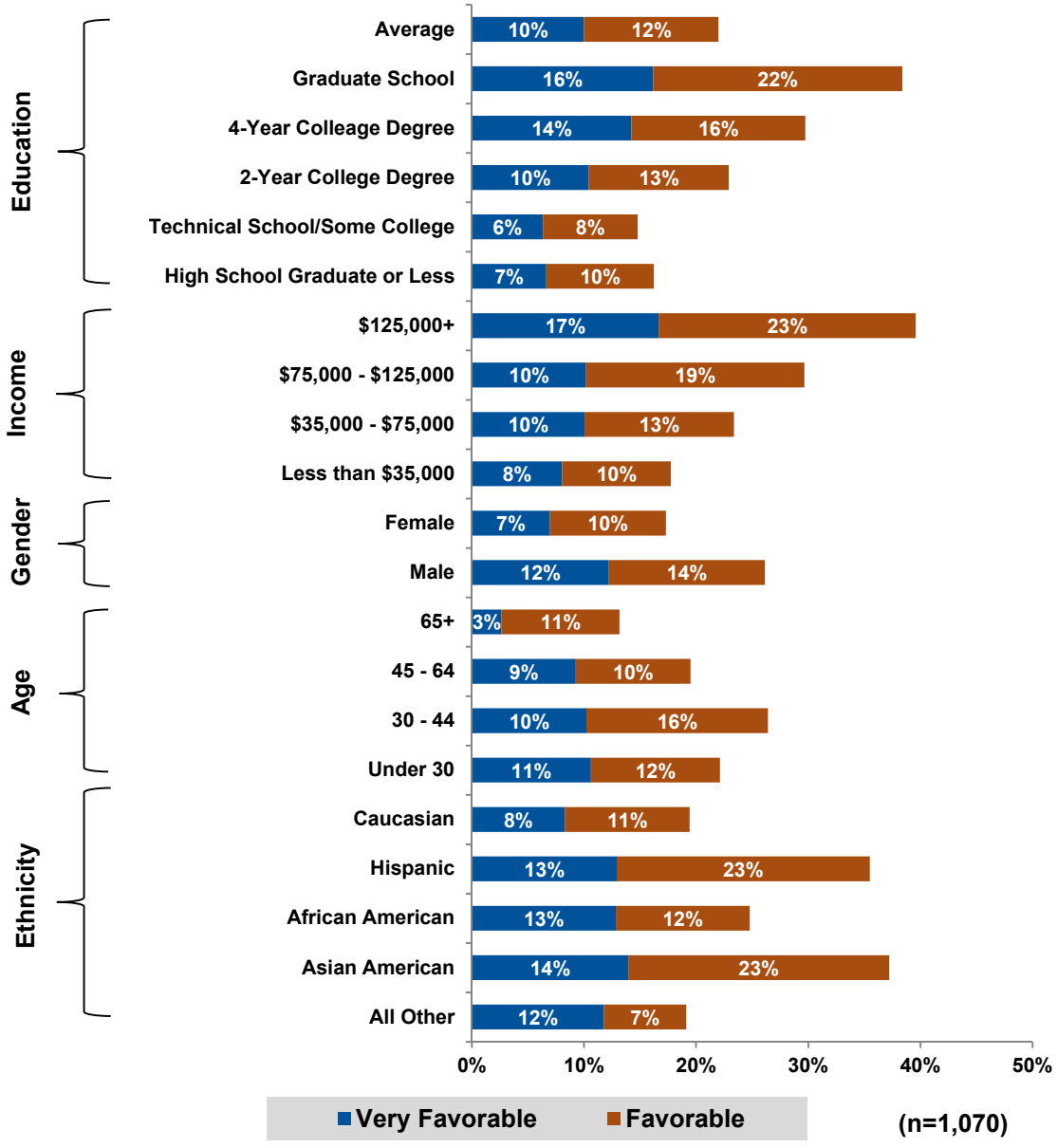
Chart 5.1 Consumer Favorability for LEED Certification, United States: 2013



(Source: Navigant Research)

In regard to demographic breakouts, favorability increased steadily with income and level of education. Hispanics hold more favorable views of LEED certification, while older respondents hold a less favorable opinion of this clean technology concept.

Chart 5.2 Consumer Favorability for LEED Certification by Demographics, United States: 2013



(Source: Navigant Research)

Section 6
SUMMARY AND CONCLUSIONS

6.1 Clean Energy

Consumer opinions of the clean energy concepts were generally positive, particularly for solar and wind energy, a trend that has been seen in previous Navigant Research consumer surveys. These results reveal that solar and wind power have reached a point of mass appeal among consumers. The non-renewable clean energy concept of nuclear power did not enjoy the same level of enthusiasm from the respondent base. Nuclear power also earned the highest percentage of unfavorable and neutral responses among all energy and environmental concepts. Women, younger, and less educated consumers tend to have a lower opinion of nuclear power, indicating that education on the advantages of nuclear power will require some additional efforts within these groups. In general, consumer favorability with clean energy, as well as other environmental topics, increased with education level and income.

6.2 Clean Transportation

Consumers also held favorable opinions of clean transportation concepts, though the favorable opinions were lower than levels achieved by solar and wind energy. Hybrid vehicles, electric cars, and natural gas vehicles were all considered favorable by more than half of all respondents. Biofuels were favored by more than two-fifths of respondents (43%) and received the highest incidence of unfamiliar or neutral responses (48%) among the clean transportation concepts. Interestingly, alternative fuels, natural gas vehicles, and biofuels have significant contrasting opinion ratings between the genders with significantly higher favorability reported by males. In general, favorability for these alternative fuel vehicles also tended to be higher among older and more educated respondents.

It can be expected that hybrid vehicles garnered the highest percentage of favorable votes for alternative fuel vehicles given that models such as the Toyota Prius have been available for some time. As more battery electric vehicles have become available and more consumers have become exposed to these cars, the favorable opinion of electric vehicles has rebounded after trending lower over the past couple years (61% favorability up from 49% in 2012 and 55% in 2011). As in previous years, Navigant Research found that natural gas-powered vehicles received favorability ratings similar to electric cars, even though natural gas powered-vehicles are largely limited to commercial fleets.

6.3 Smart Grid

Consumer reactions to the smart grid and smart meters concepts appeared less positive, with smaller percentages of favorable responses than the clean energy and transportation topics. However, this does not translate into consumers holding negative views of smart grid or smart meters. In fact, only 10% of respondents rated smart meters unfavorable, and only 6% rated smart grids unfavorable.

As in previous years, there were a high number of respondents reporting they were unfamiliar with or held neutral opinions of these concepts. As smart grid and smart meter deployments and installations continue, it is clear that consumer education is still needed. This is particularly true regarding the energy savings potential of smart grid technologies, which can directly benefit how much consumers spend on energy. Special outreach may be needed to help improve opinion among women and younger consumers.

6.4 Building Efficiency

The only building efficiency topic included in this survey was LEED certification. As in previous *Energy and Environment Consumer Surveys*, consumers continue to state that they are not acquainted with the concept. While this low level of familiarity among the general population is challenging, a positive finding is that consumers do not generally hold adverse opinions of the concept. In other words, there are not as many negative perceptions to overcome. Therefore, all that may be required to increase consumer favorability toward LEED certification programs is increased awareness of the certification program and its principles, particularly among women.

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SCOPE OF STUDY

Navigant Research has prepared this report to provide participants involved in the energy market with a study of consumer opinions related to clean energy, alternative fuel vehicles, smart grid, and LEED certification. The primary objective of this report is to impartially assess levels of consumer favorability toward 10 key smart energy topics.

Great care was taken in constructing a survey questionnaire that would yield the most accurate and unbiased results possible. However, note that consumers often have difficulty providing survey responses that accurately describe their attitudes toward products, services, and concepts with which their familiarity is limited.

SURVEY METHODOLOGY

Navigant Research conducted a web-based survey of 1,084 U.S. consumers in the fall of 2013 using a structured online questionnaire. The survey invitation was sent to a nationally representative and demographically balanced sample of consumers who are members of a large online panel. Respondents were offered a chance to win prizes in exchange for their participation. The margin of error for these survey results is +/- 3% with a 95% confidence interval.

Navigant Research is a market research group whose goal is to present an objective, unbiased view of market opportunities within its coverage areas. Navigant Research is not beholden to any special interests and is thus able to offer clear, actionable advice to help clients succeed in the industry, unfettered by technology hype, political agendas, or emotional factors that are inherent in cleantech markets.

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