



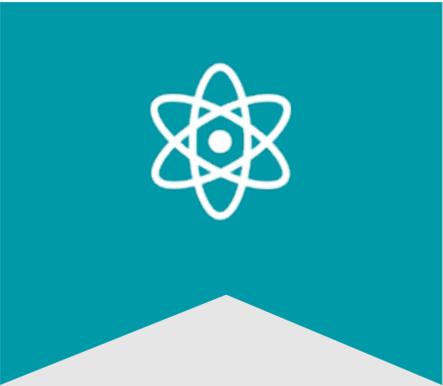
# National Energy Literacy Survey

National Energy Foundation

**Cicero**  
*Social Impact*

NEF has conducted a research study to establish a standard definition of energy literacy for high school seniors and recent graduates that can help inform the national discussion about energy.

### Literacy



Establish a standard, unbiased definition of energy literacy

### Attitudes



Identify common attitudes and perceptions toward energy

### Behaviors



Understand common actions and behaviors taken as it relates to energy



## Survey Objectives

- Take a national snapshot – high school seniors
- Create comprehensive, balanced approach
- Verify need, identify gaps
- Raise profile of energy literacy
- Raise profile of NEF

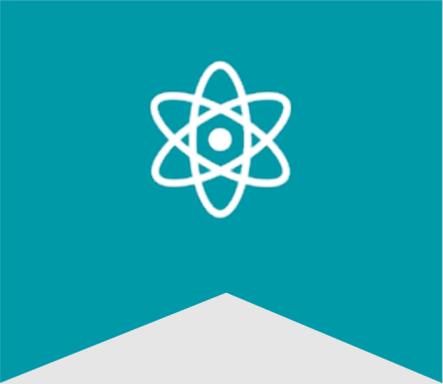


## Target Participants

- 2,005 participants - National
- Why high school seniors?
  - K-12 experience: what have they learned?
  - New voters
  - Energy customers
  - Higher education/Workforce entrants

We would now like to review key findings from our research, beginning with literacy.

### Literacy



Establish a standard, unbiased definition of energy literacy

### Attitudes



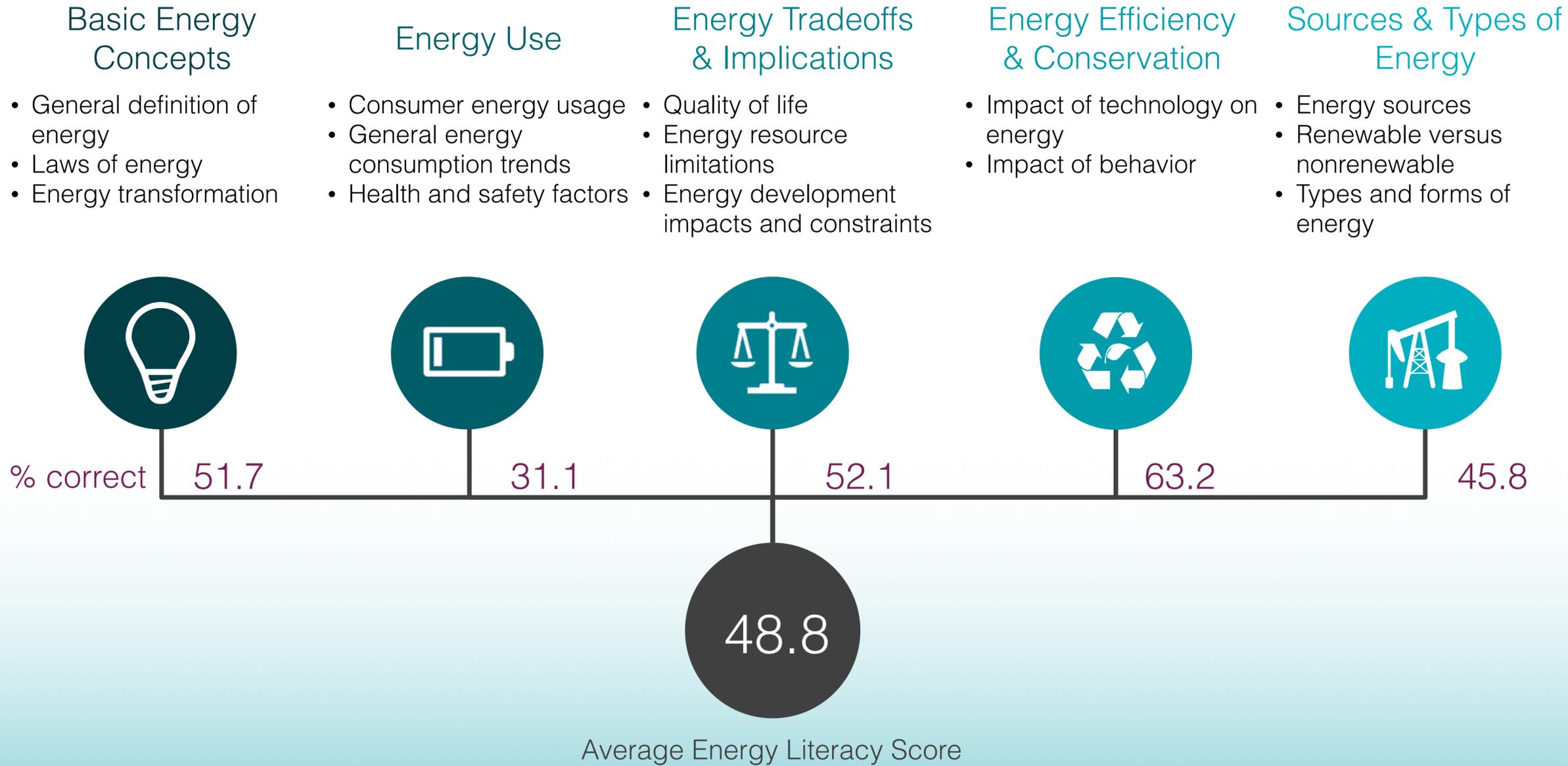
Identify common attitudes and perceptions toward energy

### Behaviors



Understand common actions and behaviors taken as it relates to energy

The overall energy literacy score for high school seniors and recent graduates is 48.8.



Basic Energy Concepts

- General definition of energy
- Laws of energy
- Energy transformation



Energy Use

- Consumer energy usage
- General energy consumption trends
- Health and safety factors



Energy Tradeoffs & Implications

- Quality of life
- Energy resource limitations
- Energy development impacts and constraints



Energy Efficiency & Conservation

- Impact of technology on energy
- Impact of behavior



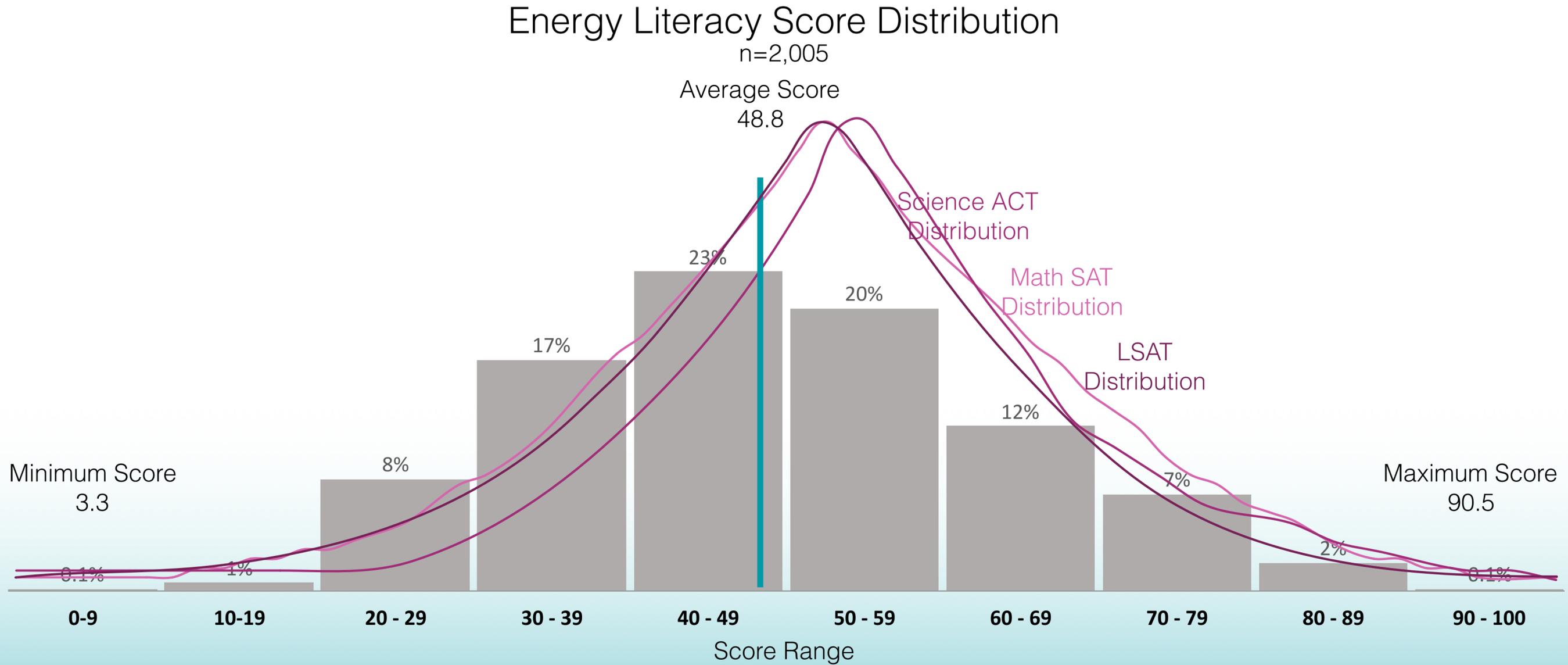
Sources & Types of Energy

- Energy sources
- Renewable versus nonrenewable
- Types and forms of energy



The Energy Literacy Score is an equally weighted average of correct answers to questions across a range of 5 energy-related categories

The overall distribution of energy literacy scores forms a normal bell curve around the mean, an important indicator of a scoring model.

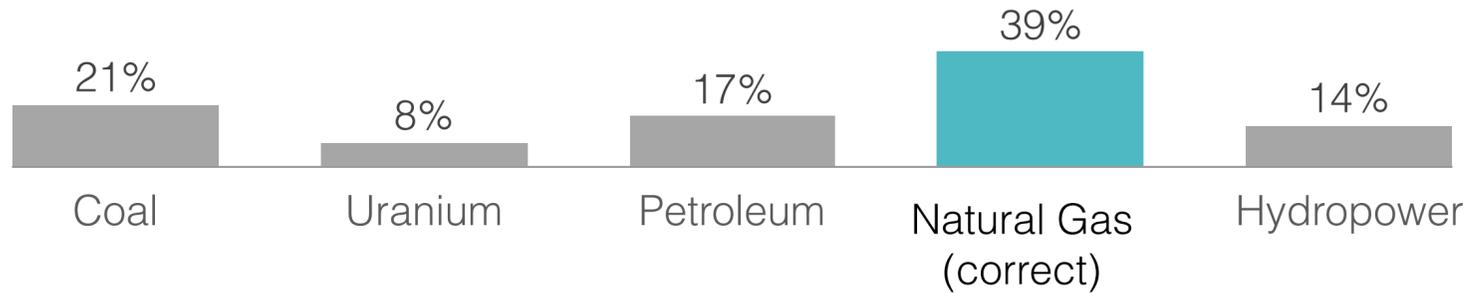


The Energy Literacy Score is an equally weighted average of correct answers to questions across a range of 5 energy-related categories

# Below are examples of questions that were asked to students.

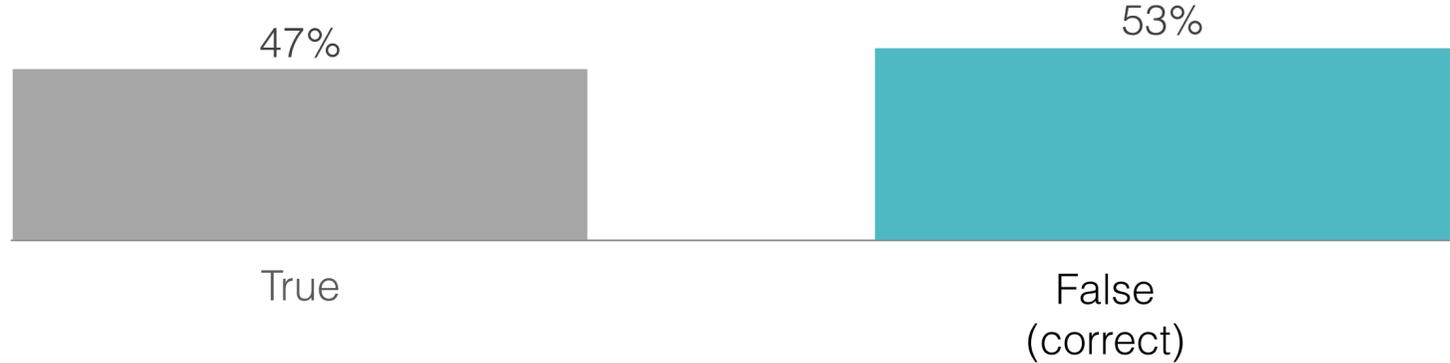
Topic: Sources and Types of Energy

Q. Most power plants being built in the U.S. today are designed to use which fuel?



Topic: Energy Tradeoffs and Implications

Q. Electric vehicles use electricity generated only from renewable energy sources.



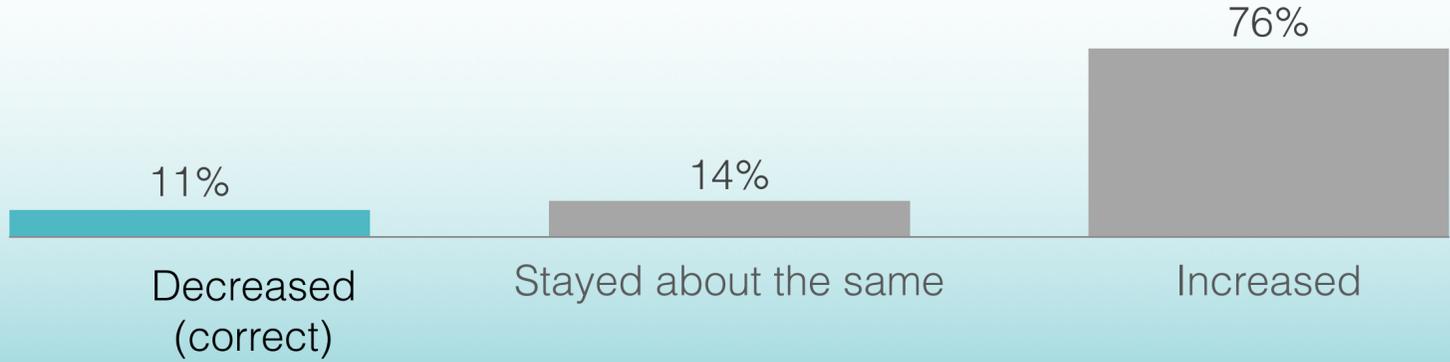
Topic: Energy Tradeoffs and Implications

Q. The technique of hydraulic fracturing to produce natural gas and oil, commonly known as “fracking,” has helped to lower consumer energy prices.



Topic: Energy Use

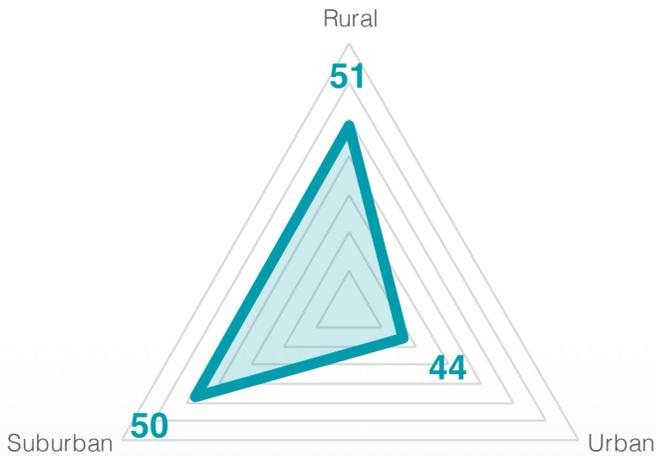
Q. Per capita energy usage in the United States since 2003 has:



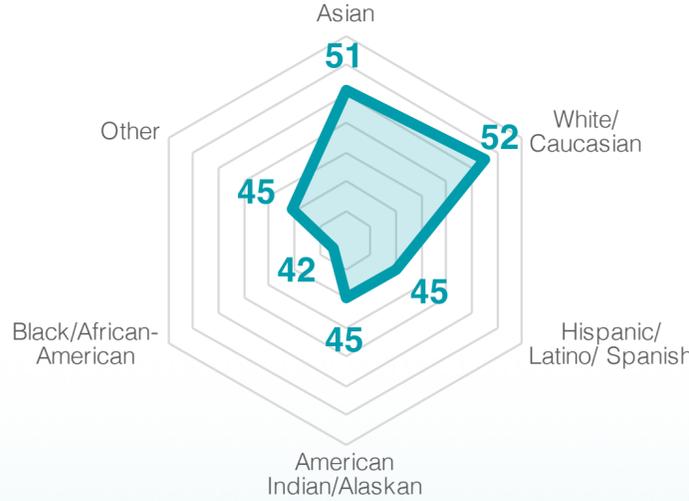
The Energy Literacy Score is an equally weighted average of correct answers to questions across a range of 5 energy-related categories

# Overall energy literacy scores varied across demographics.

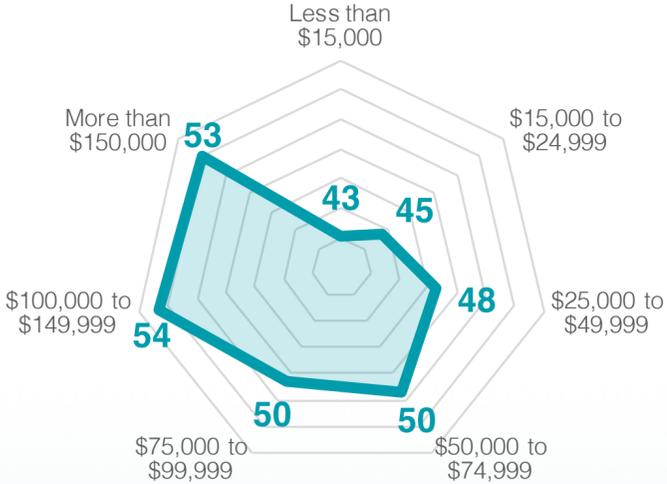
### Geography



### Ethnicity



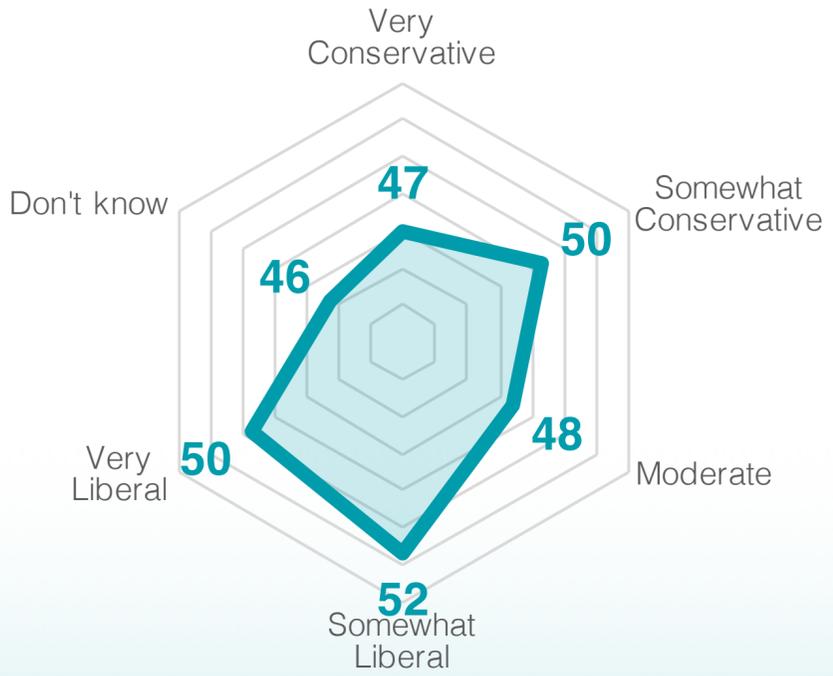
### Household Income



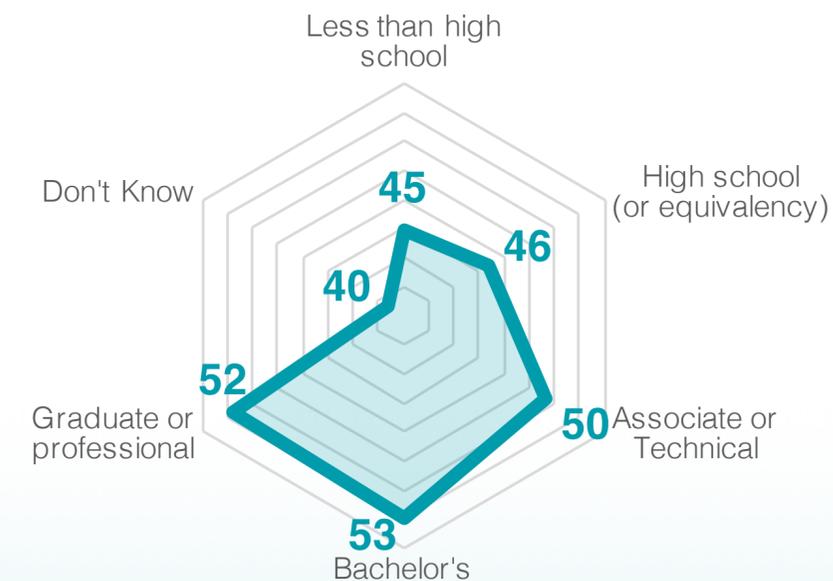
The Energy Literacy Score is an equally weighted average of correct answers to questions across a range of 5 energy-related categories  
 Q4: Please indicate your age, in years:  
 Q8: Which of the following best describes your ethnicity?  
 Q1: Which of the following best describes your parents' total household income?

# Overall energy literacy scores varied across demographics.

### Political Affiliation



### Parents Education



The Energy Literacy Score is an equally weighted average of correct answers to questions across a range of 5 energy-related categories  
 Q49: Do you consider yourself politically as liberal or conservative?  
 Q2: Which of the following best describes the location of your home?  
 Q3: What is the highest level of education you or your spouse / either of your parents have completed?

# Moving on to attitudes and perceptions held by students...

## Literacy



Establish a standard, unbiased definition of energy literacy

## Attitudes



Identify common attitudes and perceptions toward energy

## Behaviors



Understand common actions and behaviors taken as it relates to energy



The attitude questions asked can be grouped into five broad categories.

### Environmental Focus

1. Climate change is a vital issue that must be addressed
2. My efforts to conserve energy will positively impact the environment
3. We need more ways to produce renewable energy, even if it will cost more
4. Clean energy is more important than reliable and affordable energy

### Energy Vocal

1. I believe I have a voice in helping to impact energy policies
2. Energy is a very common topic of my conversations
3. I frequently stay up-to-date on local and national energy issues
4. I'm willing to compromise with those whose views on energy are different

### Responsibility Driven

1. I have a moral obligation to reduce my energy usage
2. When home, I take actions to conserve energy

### National Importance

1. Energy efficiency is vital to our national economy
2. Energy independence is vital to national economic success and security
3. We need to invest and become energy independent as soon as possible
4. The US should be focused on leveraging all energy sources
5. The government has a strong role to play in our nation's energy policies

### Comfort and Cost Minded

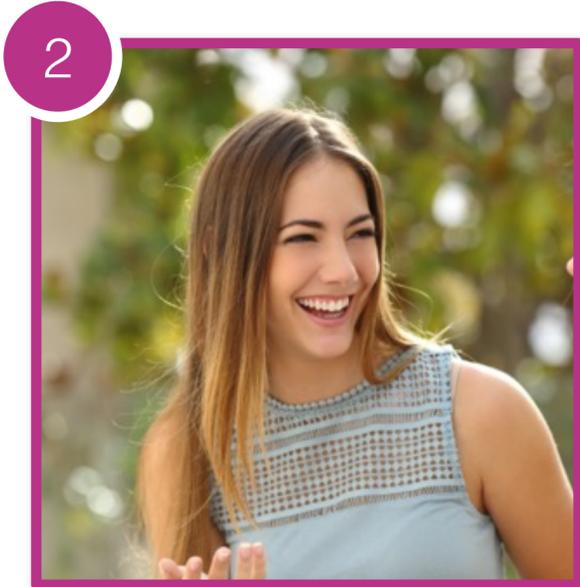
1. It's too much of an inconvenience to my lifestyle to reduce my energy usage
2. I'm too busy to be concerned with my energy usage
3. I'm not willing to conserve energy if that comes at a cost to my comfort
4. Affordable energy is more important than clean and reliable energy
5. Energy efficiency and conservation just isn't that important to me
6. There is very little I can do to conserve energy in my home
7. Reducing energy consumption will positively impact my personal finances

Student responses to the attitudinal questions revealed four distinct personas.



Agent of Change

*Energy is a priority and is fairly engaged across multiple areas*



Big Talker

*Agrees that energy is important, but is unwilling to change their behaviors*



Mindful Wanderer

*Sees the importance of energy, particularly efficiency, but unsure what they can do (climate fairly important)*



Indifferent Onlooker

*Disconnected on topics of Energy, neutral on most points*

Distribution



# Opinions and attitudes toward energy vary considerably across the four personas.



Agent of Change

*Energy is a priority and is fairly engaged across multiple areas*



Big Talker

*Agrees that energy is important, but is unwilling to change their behaviors*



Mindful Wanderer

*Sees the importance of energy, particularly efficiency, but unsure what they can do (climate fairly important)*



Indifferent Onlooker

*Disconnected on topics of Energy, neutral on most points*

Average of Top 2% Scores	Agent of Change	Big Talker	Mindful Wanderer	Indifferent Onlooker
National Importance	73%	64%	37%	13%
Environmental Focus	72%	65%	34%	9%
Responsibility Driven	68%	60%	19%	6%
Energy Vocal	33%	57%	9%	8%
Comfort and Cost Minded	13%	49%	8%	12%

All twenty-two attitudinal question were bucketed into five categories using factor analysis.

# The “Agent of Change” and “Mindful Wanderer” personas had the highest energy literacy scores



Agent of Change

*Energy is a priority and is fairly engaged across multiple areas*



Big Talker

*Agrees that energy is important, but is unwilling to change their behaviors*



Mindful Wanderer

*Sees the importance of energy, particularly efficiency, but unsure what they can do (climate fairly important)*



Indifferent Onlooker

*Disconnected on topics of Energy, neutral on most points*

Overall Energy Literacy Score	52	40	52	44
Basic Energy Concepts	55	41	56	46
Energy Use	32	25	33	30
Energy Tradeoffs & Implications	53	49	54	50
Energy Efficiency & Conservation	71	52	67	53
Sources & Types of Energy	50	35	49	41

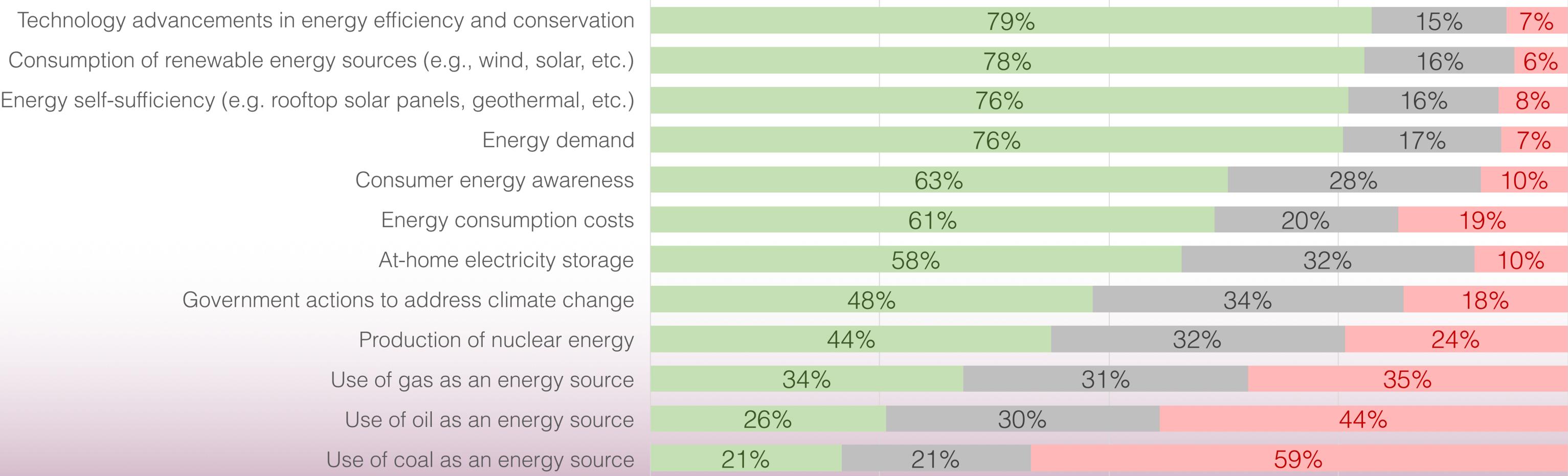
The Energy Literacy Score is an equally weighted average of correct answers to questions across a range of 5 energy-related categories

Most students expect the future to have increased technology in energy efficiency and conservation, and decreased use of oil, gas, and coal.

### Expected Direction of Energy Trends Ten Years From Now

n=2,005

■ Increase ■ Flat ■ Decrease



Q39 Fast-forward ten years from now, how do you think our nation will change in each of the following areas?  
Data contains minimal differences by segments

While attitudes vary across the different student types, students at large are in agreement that climate change is a vital issue that must be addressed.



Agent of Change

*Energy is a priority and is fairly engaged across multiple areas*



Big Talker

*Agrees that energy is important, but is unwilling to change their behaviors*



Mindful Wanderer

*Sees the importance of energy, particularly efficiency, but unsure what they can do (climate fairly important)*



Indifferent Onlooker

*Disconnected on topics of Energy, neutral on most points*

<p><b>In Most Agreement with...</b></p>	<ul style="list-style-type: none"> <li>• Energy efficiency is vital to our national economy</li> <li>• Climate change is a vital issue that must be addressed</li> </ul>	<ul style="list-style-type: none"> <li>• Energy efficiency is vital to our national economy</li> <li>• Climate change is a vital issue that must be addressed</li> </ul>	<ul style="list-style-type: none"> <li>• Climate change is a vital issue that must be addressed</li> <li>• The government has a strong role to play in our nation's energy policies</li> </ul>	<ul style="list-style-type: none"> <li>• Energy efficiency and conservation just isn't that important to me</li> <li>• The US should be focused on leveraging all energy sources</li> </ul>
<p><b>In Most Disagreement with...</b></p>	<ul style="list-style-type: none"> <li>• Energy efficiency and conservation just isn't that important to me</li> <li>• I'm too busy to be concerned with my energy usage</li> </ul>	<ul style="list-style-type: none"> <li>• I'm too busy to be concerned with my energy usage</li> <li>• I'm not willing to conserve energy if that comes at a cost to my comfort</li> </ul>	<ul style="list-style-type: none"> <li>• There is very little I can do to conserve energy in my home</li> <li>• Energy is a very common topic of my conversations</li> </ul>	<ul style="list-style-type: none"> <li>• I frequently stay up-to-date on local and national energy issues</li> <li>• Energy is a very common topic of my conversations</li> </ul>

Q39 Please indicate the degree to which you agree or disagree with the following statements about energy.

# Moving on to actions and behaviors of students...

## Literacy



Establish a standard, unbiased definition of energy literacy

## Attitudes



Identify common attitudes and perceptions toward energy

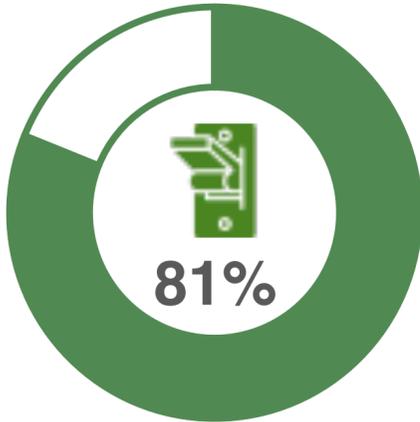
## Behaviors



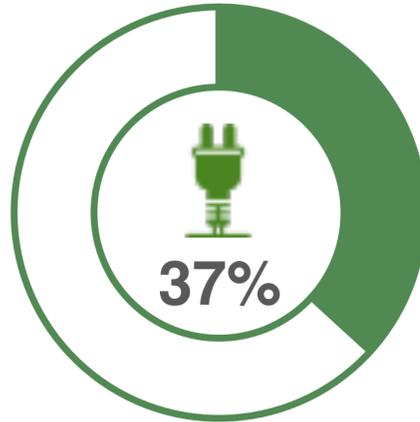
Understand common actions and behaviors taken as it relates to energy

Roughly a third of students are frequently taking measures to conserve.

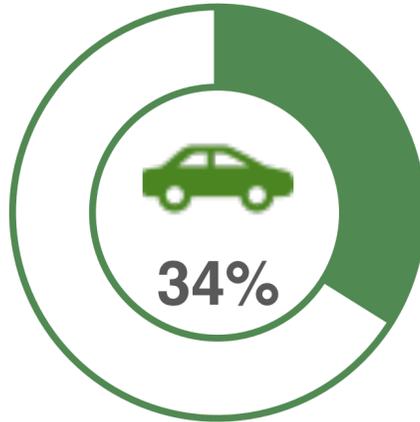
Students Who Often or Always...  
n=2,005



Turn off all lights before leaving a room



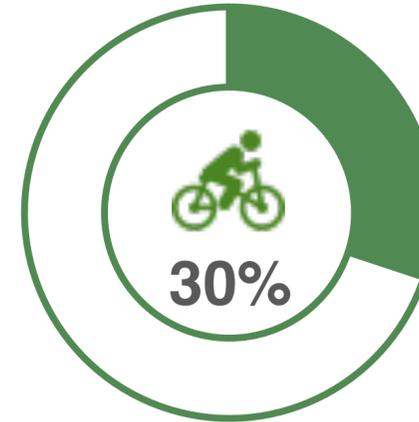
Unplug electronic devices that are not being used



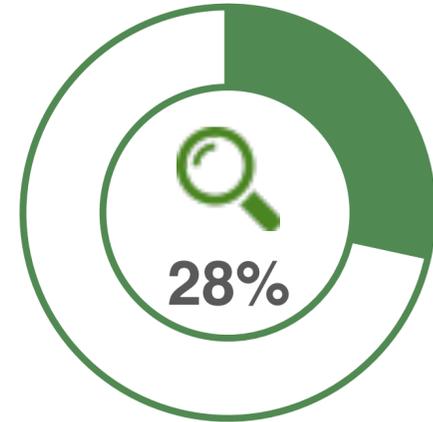
Consciously participate in carpooling



Encourage friends or family to be more energy efficient



Consciously choose to travel without a car (e.g., walk, bike, public transport, etc.)



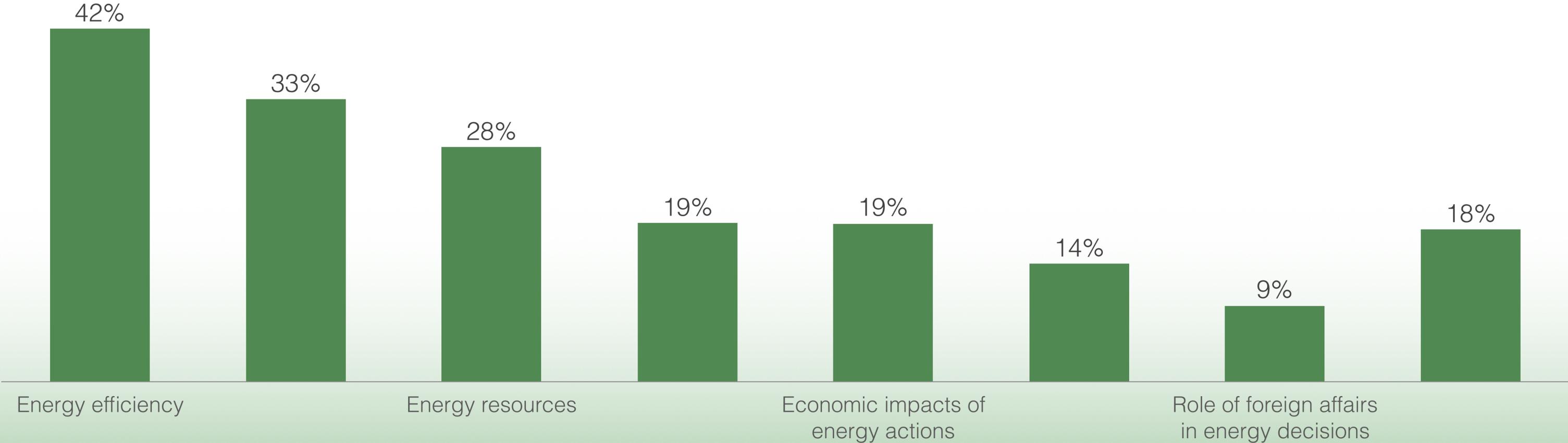
Actively search for products that are more energy efficient

Q9: Think about your typical energy usage habits, how often do you do each of the following?



Students are most likely to research energy topics related to energy and the environmental impact of energy actions.

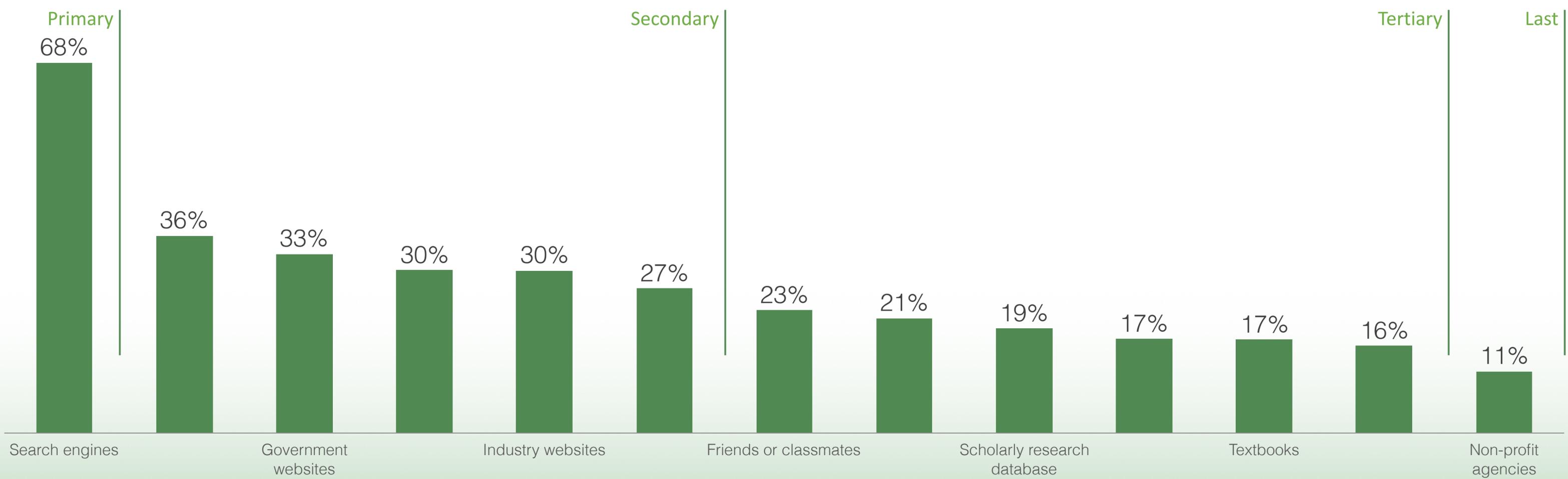
### Energy Topics Most Likely to Research Over the Next 6 Months n=2,005



Q11: Given your day-to-day habits, topics of conversation, and general attitude toward energy, which two of the following topic areas do you believe you are most likely to proactively gather information over the next 6 months? (Select two)

# Students turn first to search engines when they have a question regarding energy.

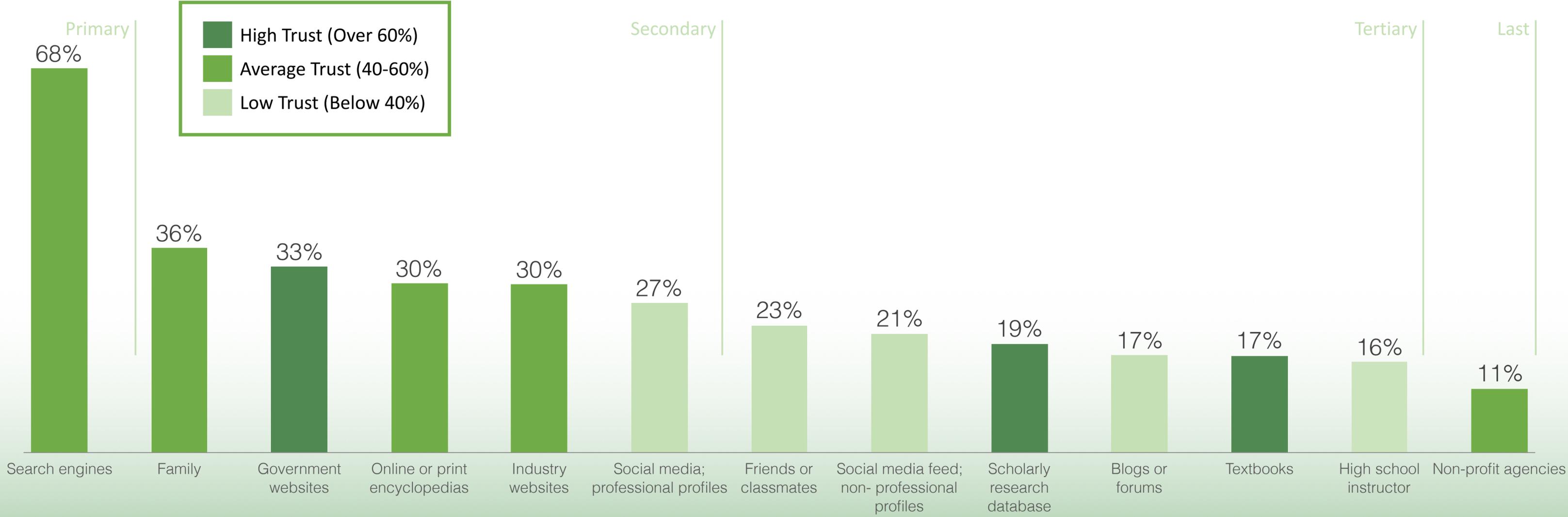
Sources of Information Students are Likely to Turn to First About Energy  
n=2,005



Q10: If you had a question about energy (e.g., trends, policy, efficiency, conservation, etc.), where would you first turn to find information?

# Students do not always turn to the sources they trust the most for information on energy.

Level of Trust in Sources as it Pertains to Energy  
n=2,005



Q11: Given your day-to-day habits, topics of conversation, and general attitude toward energy, which two of the following topic areas do you believe you are most likely to proactively gather information over the next 6 months? (Select two)  
Q12: When it comes to the topic of {insert Energy topic}, please indicate the extent to which you trust the information provided by each of the following information sources.



In conclusion, NEF plans to utilize these findings to help inform the national energy discussion and encourage greater support for K-12 energy literacy initiatives.

### Research Implications

- Instructional design should be modified to include greater focus on topics in which students are fairly uninformed (e.g., energy use)
- Due to the variety of attitudes and opinions held on energy, instructional materials and programming should be tailored to increase engagement and informed discussion among students about energy topics
- Students do not always practice efficient energy behaviors and need additional instruction on how to use energy more wisely and find accurate information on energy



# CALL TO ACTION

The Energy Story

School to home

Investment in  
community

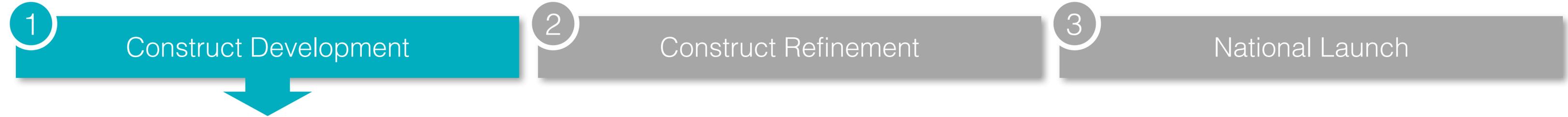
Affect *real* change



# Appendix

## Methodology and Demographics

A holistic research methodology was implemented to ensure data are accurate, complete, and reliable. We began by reaching out to a variety of Energy stakeholders for research and input.

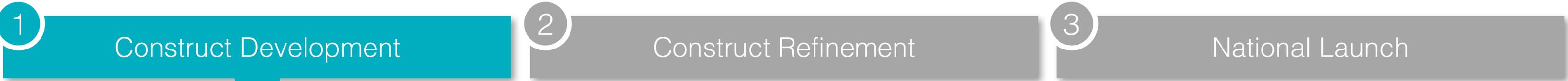


Construct Research and Development

Met with and leveraged insights from stakeholders across the Energy industry to help identify core components of the literacy construct. These stakeholders included:

- National Regulatory Research Institute
- United States Energy Association
- Edison Electric Institute
- K-12 Educators
- Institute for Electric Innovation
- American Public Gas Association
- Nuclear Energy Institute
- American Petroleum Institute
- National Mining Association
- Interstate Natural Gas Association of America
- American Gas Association

An energy literacy framework was then developed to ensure knowledge was tested across five core topics of energy.



Energy Topics  
Developed an energy literacy framework of five core topics to ensure assessment would accurately evaluate the energy knowledge of high school students

- 
**Basic Energy Concepts**
  - General definition of energy
  - Laws of energy
  - Energy transformation

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- 
**Energy Use**
  - Consumer energy usage
  - General energy consumption trends
  - Health and safety factors

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- 
**Energy Tradeoffs & Implications**
  - Quality of life
  - Energy resource limitations
  - Energy development impacts/constraints

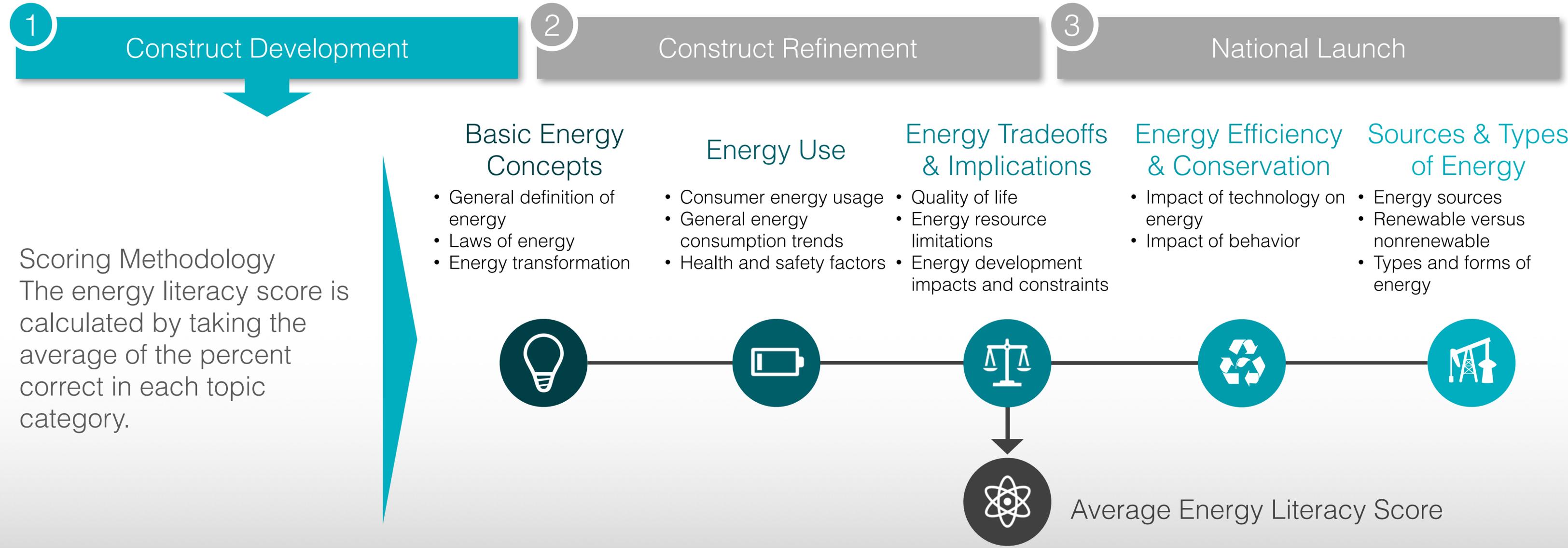
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**Energy Efficiency & Conservation**
  - Impact of technology on energy
  - Impact of behavior

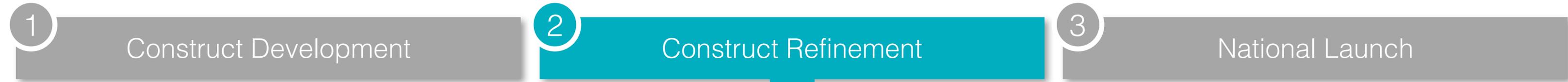
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- 
**Sources & Types of Energy**
  - Energy sources
  - Renewable versus nonrenewable
  - Types and forms of energy

The literacy score is calculated by taking a straight simple average of the number of correct responses for each of the five energy topics.



A pilot study was administered to test and refine the assessment's construct.



**Construct Validity**  
 To test the test's construct validity, as well as other behavioral and attitudinal questions, a pilot test was administered to a random subset of the target population

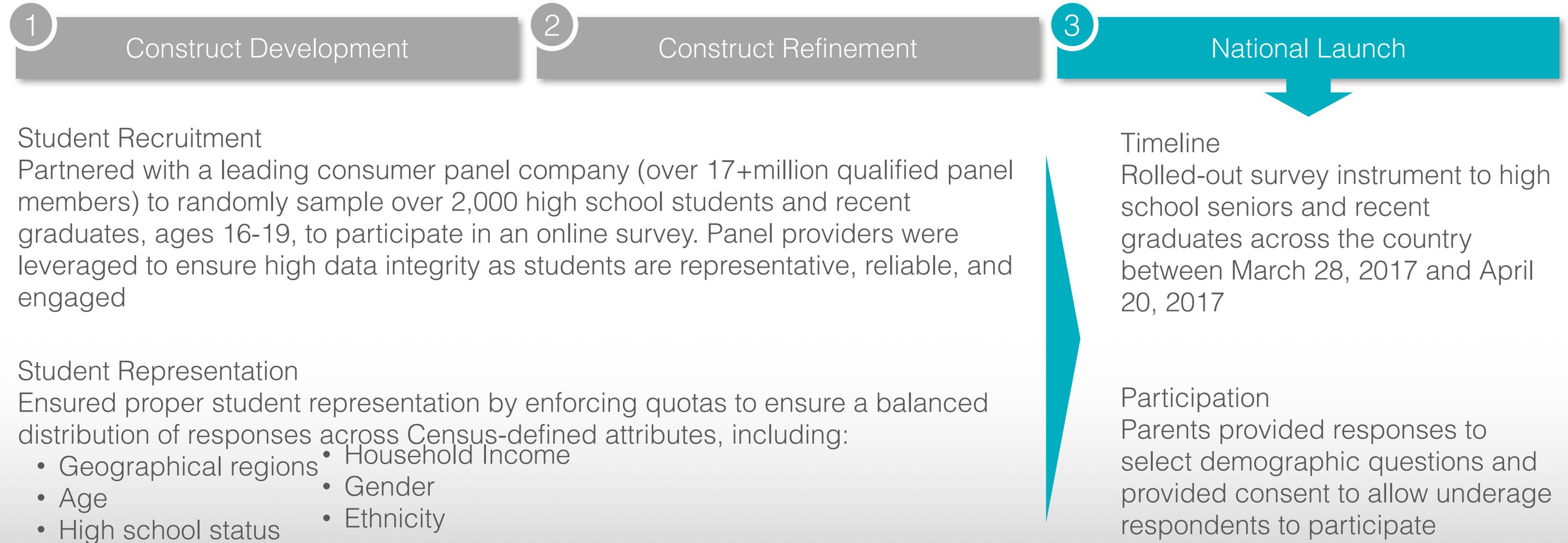
**Pilot Test**  
 Administered an online survey to nearly 400 high school students and recent graduates across the nation

**Pilot Analysis and Construct Refinement**  
 Analyzed results of the pilot test to determine which questions were most important to and most correlated with determining energy literacy and refined question set

- Analyses included:
- Response distribution analyses (flat, bimodal, skewed)
  - Correlation of questions to energy literacy score
  - Attitudinal and behavioral profiling via factor analysis

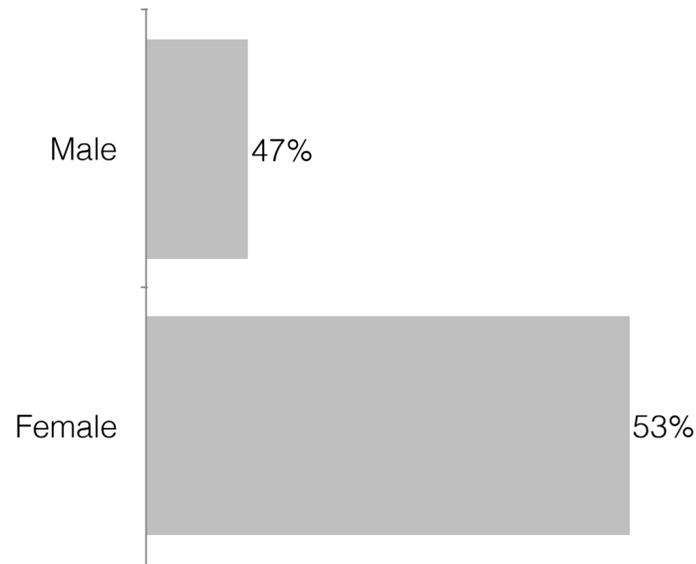
Data then informed refinement of the survey construct to more reliably and accurately determine energy literacy. Changes focused primarily on question removal and wording refinement.

The full launch of the survey targeted over 2,000 high school students and recent graduates.

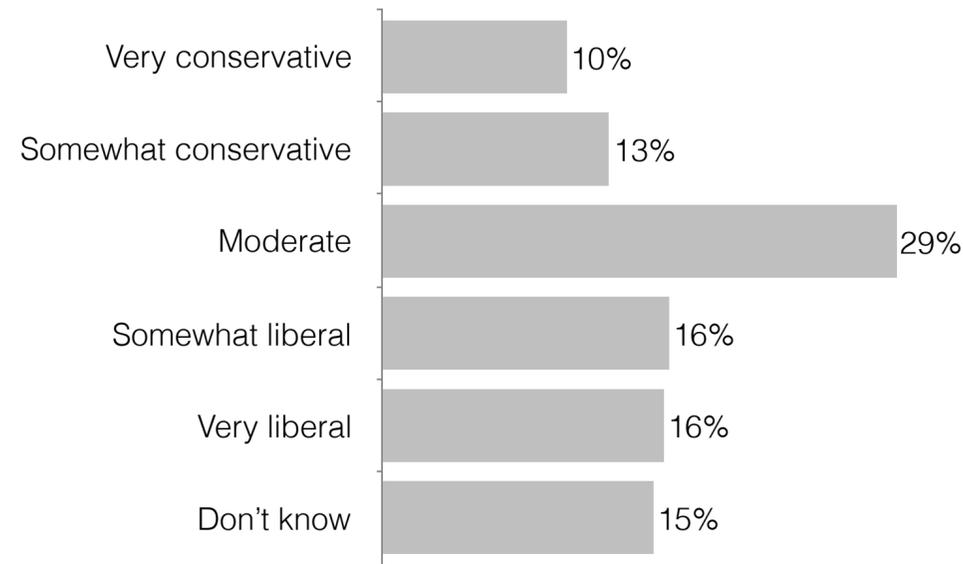




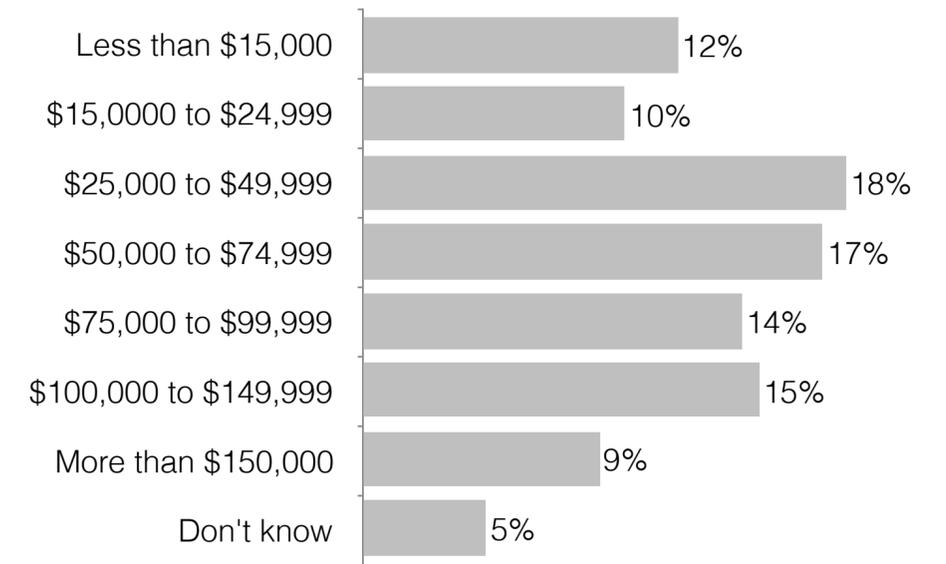
GENDER



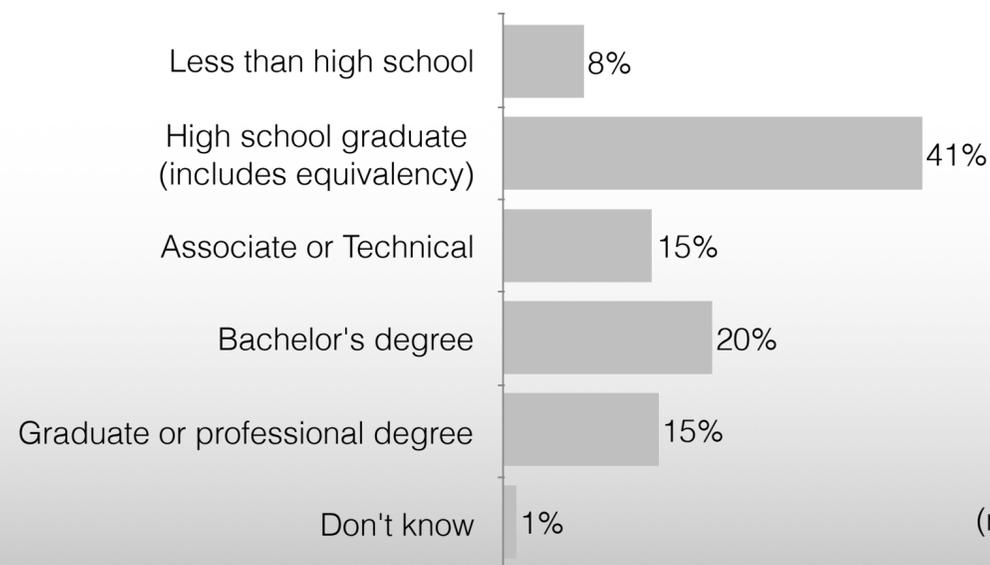
POLITICAL AFFILIATION



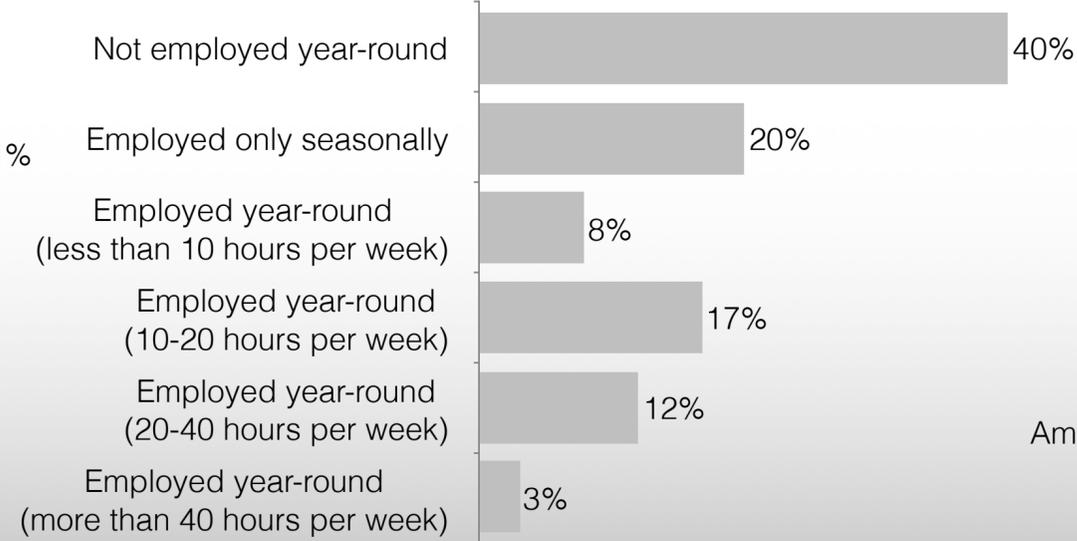
HOUSEHOLD INCOME



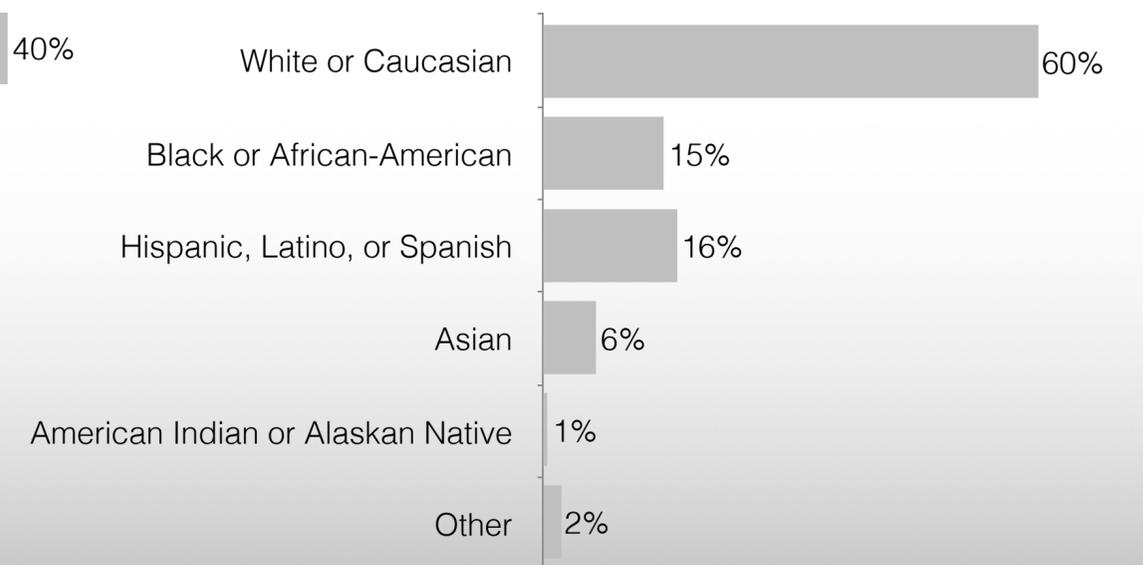
PARENTS' EDUCATION



EMPLOYMENT STATUS



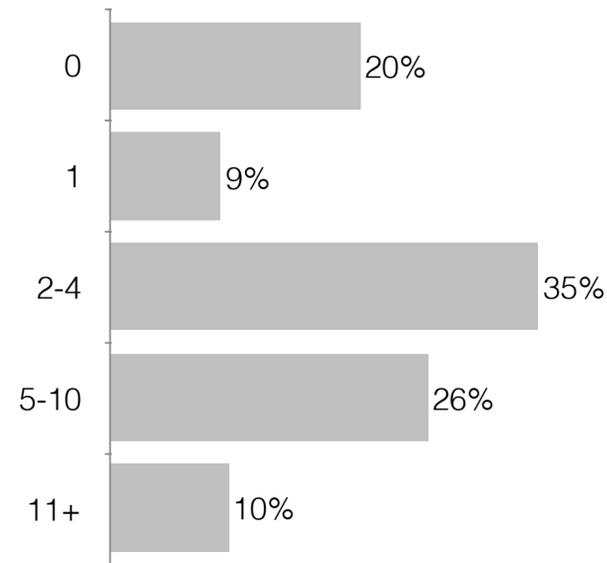
ETHNICITY



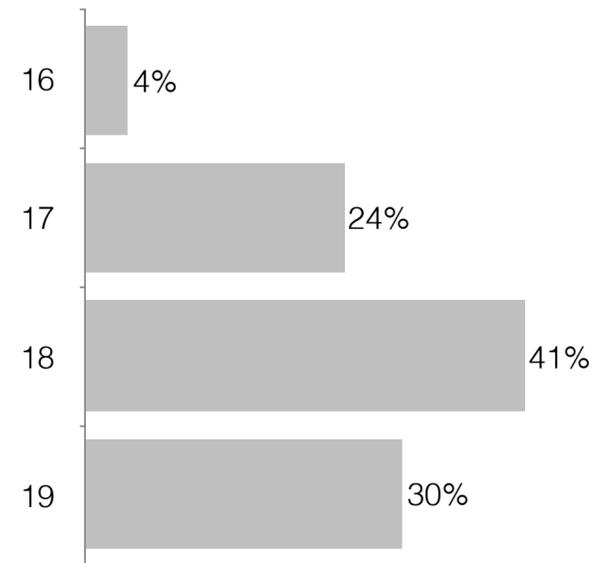
Q7: Please select your gender.  
 Q49: Do you consider yourself politically as liberal or conservative?  
 Q1: Which of the following best describes you / your parents' total household income?  
 Q3: What is the highest level of education you or your spouse / either of your parents have completed?  
 Q48: Which of the following best describes your employment status?  
 Q8: Which of the following best describes your ethnicity?



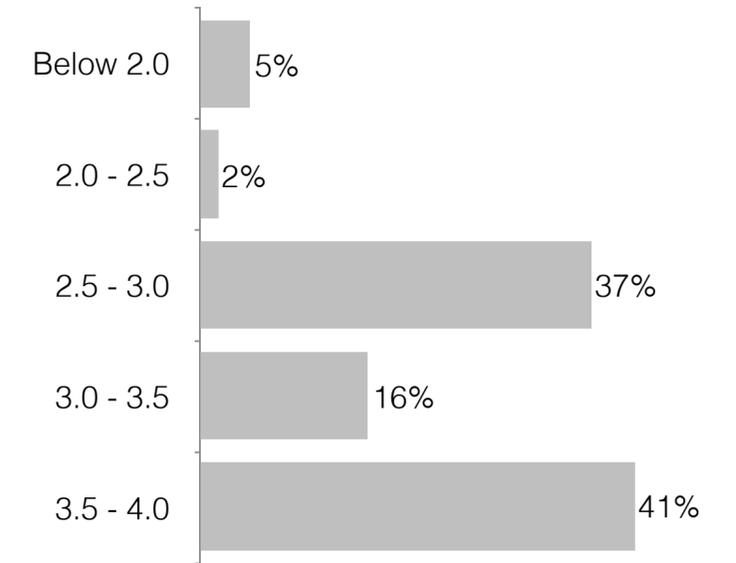
NUMBER OF AP / IB CLASSES



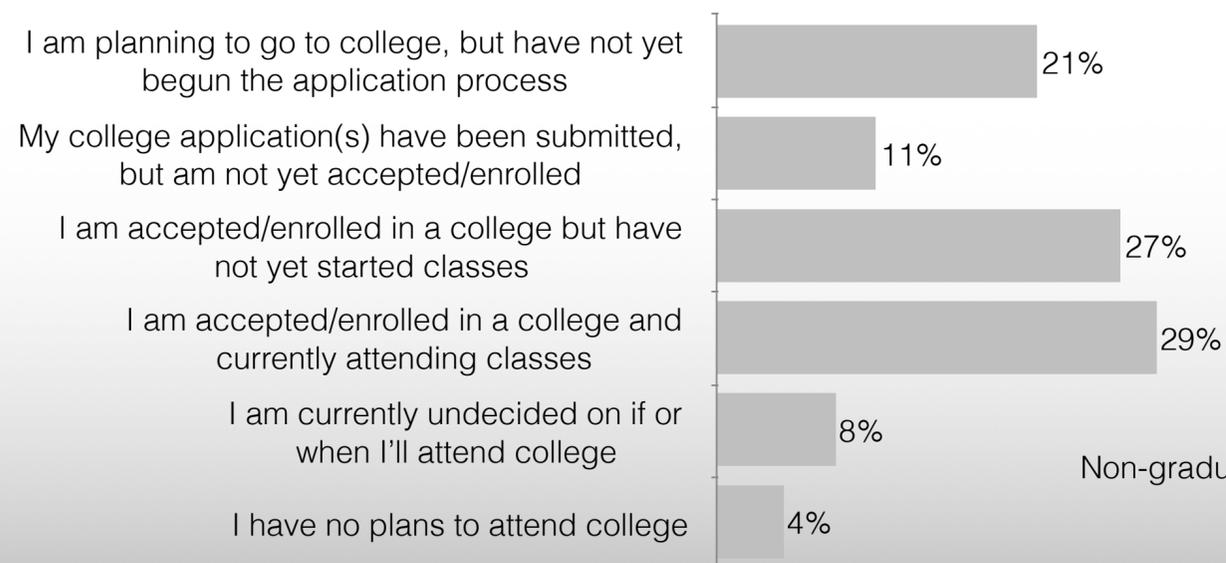
AGE



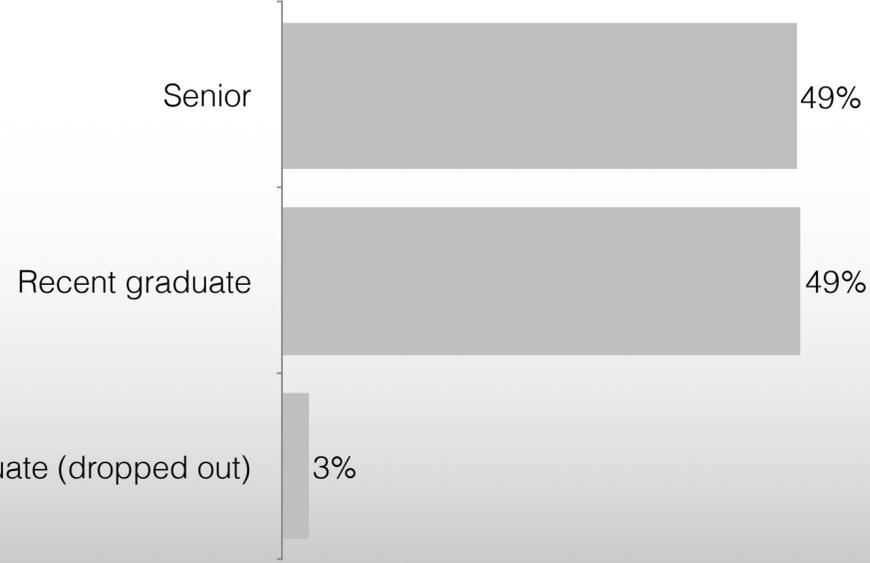
HIGH SCHOOL GPA



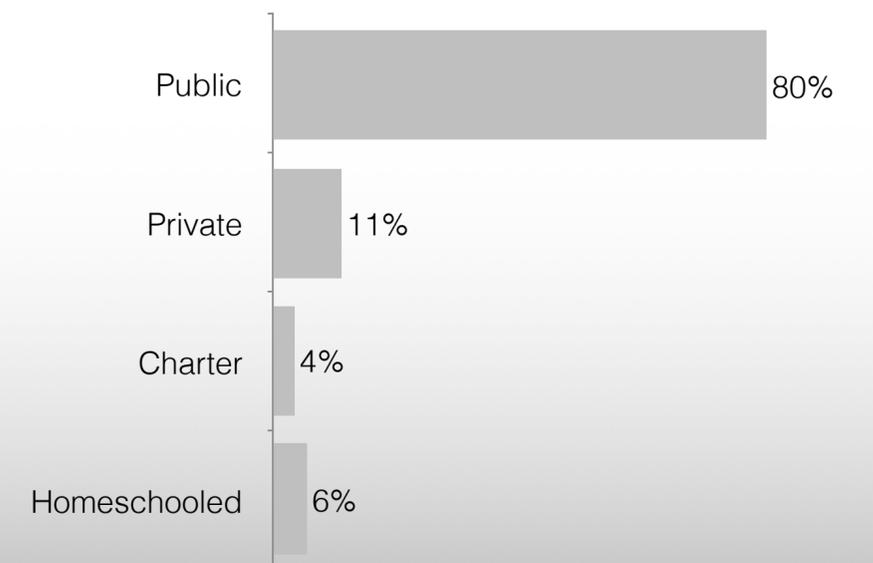
PLANS REGARDING COLLEGE



HIGH SCHOOL STATUS



HIGH SCHOOL TYPE



Q46: Please estimate the number of AP/IB classes you have completed or will have completed by the time you graduate from high school.

Q4: Please indicate your age, in years:

Q43: What is your approximate high school GPA on a 4.0 scale?

Q47: Which of the following best describes your plans regarding college?

Q5: Which of the following best describes your high school enrollment status?

Q42: Which of the following best describes your high school?



## Appendix

### Literary Assessment Question Distribution



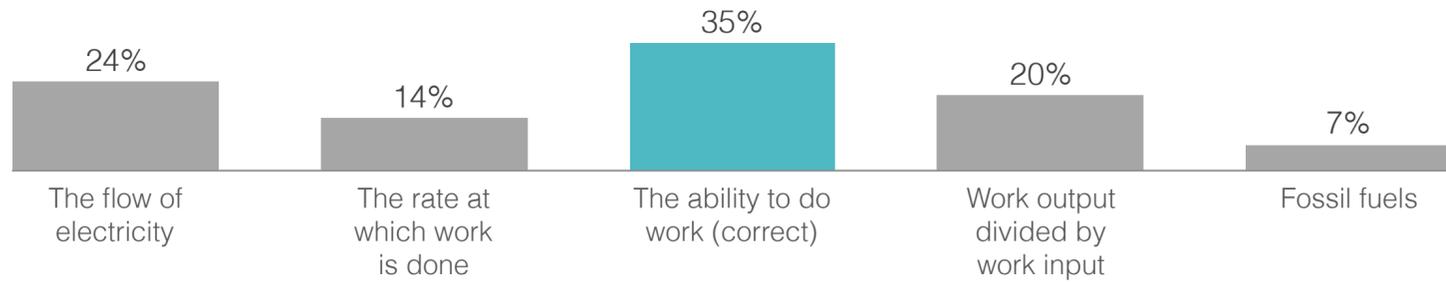
# Literary Assessment Response Distribution | Basic Energy Concepts

n=2,005

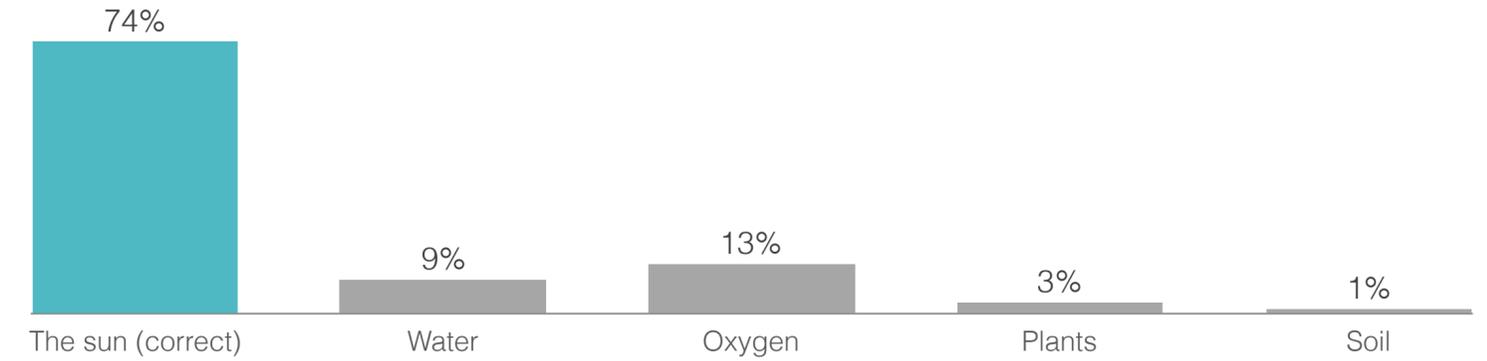


Indicates correct response

Question:  
Energy is best defined as:



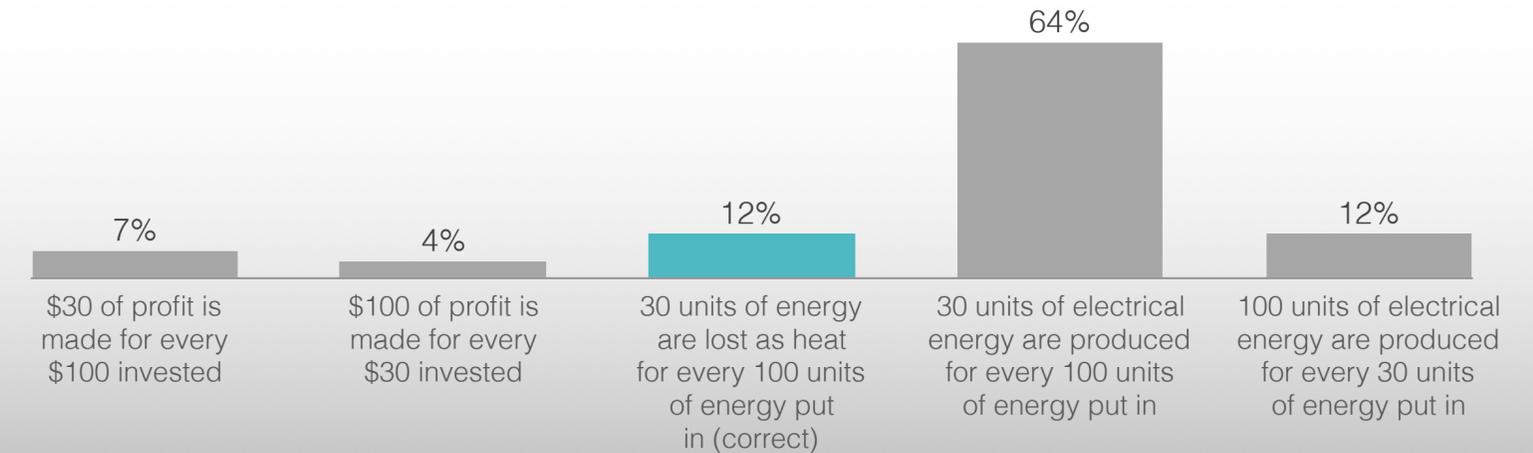
Question:  
The original energy source for almost all living things on Earth is:



Question:  
Electricity bills charge consumers by the \_\_\_\_\_, the unit of measure for an amount of electricity.



Question:  
If an electrical generating plant is 30% efficient, that means that...





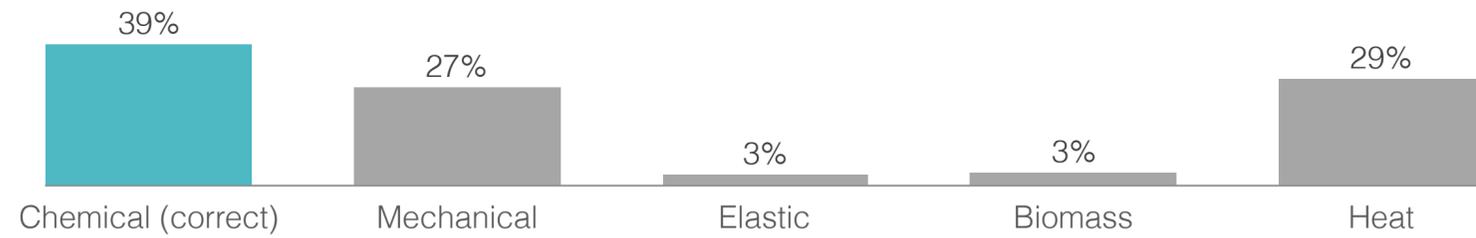
# Literary Assessment Response Distribution | Basic Energy Concepts

n=2,005

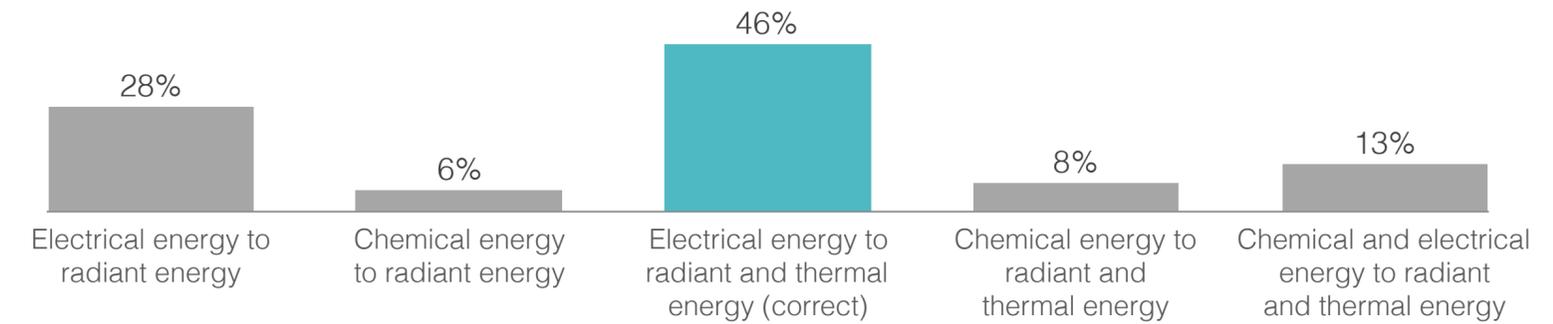


Indicates correct response

Question:  
Complete the chain of energy transformations for a battery-powered flashlight: \_\_\_\_\_ energy --> electrical energy --> radiant (light) energy



Question:  
A light bulb converts...





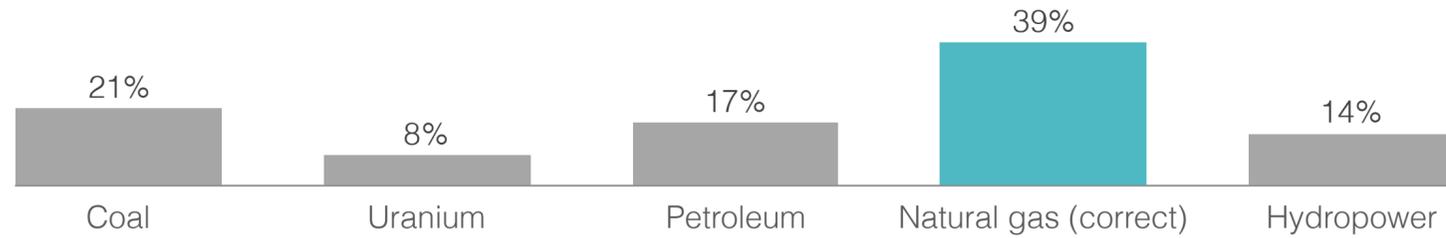
# Literary Assessment Response Distribution | Sources and Types of Energy

n=2,005

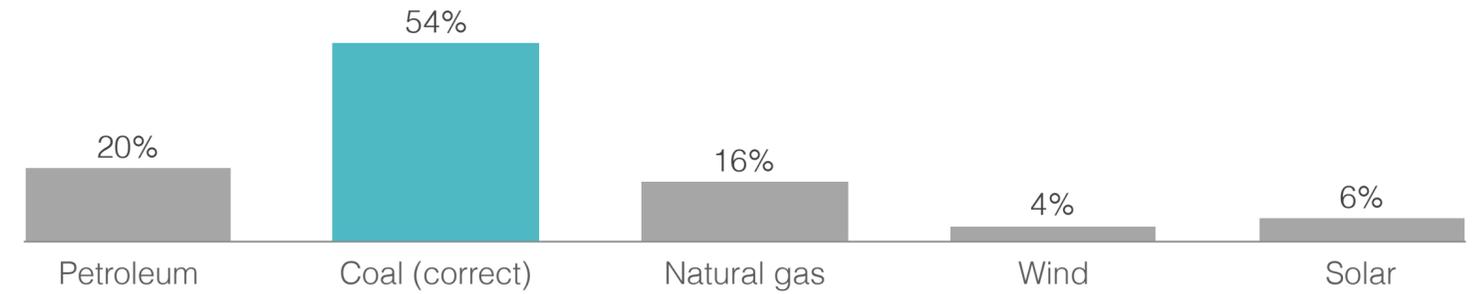


Indicates correct response

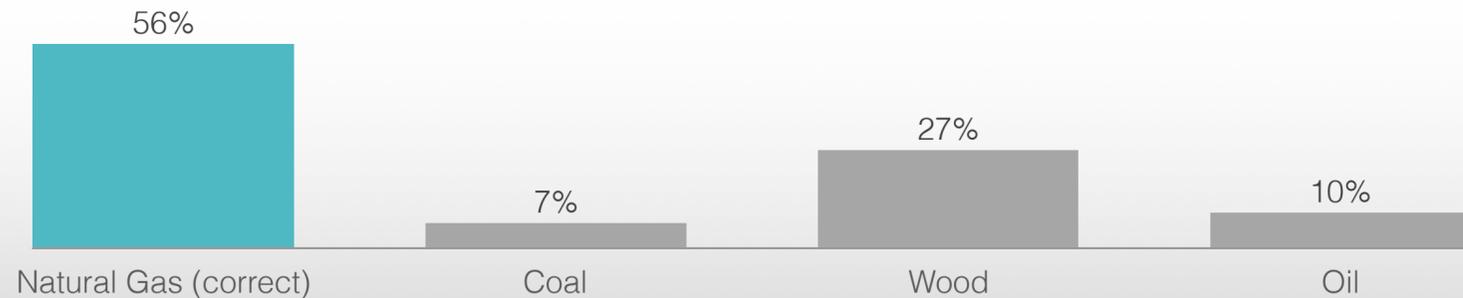
Question:  
Most power plants being built in the U.S. today are designed to use which fuel?



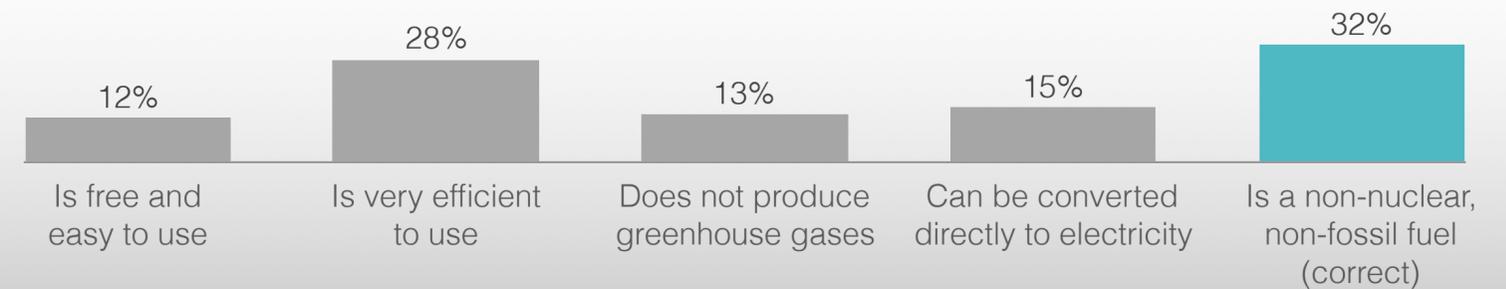
Question:  
In the past five years, both production and consumption of which resource has decreased in the U.S.?



Question:  
Which of the following resources creates the fewest emissions when used to generate electricity?



Question:  
The term renewable energy means that a resource...





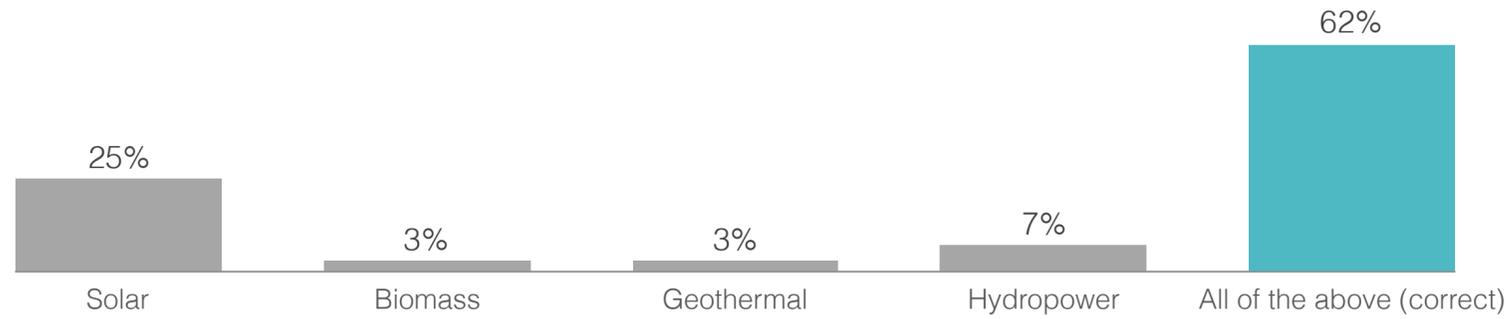
# Literary Assessment Response Distribution | Sources and Types of Energy

n=2,005

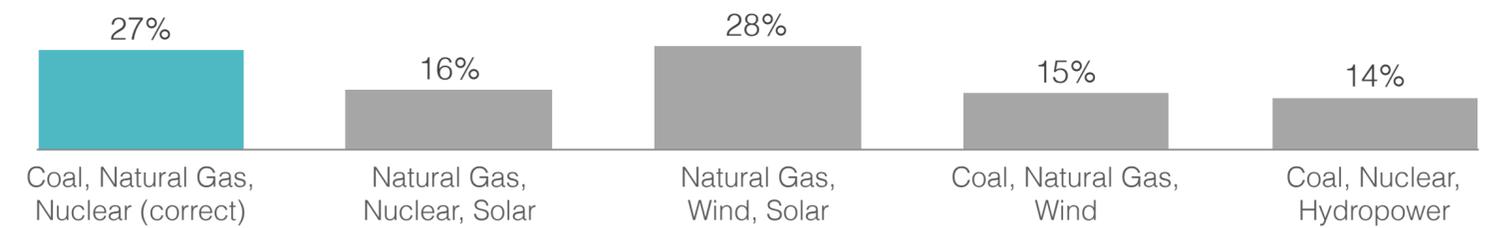


Indicates correct response

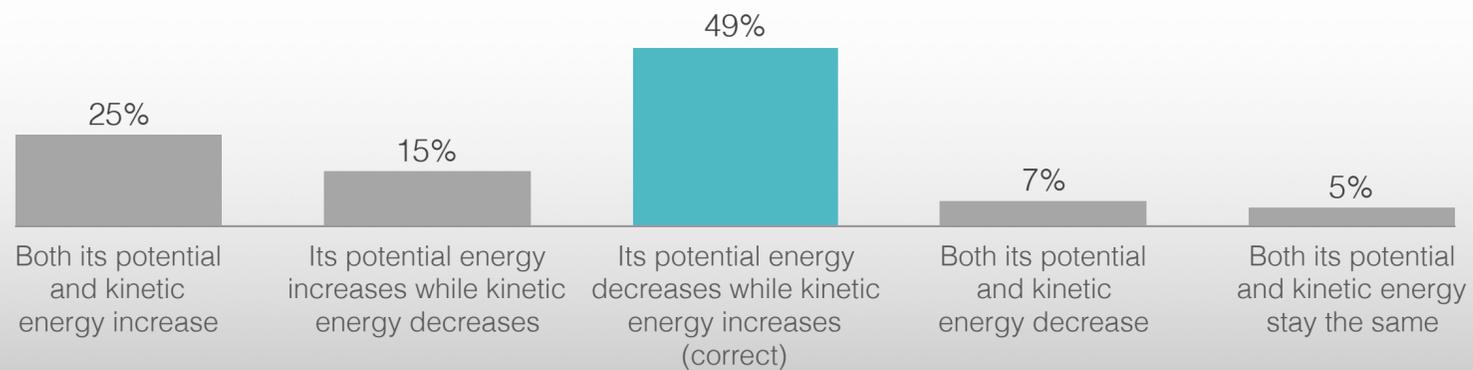
Question:  
Which of the following is a renewable energy resource?



Question:  
Which three resources provided 86% of the electricity generated in the U.S. in 2015?



Question:  
As a roller coaster descends a hill, what happens to its energy?





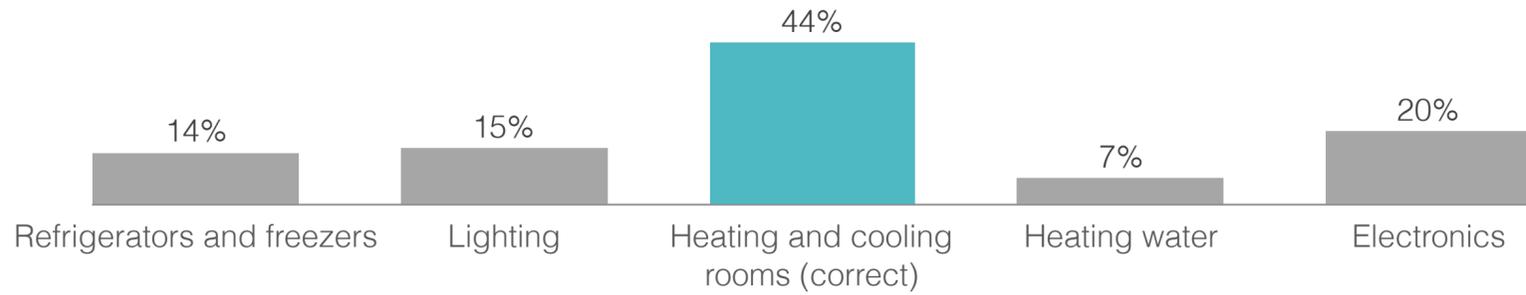
# Literary Assessment Response Distribution | Energy Use

n=2,005

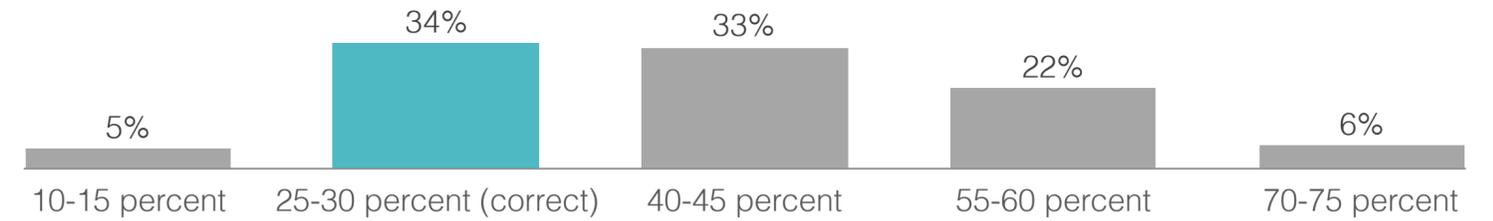


Indicates correct response

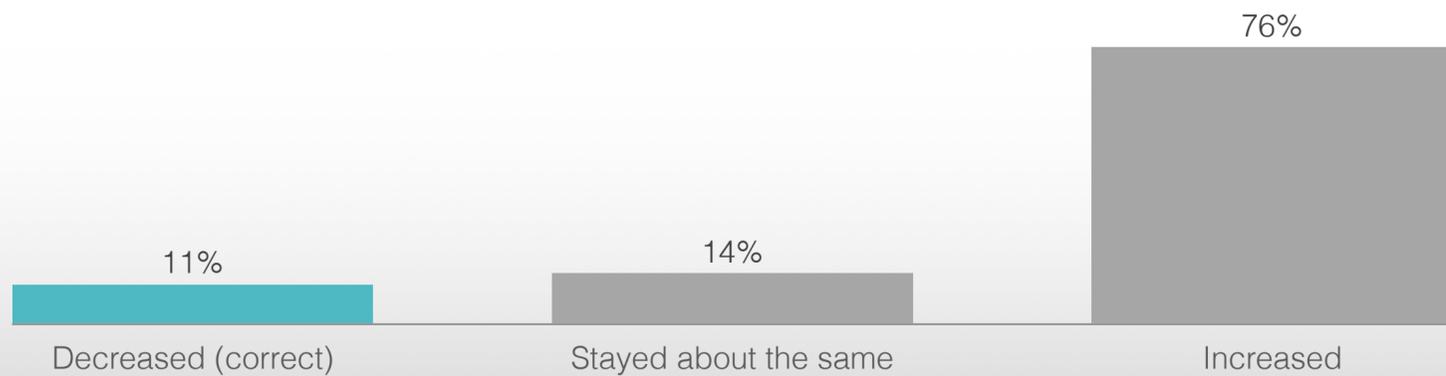
Question:  
Which of the following uses the most energy in the average American home annually?



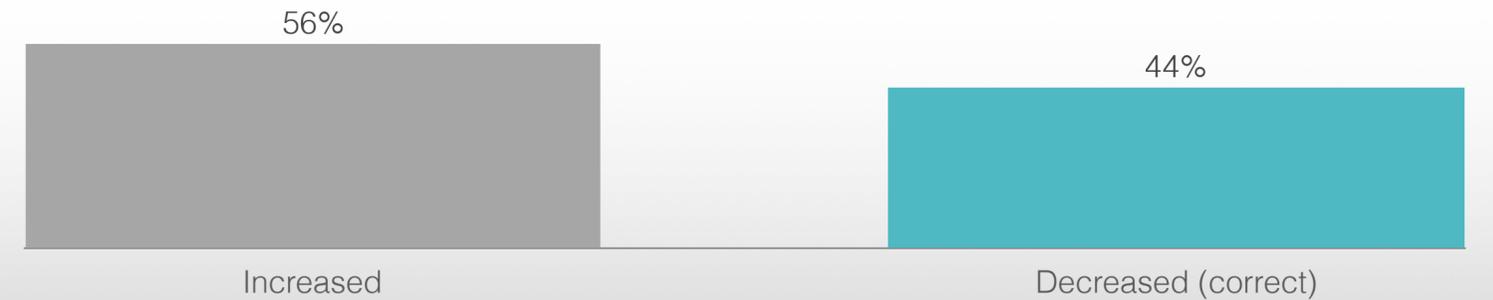
Question:  
What percentage of the U.S. overall energy consumption is used for transportation?



Question:  
Per capita energy usage in the United States since 2003 has:



Question:  
In the past ten years, petroleum imports into the U.S. have:





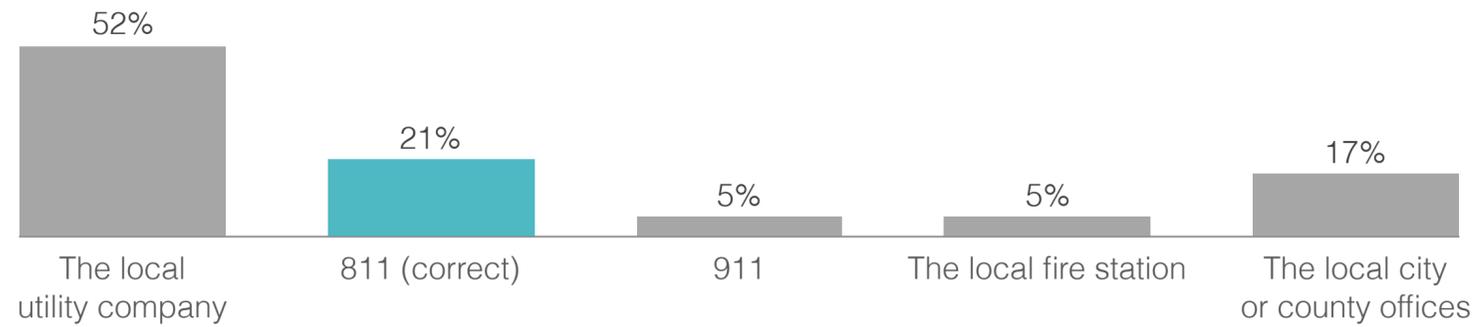
# Literary Assessment Response Distribution | Energy Use

n=2,005

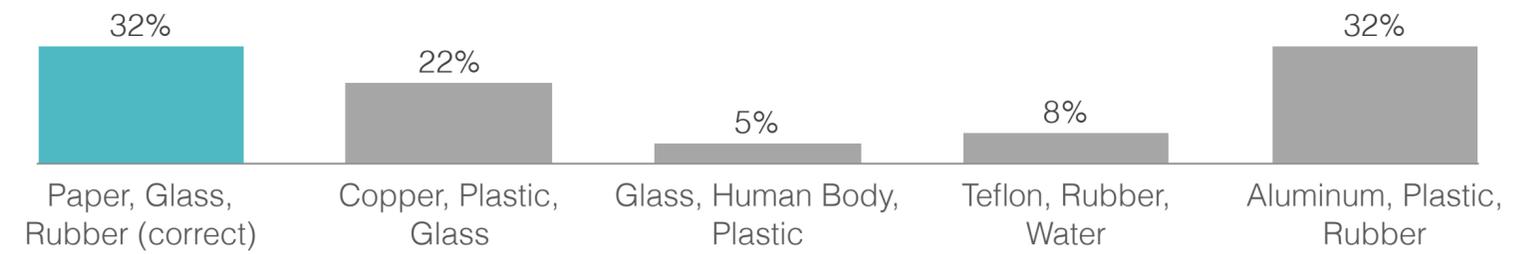


Indicates correct response

Question:  
Prior to a digging project, underground utility lines should be identified. What number should you call to ensure this is done correctly?



Question:  
Which of the following are all insulators of electricity and help ensure electrical safety?





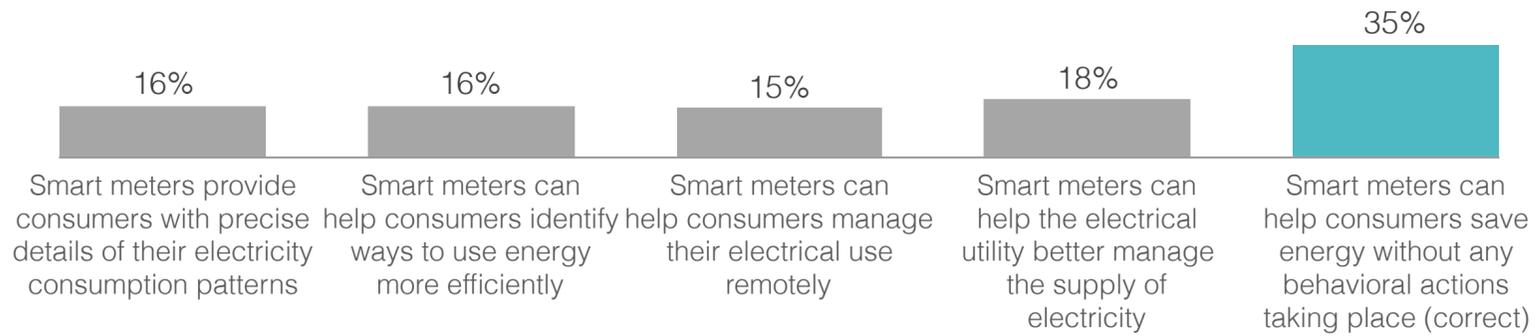
# Literary Assessment Response Distribution | Energy Efficiency and Conservation

n=2,005

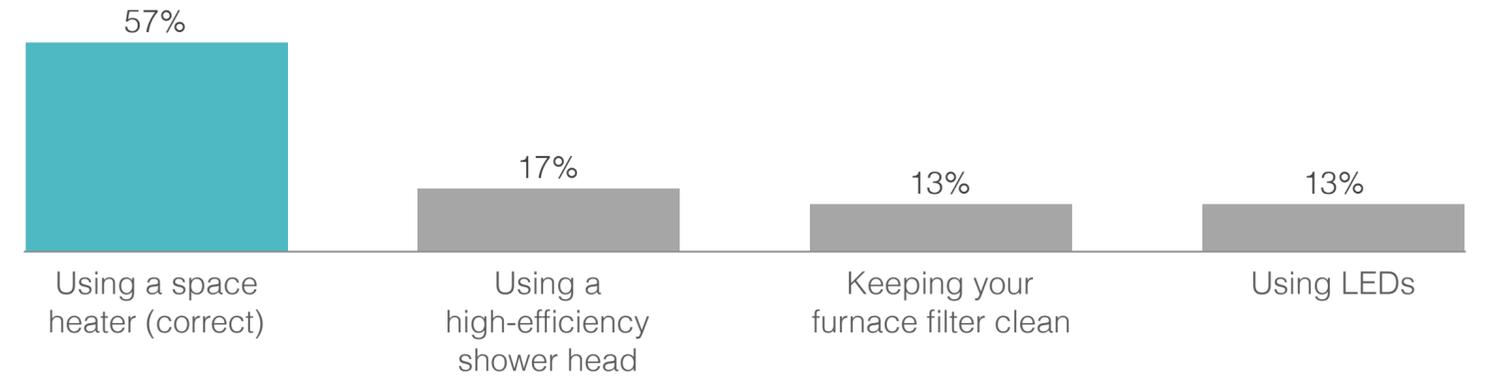


Indicates correct response

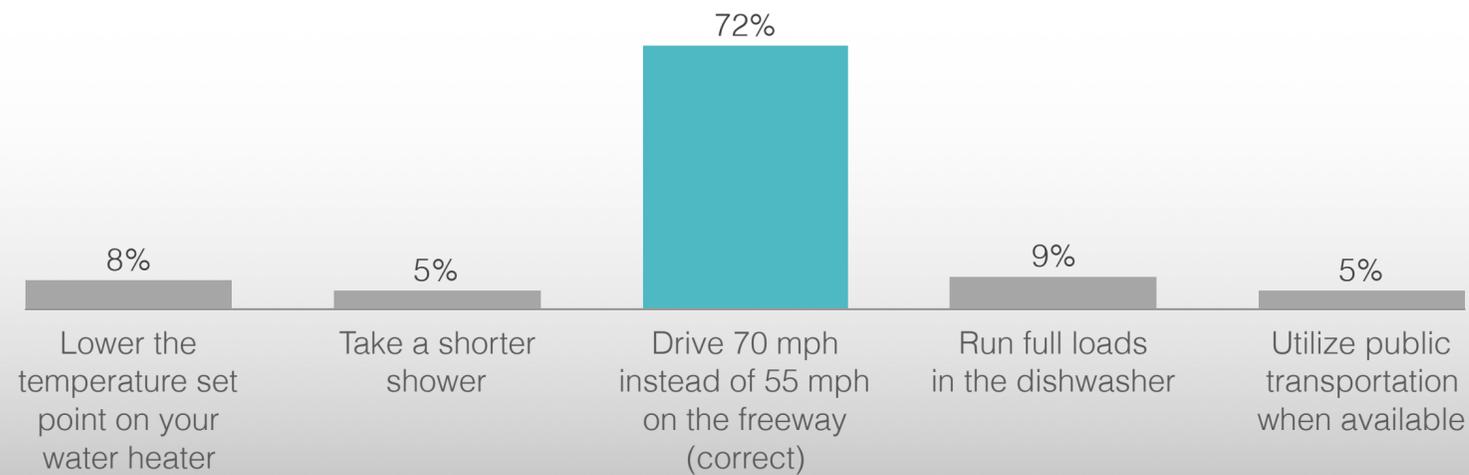
Question:  
Which of the following is not a potential advantage of using a smart meter?



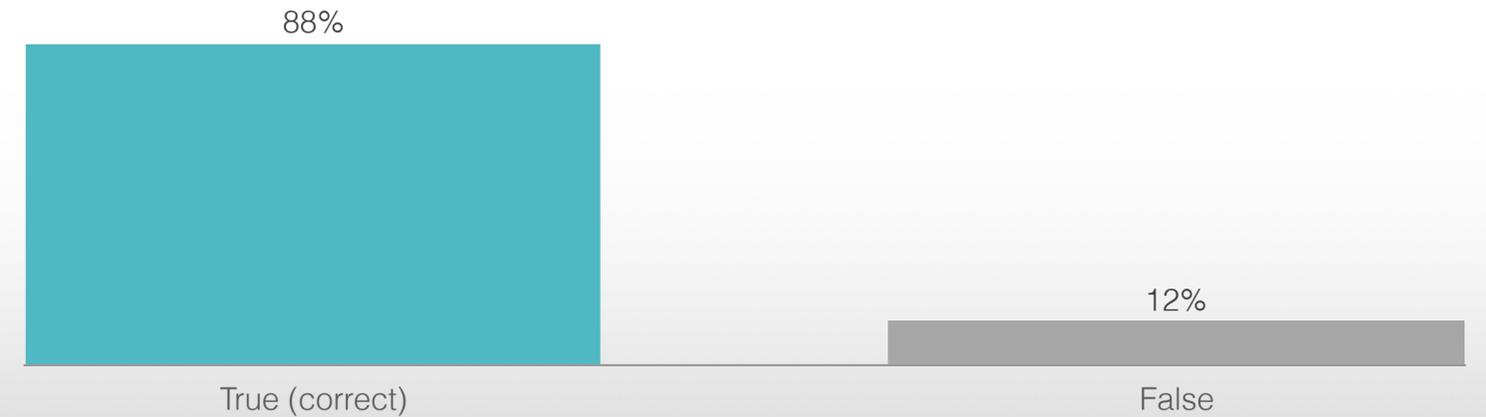
Question:  
Which of the following does NOT promote energy savings?



Question:  
Which is an example of a behavior that would not help to use energy more efficiently?



Question:  
Conserving water also conserves energy.





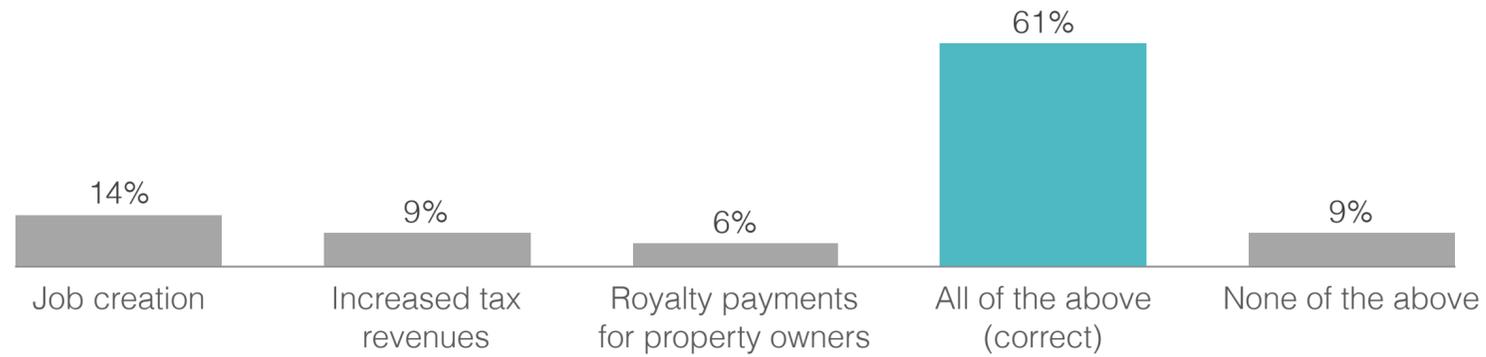
# Literary Assessment Response Distribution | Energy Tradeoffs and Implications

n=2,005

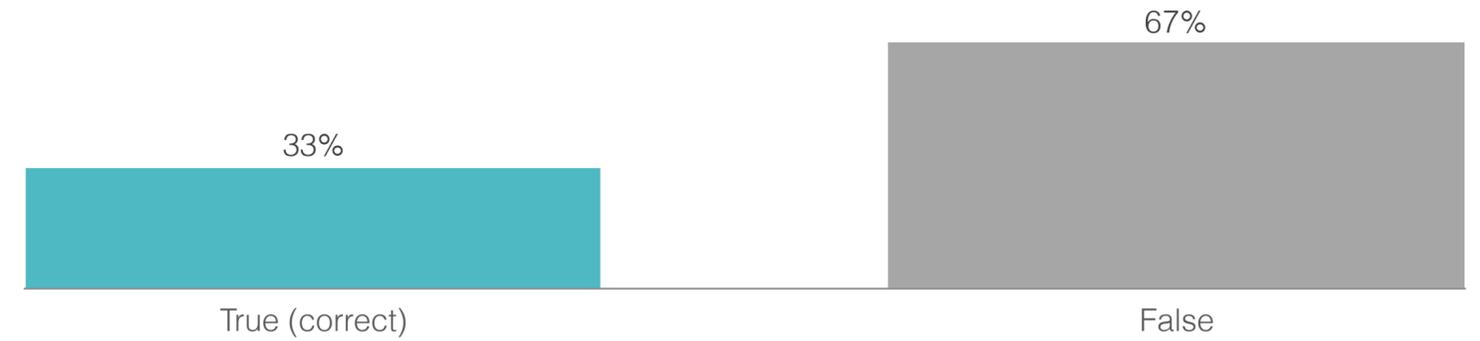


Indicates correct response

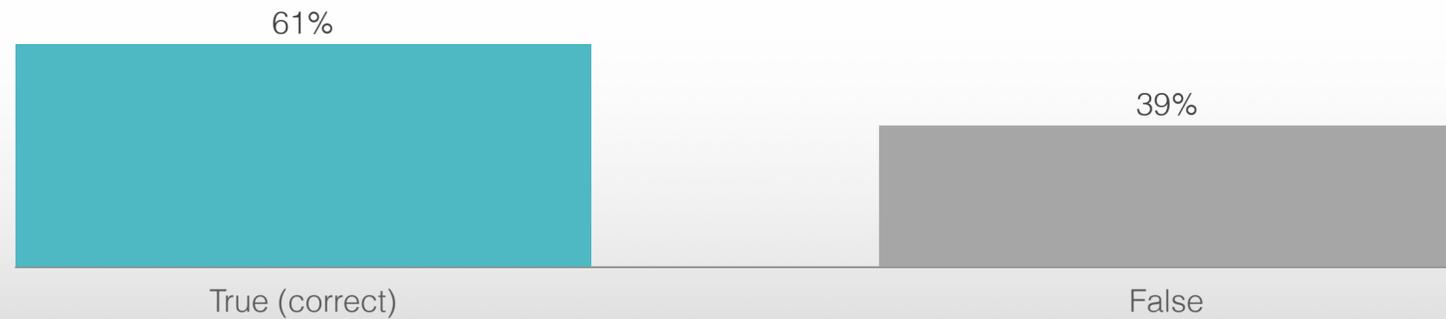
Question:  
Which of the following are possible economic impacts of increased energy production:



Question:  
Nuclear reactors do not produce air pollution or carbon dioxide while operating:



Question:  
The technique of hydraulic fracturing to produce natural gas and oil, commonly known as “fracking,” has helped to lower consumer energy prices.



Question:  
Electric vehicles use electricity generated only from renewable energy sources.

