

# Power Fuel

## Objective

Students will recognize the energy efficiency and environmental benefits of different types of vehicles based on fuel economy, cost savings and greenhouse gas emissions.

## Curriculum Focus

Science  
Math  
Social Studies

## Materials

1. Device with internet access for each student
2. Copies of "Fuel Cost Data" student worksheet
3. Copies of "EPA Fuel Economy Labels"

## Key Vocabulary

All electric vehicle  
Fuel economy  
Greenhouse Gas Emissions  
Plug-in hybrid vehicle

## Learning Standards

### Next Generation

MS-PS1 - 3  
MS-ESS3 - 3  
MS-ESS3.C  
MS-ETS1 - 3  
HS-PS3 - 3  
HS-ESS3 - 4  
HS-ESS3.C  
HS-ESS3 - 6  
HS-ETS1 - 3  
HS-ETS1.B

### Common Core

RI.7  
W.2  
SL.1  
6-7.NS.3

### American Driver and Traffic Safety Education

C 12.2.2  
C 12.6.1  
C 12.6.2  
C 12.6.3



## Introduction

In this activity, students investigate transportation, energy resources and resource planning. Participants gather data based on their family's driving habits. This data is used to evaluate fossil fuel powered cars, all electric vehicles, and plug-in hybrid vehicles based on fuel type and emissions. Fossil fuel powered cars emit byproducts from an internal combustion engine like carbon dioxide and other gases which cause pollution. These gases can trap heat from the sun and are known as greenhouse gases. In some situations, electric and/or hybrid cars can decrease greenhouse gas emissions.



## Procedure

1. Assign students the “Fuel Cost Data” student worksheet one week before the in class lesson.
2. On the day of the lesson, show students Energy 101: Electric Vehicles video from the Department of Energy  
[youtube.com/watch?v=M69GBLOIDzI&list=PLACD8E92715335CB2&index=17&t=1s](https://www.youtube.com/watch?v=M69GBLOIDzI&list=PLACD8E92715335CB2&index=17&t=1s)
3. Explain to students that dealerships are required to post the EPA Fuel Economy Label in the window of vehicles for sale. The label is based on the standards of Fuel Economy and Environment set by the Environmental Protection Agency and the U.S. Department of Energy. There is a separate label for fuel powered vehicles, plug-in hybrid vehicles and all electric vehicles. The EPA has an interactive version of each label at [fueleconomy.gov/feg/Find.do?action=bt1](https://www.fueleconomy.gov/feg/Find.do?action=bt1). Discuss each section of the label with the class.
4. Distribute devices with an internet connection and give each student an “EPA Fuel Economy Labels” student worksheet.
5. Instruct students to choose one of the cars used on the “Fuel Cost Data” student worksheet then go to [fueleconomy.gov](https://www.fueleconomy.gov). Click on Find and Compare Cars. Enter the Make and Model by choosing options from the drop-down menus. If neither car used in the “Fuel Cost Data” student worksheet is available, instruct students to choose any gasoline powered car. Fill out the label for the car using the information listed on the website.
6. Instruct students to choose a plug-in hybrid vehicle and an all electric vehicle listed on the website, fill out the label for each car and answer the questions comparing the three vehicles based on fuel cost, fuel economy, greenhouse gas rating and smog rating.



## Discussion

- Discuss what students found out by analyzing the fuel costs of the three types of vehicles. Were there any surprises? Has their criteria for evaluating a car purchase changed?



## To Know and Do More

1. Compare recharging costs of all electric cars during peak and off-peak hours using your local utility’s rates.
2. Research local, state and federal rebates for the purchase of alternative fuel vehicles. Compare and contrast new car pricing.

# Student Sheet: Fuel Cost Data Collection

For one week, keep track of you and/or your parent's driving habits. Record the number of miles driven per day and the cost of a gallon of fuel. Fuel prices change often, sometimes changing throughout the day, so use the cost of a gallon of fuel when you begin the assignment.

Car 1 Make/Model:

Car 2 Make/Model:

Average cost per gallon of fuel:

	Sunday (Miles Driven)	Monday (Miles Driven)	Tuesday (Miles Driven)	Wednesday (Miles Driven)	Thursday (Miles Driven)	Friday (Miles Driven)	Saturday (Miles Driven)	Total Miles Driven for the Week	Fuel Cost for the Week*	Fuel Cost for the Year**
Car 1										
Car 2										

\*Multiply the total miles driven for the week by the cost of fuel per gallon.

\*\*Multiply the total fuel cost for the week by 52.

# Student Sheet: EPA Fuel Economy Labels

Procedure: Use [fuelconomy.gov](http://fuelconomy.gov) to fill out the EPA labels.

**EPA DOT** Fuel Economy and Environment

Gasoline Vehicle

**Fuel Economy**

MPG

combined city/hwy    city    highway

gallons per 100 miles

**You save**

**in fuel costs over 5 years**  
compared to the average new vehicle.

**Annual fuel COST**

**Fuel Economy & Greenhouse Gas Rating** (tailpipe only)

1
10
Best

This vehicle emits  grams CO<sub>2</sub> per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel also create emissions; learn more at [fuelconomy.gov](http://fuelconomy.gov).

**Smog Rating** (tailpipe only)

1
10
Best

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 22 MPG and costs \$12,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.70 per gallon. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

**fuelconomy.gov**

Calculate personalized estimates and compare vehicles

Smartphone QR Code

**EPA DOT** Fuel Economy and Environment

Plug-In Hybrid Vehicle  
Electricity-Gasoline

**Fuel Economy**

**Electricity**

Charge Time:  hours (240V)

MPGe

kW-hrs per 100 miles

combined city/highway

**Gasoline Only**

MPG

gallons per 100 miles

combined city/highway

**Driving Range**

0
10
20
30
40
410

Gasoline only

**You save**

**in fuel costs over 5 years**  
compared to the average new vehicle.

**Annual fuel COST**

**Fuel Economy & Greenhouse Gas Rating** (tailpipe only)

1
10
Best

This vehicle emits  grams CO<sub>2</sub> per mile. The best emits 0 grams per mile (tailpipe only). Producing and distributing fuel & electricity also create emissions; learn more at [fuelconomy.gov](http://fuelconomy.gov).

**Smog Rating** (tailpipe only)

1
10
Best

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 22 MPG and costs \$12,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$3.70 per gallon and \$0.12 per kW-hr. This is a dual fueled automobile. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

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**EPA DOT Fuel Economy and Environment** **Electric Vehicle**

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**Fuel Economy**

**MPGe**

combined city/hwy  city  highway  kW-hrs per 100 miles

**Driving Range**

When fully charged, vehicle can travel about...  miles

Charge Time:  hours (240V)

**You save**

**in fuel costs over 5 years**

compared to the average new vehicle.

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**Annual fuel COST**

**Fuel Economy & Greenhouse Gas Rating (tailpipe only)**

Best

This vehicle emits  grams CO<sub>2</sub> per mile. The best emits 0 grams per mile (tailpipe only). Does not include emissions from generating electricity; learn more at fueleconomy.gov.

**Smog Rating (tailpipe only)**

Best

Actual results will vary for many reasons, including driving conditions and how you drive and maintain your vehicle. The average new vehicle gets 22 MPG and costs \$12,600 to fuel over 5 years. Cost estimates are based on 15,000 miles per year at \$0.12 per kW-hr. MPGe is miles per gasoline gallon equivalent. Vehicle emissions are a significant cause of climate change and smog.

**fueleconomy.gov**  
Calculate personalized estimates and compare vehicles

Smartphone QR Code™

## Questions

1. Which car is the most fuel efficient? How much money would you save in fuel costs over 5 years by driving this car?
  
2. What is the difference between the greenhouse gas rating and the smog rating? Which car was rated the highest in both areas?
  
3. Beyond tailpipe emissions refers to greenhouse gas emissions released from the production of the electricity used to power a plug-in hybrid vehicle or an all electric vehicle. The rating is based on how your area generates electricity. Locations that use renewable energy, such as wind power, will have lower greenhouse gas emissions. To access the calculator, click "About EPA Ratings" then "Beyond Tailpipe Emissions." Enter your zip code, year and model for the all electric car. What is the rating based on your location?
  
4. Which car provides the best value? What criteria did you use to make your decision?