Electric Cars Part 2

Segment Length: 5:37 minutes

Lesson Description:
Are electric cars the future? Part 2 of our series on electric cars uncovers more "inconvenient facts." Did you know that batteries, despite their advancements, still can't match the energy density of oil? Can we rely solely on renewable energy to power all our electric vehicles? And what happens when the electric grid can't handle the load of millions of electric cars? Delve into the complexities of the electric car revolution with expert insights and eye-opening revelations.

Objectives:
Students will be able to:

- Identify the key challenges associated with battery technology and the electric grid in the context of electric vehicle adoption.
- Discuss the relationship between energy storage limitations in batteries and the feasibility of widespread electric vehicle usage, considering factors such as energy density, infrastructure requirements, and environmental impact.
- Evaluate the effectiveness of proposed solutions for addressing the strain on the electric grid caused by increasing numbers of electric vehicles, weighing the benefits and drawbacks of various strategies.
- Assess the future of electric vehicles, considering factors such as energy sources, infrastructure development, and sustainability goals.

Concepts & Key Terms:

Energy Density: The amount of energy stored in a given system or substance per unit volume or mass. In the context of electric cars, it refers to the energy stored in batteries compared with traditional fossil fuels like gasoline.

Propaganda: Information, often biased or misleading, put out to promote a particular viewpoint or agenda.

Renewable Energy: Energy derived from naturally replenishing sources, such as sunlight, wind, or water flow, that are not depleted when used.

Strain: The pressure or burden placed on something, often beyond its capacity or limits. In the video, strain refers to the stress on the electric grid caused by the growing number of electric vehicles drawing power from it, potentially leading to shortages or overloads.

Transition: The process of changing from one state, condition, or form to another

Preview Activity:
Distribute copies of the K-W-L worksheet to the class. Have students fill in the K and W sections. After showing the video, have students complete the L section and answer the questions at the bottom of the worksheet.

Viewing Guide:
We recommend that teachers show the video segment twice: first to allow students to view the video and focus on the issues presented, and second to allow them time

to complete the viewing guide. After they complete the viewing guide, allow students a few minutes to work in pairs to share and verify answers.

Answers to Viewing Guide

1. Batteries
2. fantasy
3. zero
4. electric
5. more
6. everything

Electric Cars Part 2

Viewing Guide

Name _____ Date _____

Class _____Per_____ Teacher _____

Directions: As you watch the video, fill in the blanks with the correct words.

1. _____ are really lousy at storing energy.
2. Batteries powerful enough to replace fossil fuels are a _____.
3. California will require all new cars sold to be _____ emission vehicles.
4. Our president says we're going to achieve a carbon-pollution-free _____ sector by the year 2035.
5. Unfortunately, the politicians are making us pay _____ to do things that hurt the environment. (4:20)
6. The energy demands are off the charts big. We're going to need _____.

Now, take a few moments to reflect on the video and answer the questions below:

If it will take $100 trillion worth of batteries (and 400 years to make the batteries) to store the same amount of energy that Europe had in storage to get through the winter, is it feasible to do it? Why/why not? _____

_____

_____

What has to be done to the electrical grid in order for all U.S. cars to be electric?

_____

_____

_____

Why would politicians claim we can achieve a carbon-pollution-free electric sector by 2035 and not mention the massive hurdles in the way of achieving that? _____

_____

_____

_____

Discussion and Analysis

1. What are some facts mentioned in the video about electric cars?
2. How do electric cars work differently from traditional gasoline cars?
3. Why do batteries have limitations in storing energy for electric cars?
4. What are the potential challenges of completely transitioning to electric vehicles?
5. How might the strain on the electric grid affect people's daily lives?
6. Do you think renewable energy sources such as wind and solar can fully power electric cars? Why or why not?
7. What role do policymakers play in promoting electric vehicles and what decisions do they need to make? Should that be the role of politicians?
8. How might advancements in technology change the future of transportation beyond electric cars?
9. What ethical considerations should be considered when discussing the transition to electric vehicles? How should we consider the needs of people in other countries to elevate their standards of living through the use of energy?
10. How might the global demand for energy affect the future of electric cars?
11. What evidence does the video provide to suggest that the transition to electric vehicles may not be feasible in the near future?
12. How might government mandates for electric vehicles impact individuals who rely on traditional vehicles for their livelihoods?
13. What are some potential consequences of rushing the transition to electric vehicles without addressing infrastructure limitations?
14. How might government policies inadvertently exacerbate existing social or economic inequalities in the push for electric vehicle adoption?
15. What are the ethical implications of enforcing mandates for electric vehicles when the infrastructure to support them is lacking?
16. How can individuals advocate for more realistic and achievable government policies regarding the transition to electric vehicles?

Discuss These Lines from the Video:

1. Electric cars are great, but oil begins with a huge advantage over the chemicals that are in a battery. Oil has about 5000% more energy in it per pound.
2. You need to build about a hundred trillion dollars worth of batteries to store the same amount of energy that Europe has in storage now for this winter.
3. California will require all new cars sold to be zero emission vehicles.

4. No one is planning to double the electric grid in California. So they'll be rationing.
5. It really has been an extraordinary accomplishment of propaganda and there's no other word for it.
6. So what we've done now is had our energy systems designed by bureaucrats instead of engineers. And what we're getting is worse, energy, more expensive energy, higher environmental impacts.
7. We're still drilling things. You're still digging up stuff. You're still building machines that wear out.
8. It's almost infantile. It's really, it's distressing because it's so silly.

<u>Quotes for Discussion</u>:

If grid infrastructure doesn't keep up with the EV boom, drivers can expect charging difficulties such as long queues or only being able to charge at certain times and places. An overly strained grid will also be more vulnerable to extreme weather events and prone to blackouts, which California experienced in 2020.
– Aram Shumavon

I think we need probably about $20 [billion] or $30 billion a year on new capacity, new line miles and new delivery capacity. We're spending close to zero on that right now. – Rob Gramlich

The role of government policy is crucial, firstly with incentives to buy electric vehicles until there is price parity and then to rapidly ramp up fast-charging infrastructure. If the US government set a date for the end of gasoline cars, it would give a very clear signal to the market. – Amol Phadke

The truth is that with today's EV battery technology, automakers can't produce the affordable first car for a newly employed college grad. They also can't make a utility van for a hard-working contractor or an SUV for a single parent juggling two jobs. – Charlotte Hamilton

On the one side, [disposing of EV batteries] is a waste management problem. And on the other side, it's an opportunity for producing a sustainable secondary stream of critical materials. – Gavin Harper

Based on current technology, the world is not even close to being on track to achieving California's goal of banning the sale of new gasoline-powered cars and light trucks by 2035. The industry hasn't yet defined a profitable roadmap to get there. – Charlotte Hamilton

<u>Activities</u>:

1. Have students complete the K-W-L chart in class or for homework.
2. Have students complete the political cartoon activity in class or for homework.
3. Have students complete the Venn Diagram activity in class or for homework.

4. Divide the class into two groups. One group will research and argue in favor of oil-based fuels and the other will research and argue in favor of battery-powered electric vehicles. To foster critical thinking skills, you might want students to research and argue against the position they support.

5. To encourage civic engagement and critical analysis, have students write a letter to their governor expressing their support for or opposition to government mandates that would require all new cars to be zero-emission vehicles. Students should provide evidence to support their position.

6. In small groups, have students brainstorm potential solutions to address the strain on the electric grid caused by widespread electric vehicle adoption. They should consider factors such as expanding renewable energy sources, upgrading grid infrastructure, and implementing smart grid technologies. Students should consider who would ultimately pay the cost of these solutions.

7. Ask students to create a slideshow about the efforts that go into making electric car batteries.

8. Have students write an opinion piece for a school newspaper or online platform discussing the feasibility and potential consequences of relying solely on renewable energy sources to power electric cars. Students should be sure to support their arguments with evidence from the video and additional research.

9. Have students create a 60-90 second public service announcement (PSA) that brings attention to the benefits or drawbacks of electric car production and use.

10. Have students research and compare the energy efficiency of electric vehicles versus traditional gasoline cars, then create posters or slideshows that highlight the environmental and economic benefits of electric cars.

11. Facilitate a class discussion on the effectiveness of government mandates for electric vehicles. Students consider whether mandates are the best approach to address environmental concerns and explore alternative policy options.

12. Have students conduct a survey among their peers, neighbors, or shoppers at a local store, to gauge their knowledge of the electric car debate, the awareness of energy consumption, and their attitudes toward electric vehicles. Students should analyze the survey results and present their findings to the class.

13. In groups, have students develop proposals for sustainable transportation solutions that address the limitations and challenges discussed in the video. They should consider factors such as energy efficiency, environmental impact, societal need, and cost.

14. Have students research recent news articles or policy updates related to electric vehicles and renewable energy. They should analyze the information to identify trends, challenges, and potential solutions, promoting media literacy and critical thinking skills.

Name _____ Date _____

Class _____ Per _____ Teacher _____

Electric Cars Part 2

K-W-L Chart

Directions: Complete the **K** and **W** sections prior to watching the video. After you have seen the video, complete the **L** section and answer the questions below the K-W-L chart.

K	W	L
What I know about electric cars and energy...	What I want to know about electric cars and energy...	What I've learned about electric cars and energy...

What factors limit/hinder the ability of the U.S. to move to all electric cars? _____

_____

_____

What surprised you the most from this video? _____

_____

Why did that surprise you? _____

_____

Name _____ Date _____

Class _____ Period _____ Teacher _____

Electric Cars Part 2
Venn Diagram

Directions: Complete the three sections below in the Venn Diagram. What are the similarities and differences between forced conversion to electric vehicles and allowing consumers and markets to decide?

Mandated Conversion to Electric Vehicles	**Both Methods**	**Consumer/Market- Driven Adoption of Electric Vehicles**

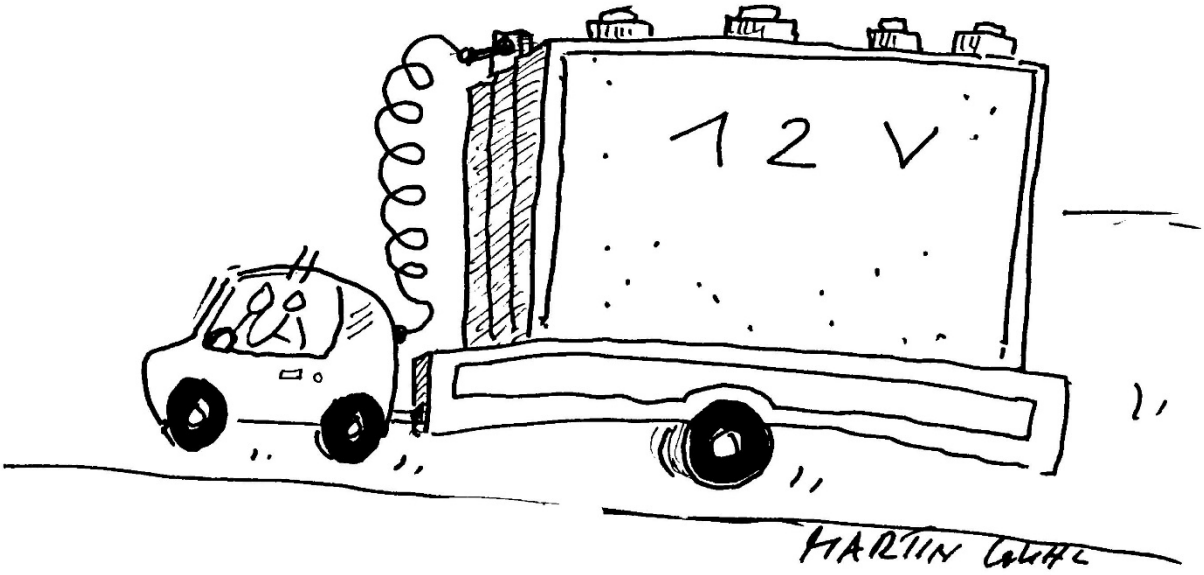
Name _____ Date _____

Class _____ Period ____ Teacher _____

Electric Cars Part 2

Political Cartoon Activity

Directions: Use the political cartoon to answer the questions below.



Briefly describe what is happening in the cartoon. _____

_____

_____

How does the cartoon relate to the video? _____

_____

_____

_____

Why is the battery depicted as so large? _____

_____

_____

What challenges of electric vehicles does this cartoon highlight? _____

_____

_____