**teacher guide**

**Energy transformations 1:**

**Comparing cars**

# Components

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|  | NAME | DESCRIPTION | AUDIENCE |
|  | *Comparing cars*teacher guide | This guide describes how to introduce students to concepts of energy and energy transformation by comparing electric and combustion engine cars. | teachers |
|  | *REV it up*video | Sources of energy involved in driving a vehicle are compared for a combustion engine car and renewable energy electric car. | students |

Purpose

To **Engage** students in learning about energy and energy transformations.

# Activity summary

Outcomes

Students:

* understand that energy is required to make a vehicle work;
* understand energy may come from different sources;
* list forms of energy (e g heat, electrical, solar);
* list advantages and disadvantages of renewable energy electric vehicles and combustion engine vehicles;
* explain how cars convert energy from one type to another; and
* understand that energy can be lost during transformations.

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| ACTIVITY POSSIBLE STRATEGY |
| Students watch the video, *REV it up*. | whole class |
| class or small group discussion about issues presented in the videoSee **Teacher notes** below. | whole class, small groups or individual |

# Technical requirements

The teachers guide requires Adobe Reader (version 5 or later), which is a free download from [www.adobe.com.](http://www.adobe.com/)

A modern browser (e g Internet Explorer 9 or later, Google Chrome, Safari 5.0+, Opera or Firefox) is required to view the video. A high quality MP4 version of the video is available by download from the SPICE website.

# Acknowledgements

Thanks to Renewable Energy Vehicle project staff from the School of Electrical, Electronic and

Computer Engineering at The University of Western Australia: Professor Thomas Bräunl (REV Project Director) and Marcus Pham.

For more information on the REV project, see [http://www.therevproject.com](http://www.therevproject.com/)

Designed and developed by the Centre for Learning Technology, The University of Western Australia.

Production team: Alwyn Evans, Bob Fitzpatrick, Sally Harban, Dan Hutton, Paula Lourie, Dominic Manley, Bec McKinney, Paul Ricketts, Kate Vyvyan and Michael Wheatley with thanks to Beate Ferbert- Booth, Jan Dook, Jenny Gull, Wendy Sanderson and Jodie Ween.

# Teacher notes

Class discussion after viewing the video may include the following questions:

1. What is the source of energy for vehicles discussed in the video?

*combustion engine: chemical (from petrol) REV: light from the Sun or electrical (from solar panels)*

1. What are some advantages of combustion engine vehicles?

*They are convenient, heat from engine can be used to warm passengers, and the vehicles have longer range.*

1. What are some advantages of renewable energy electric vehicles?

*They are environmentally friendly, efficient, cheap to run and quiet.*

1. Which type of vehicle do you think would better suit your family? Why?

*Answers will vary.*

1. What kinds of energy are involved in using a car?

*chemical, electrical, heat, sound, light, solar (for the REV car)*

1. The video includes a statement that combustion engines are not efficient. What does efficiency measure?

*Efficiency is a measure of how much energy is used by a car to move it compared to the wasted energy that flows into the environment.*

1. Why aren’t combustion engines efficient?

*Only 30% of energy produced makes the car move — the rest is wasted as heat.*

# Associated SPICE resources

*Energy transformations 1: Comparing cars* may be used in conjunction with related SPICE resources to address the broader topic of energy transfer, transformation and conservation.

# SPICE resources and copyright

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| DESCRIPTION | LEARNING PURPOSE |
| *Energy transformations (overview)* |  |
| *Energy transformations 1: Comparing cars*A video compares conventional internal combustion powered cars to REV vehicles and introduces some associated energy transformations. | **Engage** |
| *Energy transformations 2: Investigating energy*Students make model vehicles that use different energy sources to investigate energy transformations. | **Explore** |
| *Energy transformations 3: Analysing energy*Students develop explanations of energy transformations by analysing data from a simulated electric vehicle journey. | **Explain** |
| *Energy transformations 4: Car choices*Students use data about a range of conventional, electric and hybrid vehicles to decide and communicate which car is suited to specific purposes. | **Elaborate** |