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|  | Australian Curriculum Year 8 Science sample assessment ׀ Assessment resource  Energy test: stimulus |

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# Energy for transport

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| You:   * will bring this stimulus sheet into the test with you * will use the research below as the source of information when responding to questions in the test * should ask questions of your teacher if you do not understand the content below.  It is important that you understand what you are reading before the test * can make extra notes in the margins or on the blank page at the end of the stimulus sheet if you have done further research to assist you to understand the information — the sources of the information below can be found in the references list. |

## Greenhouse gases background information

Greenhouse gases include carbon dioxide, methane, fluorocarbons and nitrous oxide. These gases act as a shield to trap heat in the earth’s atmosphere. This trapped heat contributes to the greenhouse effect.

Human activities are increasing greenhouse gas levels in the Earth’s atmosphere. These activities include the burning of fossil fuels (coal, oil and natural gas) for electricity production and transportation, agriculture and industrial processes.

In December 2007, Australia ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change, agreeing to limit greenhouse gas emissions pollution. The Australian Government has also committed to a long-term target to cut pollution.

## Emission predictions

The Bureau of Infrastructure, Transport and Regional Economics (BITRE) conducted a study during 2007 to predict greenhouse gas emissions from the different forms of transport in Australia. Transport is the third largest emitter of greenhouse gases in Australia behind energy generation and agriculture.

It was predicted that emissions from the transport in 2010, would be around 48% above the level for 1990 and by 2020 emissions would be around 70% above 1990 levels. Passenger cars would contribute the most to these emissions.

**Figure 1: Predicted greenhouse gas emissions from transport in Australia**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Cars** | **Other road users** | **Air** | **Rail** | **Marine** | **Other** | **Total** | **Per cent change from 1990** |
| ***(1 000 000 tonnes)*** | | | | | | | |
| 1990 | 34 | 19 | 2 | 2 | 2 | 0.060 | 59 |  |
| 2007 | 44 | 29 | 6 | 3 | 2 | 0.094 | 84 | 42 |
| 2010 | 46 | 32 | 7 | 3 | 2 | 0.097 | 90 | 53 |
| 2020 | 49 | 41 | 8 | 4 | 2 | 0.107 | 104 | 76 |

**Figure 2: Total predicted greenhouse gas emissions predictions from transport   
in Australia**

## Technologies in development

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is conducting research that focuses on developing clean, affordable energy and transport technologies. The initial goal of this research was to develop an efficient, low emission power source for hybrid electric vehicles (HEVs).

A hybrid vehicle is a vehicle that uses two or more distinct power sources to move the vehicle. The most common type of hybrid vehicle contains parts of both petrol and electric vehicles i.e. HEVs.

### UltraBatteryTM

The UltraBatteryTM is a hybrid energy storage device developed by the CSIRO. This technology has two major applications:

* energy source for low emission transport e.g. hybrid electric vehicles (HEVs)
* storage of renewable energy from wind and solar sources.

The UltraBatteryTM has advantages over the batteries currently used in HEVs. It is approximately 70% less expensive, has lower maintenance needs and charges faster — all with comparable performance. It is expected that the recycling rates of the UltraBatteryTM will be 100%.

The testing of the UltraBatteryTM was a collaborative process involving government and commercial laboratories in the USA, Japan and Australia.

### Future applications of UltraBatteryTM technology

#### Railway power source

Battery energy storage could be used to provide hybrid power in trains. The change to hybrid power should be made easier as many trains already have both diesel and electric motors. The advantages to this application of the UltraBatteryTM include:

* hybrid power allows emissions-free train movements in populated areas
* railway carriages are built to last a long time, so it can make economic sense to retrofit a hybrid power system to existing cars rather than waiting to order replacements.

#### Wind energy storage

The UltraBattery™ might provide an effective means for the storage of wind energy. The battery cell would allow storage of a large amount of energy. Converting wind energy to electricity is approximately 8–10 times cheaper than converting solar energy to electricity.

## References

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