

# SUSTAINABLE TRANSPORT COALITION



STUE

## ALTERNATIVE FUELS Policy Statement



## POLICY ON ALTERNATIVE FUELS

The Sustainable Transport Coalition believes that it is imperative that action is taken now to reduce the oil vulnerability of Australia's transport system by promoting alternative transport to motor vehicles, by being more frugal through travelling less, through greater efficiency in fuel use and by carefully examining alternative fuel sources, which is the subject of this policy <sup>1</sup>. The Coalition believes that the following should take funding precedence over alternative fuels:

- Community awareness and engagement on the consequences of 'Peak Oil', frugality and energy efficiency measures and other conservation practices, like individualised marketing demand management (TravelSmart).
- Increasing the efficiency of goods transport by investing further in both rail track and rolling stock.
- Introducing fiscal incentives for and providing more extensive, frequent public transport services.
- Improving and extending cycling and walking <sup>2</sup> facilities.

<sup>1</sup> Some Americans and Canadians think the same way – see <http://www.participate.net/oilchange> and <http://www.canada.com/topics/news/agriculture/story.html?id=5d33956b-bd2d-4f90-adcc-2994527ff48c&tk=43254&tp=1>

<sup>2</sup> For cycling and walking policies of the STC see <http://www.stcwa.org.au/>

## DEFINITION

For the purposes of this policy, an alternative fuel for motorised transport is "something consumed to produce energy for transport", other than conventional petrol or diesel. It thus includes energy carriers/stores (such as hydrogen) as well as sources of embodied energy (eg LPG, CNG).

Alternative fuels include:

- **Alcohols** - ethanol and methanol made from many different substrates.
- **Biodiesel** - a lot like diesel fuel, but made from plant oil or animal fat.
- **Liquefied natural gas (LNG)** - natural gas that is very, very cold.
- **Liquefied petroleum gas (LPG)** - hydrocarbon gases under low pressure.
- **Compressed natural gas (CNG)** - natural gas under high pressure.
- **Liquids made from coal, oil shale or other sources** - petrol and diesel fuel that doesn't come from oil.
- **Electricity** - stored in batteries or, in the case of fixed-track public transport systems, distributed by wire directly to the vehicle, and may be generated from a wide variety of renewable and non-renewable sources.
- **Hydrogen** - a gas with power producing capacity that can be produced from natural gas or by electrolysis of water.



# PRINCIPLES

The Sustainable Transport Coalition considers that the principles by which alternative fuels (by this definition) are assessed should include:

- Whole of life cycle costs/impacts - includes assessment of the feedstock and the conversion/refining process and additional costs to consumers and life cycle greenhouse gas emissions.
- Other direct and indirect costs/impacts.
- Sustainability of supply, including competition with other products (eg food).
- Sustainability in terms of environmental impacts (eg biodiversity).
- Sustainability in terms of energy balance (often expressed as EREOI= Energy Return on Energy Invested) - do the usable energy outputs significantly exceed the non-renewable energy inputs?
- Scale of potential production/availability.
- Adaptability to wide-scale use, including distribution systems (eg direct oil-substitutes could use existing distribution systems but hydrogen would require new distribution systems) and localised production (eg hydrogen can, in principle, be produced in small-scale facilities through electrolysis of water using a range of power sources).
- Niche markets (eg biodiesel can be preferred to fossil diesel in restricted areas, like mines, because the emissions are less damaging to human health).

# THE POLICIES

**1** Human energy is a very good alternative fuel and its use is likely to have long term health benefits in terms of reduced obesity, reduction of stress and local security. So everyone, including governments, should encourage the use of cycling and walking wherever possible. Walking and cycling are effective substitutes for the short-medium length trips, especially the 10% of private car trips that are less than 1km (walking) and up to 48% that are less than 5km (cycling).

**2** For those who cannot walk or cycle, electric bicycles and 'gopher buggies' are energy and emissions efficient alternatives. Government focus needs to be on extending the bike path network and making it suitable for all of the above forms of 'micro-light' transport. These bike paths need to be where the use of bicycles and micro-light transport is and will be used.

**3** A full triple bottom line accounting should be made in the assessment of alternative fuels, especially in relation to the greenhouse gas accounting of their production and use. Alternative fuels should have high energy output to non-renewable input ratios. This will lead to reductions in Greenhouse Gas emissions, as well as higher net benefits in energy use. If almost as much energy is required to produce a fuel as is available in the final product, then overall efficiency will be low and the fuel's price will rise with any rise in the cost of the input. For example the production of biodiesel from canola and mustard crops in Australia has energy efficiency ratios between one and three, compared to early oil wells that had ratios in excess of 100<sup>3</sup>. Biofuel production makes very little sense when large quantities of fossil fuels are required to produce these fuels and do very little, if anything, to reduce greenhouse gas emissions. The production of oil from coal or shale has low energy output/input ratios. Hydrogen from fossil fuels also has very low energy efficiency ratios as well as higher

<sup>3</sup> See Heinberg, R (2003) "The Party's Over: oil, War and the Fate of Industrial Societies" New Society Publishers, Gabriola Island, 274 pp and Odum, H T (1996) Environmental Accounting, Energy and Decision Making, John Wiley, New York

greenhouse gas emissions. Hydrogen generated solely from renewable energy through electrolysis of water may have a high energy output/input ratio (eg Iceland's use of geothermal energy to power its drive to a full hydrogen economy), but the desirability of this will depend upon a range of factors including alternative uses of the renewable energy and, in the case of Western Australia in particular, the availability of sufficient suitable water supplies to make the hydrogen.

**4** It would be preferable for alternative fuels to be used in vehicle fleets with existing technology, rather than requiring new motors or vehicles. There are several problems with hydrogen fuel cells in this regard, with the use of fuel cells and the use of precious metals in the manufacture of these cells. The focus of local research should be on sustainable production of hydrogen from renewable electricity (which could also be used directly for electric vehicles) such as off-peak wind, biomass and photovoltaic cells, rather than spending large amounts on testing fuel cells.

**5** Australian governments should not subsidise, or in any way encourage, the development of alternative fuel industries to use resources, including land, that are needed for growing food or fibre or for conserving biodiversity. Biofuel producers compete for feedstock with livestock and human food production<sup>4</sup>. Already (2007) corn prices in the United States are increasing as a consequence of grain demand by ethanol fuel production facilities<sup>5</sup>. Increased grain prices lead to increased food costs. Indeed it appears in some cases that increases in oil price and feedstocks will go hand-in-hand and constantly maintain biofuel production outside the margin of profitability without government subsidy.

**6** Governments should foster the use of "true" wastes to produce alternative fuels and other products where these have net environmental benefits. Alternative fuel production from "wastes" (waste

<sup>4</sup>see <http://www.cipav.org.co/lrrd/lrrd16/11/pres16087.htm>, <http://www.guardian.co.uk/commentisfree/story/0,,2043724,00.html> and [http://theaustralian.news.com.au/story/0,20867,21343027-30417,00.html?from=public\\_rss](http://theaustralian.news.com.au/story/0,20867,21343027-30417,00.html?from=public_rss) <sup>5</sup>see <http://www.earth-policy.org/> and <http://www.planetark.com/dailynewsstory.cfm/newsid/34983/story.htm>

starch, C-grade molasses, used cooking oil and tallow) appears to be relatively benign and profitable<sup>6</sup>, but the supply of these is restricted. The potential for biofuels to contribute to our national transport fuel energy supply is estimated to be very low. For example, CSIRO calculations indicate that using all of Australia's crop and biological waste resources would satisfy only 63% of Australia's transport energy use. Therefore, to ensure efficiency the government should encourage the local use of biofuels around places of production and processing, rather than mandating fuel ratios across states and nations.

**7** **Alternative fuels should not be mandated by government regulation.** This is a mechanism to make a considerable number of users pay for a possible benefit to a minority. It reduces the ability of customers to select a fuel appropriate to their financial needs and ethics. Current proposals for mandated fuels and mixes being put to various state and Commonwealth governments are to be resisted. Mandating a fuel mix is also likely to inhibit innovation in transport energy supply.

**8** **The use of alternative fuels should only be encouraged by differential excises and taxation if there are good long term reasons, including that they have low greenhouse gas emissions.** For example fuels supplied with in-built carbon offsets are to be encouraged<sup>7</sup>. Currently both the Commonwealth and the Western Australian governments are subsidising conversion of vehicles to LPG. Much of the reduction in cost of using LPG is due to the excise differential between LPG and petrol and diesel, thus reducing government income<sup>8</sup>. Government excises, subsidies and regulations are encouraging biofuel industries, but some of these will be removed in 2011 and later. Already Australian Government fuel excises and excise rebates are causing some inappropriate responses (eg farmers who manufacture biodiesel and receive the fuel excise rebate could be better off selling the biodiesel to a user who does not get the rebate). The Government should assess current and future excise and

<sup>6</sup>see <http://abareonlineshop.com/product.asp?prodid=12755> see <http://abareonlineshop.com/product.asp?prodid=12755> <sup>7</sup>However the carbon neutrality claimed needs to be carefully assessed. For example the Kyoto Protocol rules need to be followed. There are many supposedly "carbon neutral" offers that do not meet these rules. <sup>8</sup>Currently (2007) the LPG that is supplied to the Perth market is derived from crude oil, so there is no gain in efficiency.

regulation for all fuels, including the diesel fuel excise rebate and the Fringe Benefits Tax to ensure that these excises do not encourage inappropriate fuels to be produced or used.

**9** **The use of alternative fuels needs to be assessed in relation to how they fit into the supply chain.** For example the proponents of electric vehicles argue that batteries can be recharged using base load power at night, and therefore make very low demands on and improve the efficiency of current electricity supplies.

**10** **In a manner similar to the certification of tropical rainforest timber, the Australian Government should ensure that any imported biofuels have been produced without detriment to the originating environment**<sup>9</sup>. Also there are now several examples overseas where biofuel production is impacting on nature conservation and other values. For example palm oil, the production of which is causing the loss of considerable areas of rainforest and therefore biodiversity.

**11** **More research into biofuel production is urgently required before further commitment of government (or industry) funds.** There is no doubt that further research on alternative fuels is urgently required<sup>10</sup>, especially into the conversion of cellulosic plant residues to biofuels from hemicellulose (by fermentation, pyrolysis, enzymatic hydrolysis, gasification and high and low temperature catalytic reactions)<sup>11</sup>. But this does not imply that industries should be encouraged, and certainly not established before the research concludes that they would be viable.

<sup>9</sup>At a recent conference "Biofuels and Bioenergy in WA: Initiatives and Challenges" Mr Frank Russell of BP Australia stated that BP refused to handle biofuels from palm oil for ethical reasons. Also see <http://www.monbiot.com/archives/2005/12/06/worse-than-fossil-fuel/> <sup>10</sup>See for example [http://www.csiro.au/news/newsletters/0606\\_energy/story3.htm](http://www.csiro.au/news/newsletters/0606_energy/story3.htm) <sup>11</sup>See <http://www.whitehouse.gov/news/releases/2007/03/20070326-1.html> though the problems will still be large, see <http://i-r-squared.blogspot.com/2007/03/>



## SUMMARY OF THE MAJOR CHARACTERISTICS OF ALTERNATIVE FUELS<sup>12</sup>

Fuel	Feedstock	EROEI <sup>13</sup>	Engine	Environmental	Social
Ethanol	Corn or other grain	~1	Flex fuel vehicles	25% reduction in ozone forming emissions compared to petrol. Increased soil erosion. 30% net reduction in greenhouse emissions. Competes for land with bio-diversity if land-clearing required for production of feedstock.	Competes for land with food production. Forces up food prices, including staple food for less developed countries.
Ethanol	Sugarcane	~7	Flex fuel vehicles	25% reduction in ozone forming emissions compared to petrol. Increased soil erosion and loss of biodiversity. 60% net reduction in greenhouse gas emissions. Competes for land with bio-diversity if land-clearing required for production of feedstock.	Competes for land with food production. Forces up food prices, including staple foods for less developed countries.
Ethanol	Hemicellulose	?	Flex fuel vehicles	Competes for land with bio-diversity if land-clearing required for production of feedstock.	Large numbers of research institutions are tackling production problems.
Biodiesel	Tallow	~20	Any vehicle that runs on diesel today <sup>14</sup>		Limited quantities of tallow are available.
Biodiesel	Palm oil	~7	Any vehicle that runs on diesel today <sup>15</sup>	Serious concerns over the destruction of tropical rainforests <sup>16</sup> Competes for land with bio-diversity.	Requires appropriate branding to ensure that source is not environmentally damaging.
Biodiesel	Seed crops	Varies between 1.2 and 7 <sup>17</sup>	Any vehicle that runs on diesel today <sup>18</sup>	Competes for land with bio-diversity if land-clearing required for production of feedstock.	Competes for land with food production. Forces up food prices, including staple food for less developed countries.
CNG	Gas fields		Internal combustion <sup>21</sup>	Demonstrates a reduction in ozone forming emissions. However, hydrocarbon emissions may be increased.	Most suitable for heavy freight and passenger vehicles rather than small private vehicles.
LNG	Gas fields		Internal combustion <sup>22</sup>	Demonstrates a reduction in ozone forming emissions. However, hydrocarbon emissions may be increased.	
LPG	Crude oil		Internal combustion <sup>23</sup>	Demonstrates a reduction in ozone forming emissions. However, hydrocarbon emissions may be increased.	
Electricity	Coal, nuclear, natural gas and renewables		Electric motor	All emissions are generated at the power plants, except for those associated with extraction and processing of feedstock. Batteries must be replaced every 3-6 years.	Suitable for light cars and micro-light vehicles such as electric bikes and 'gopher buggies'. Also used for public transport with fixed infrastructure power supply (track; overhead wires).
Hydrogen	From natural gas at present, but almost any source of power can be used	~0.3	Fuel cell with an electric motor	Zero tailpipe emissions. Other emissions associated with feedstock extraction and processing. Currently no large scale production from renewable energy sources. Very expensive to transport.	Limited fuelling stations.

<sup>12</sup> With acknowledgements to Simmons Company <http://www.simmonsco-intl.com/files/091506%20Alternative.pdf> <sup>13</sup> EROEI = Energy return on energy invested. Most of these numbers are based on informed judgement, not technical analysis <sup>14</sup> No modifications are needed up to 5% blends. Many engines are compatible with up to 20% blends (Simmons Co above) <sup>15</sup> No modifications are needed up to 5% blends. Many engines are compatible with up to 20% blends (Simmons Co above) <sup>16</sup> See <http://www.ecoworld.com/blog/2007/02/12/biofuel-is-not-carbon-neutral/> <sup>17</sup> The numbers from Australia are at the lower, less efficient end <sup>18</sup> No modifications are needed up to 5% blends. Many engines are compatible with up to 20% blends (Simmons Co above)

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## OTHER STC POLICIES:

- Oil: Living With Less
- Walking
- Cycling



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