5. SUSTAINABILITY IMPROVEMENTS RELATING TO THE COUNCIL'S FLEET

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The purpose of this report is to update the Council on the progress in improving sustainability of the Council's vehicle fleet.

CONTEXT

The Council at its meeting on 26 September 2002 considered a comprehensive report entitled "Sustainability improvements – Council's own transport" and resolved that *"sustainability issues relating to the Council's fleet be reviewed regularly and staff report annually on new opportunities becoming available to the Council resulting from technological progress by the motor industry and environmental improvements achieved".*

The referred report summarised that, after considering a number of alternative fuel and vehicle options, the most promising future options that would provide both greater sustainable and environmental benefits, were hybrid and fuel cell vehicles.

However, availability of new generation hybrid and fuel cell vehicles was limited both in the range of vehicles available and their commercial availability in New Zealand. While the hybrid cars could be imported, there was no support and service infrastructure operating here yet. There were no cost-effective options for purchasing sustainable vehicles for the Council's fleet that would satisfy the requirements of the Council's current fiscal policies.

In the meantime staff were actively pursuing other opportunities for improving vehicle fuel efficiency, reducing CO_2 emissions and local pollution, within existing technologies and continued to monitor development and availability of new technology vehicles.

IMPROVEMENTS ACHIEVED WITHIN CONVENTIONAL TECHNOLOGIES

A major step towards better sustainability of the Council's fleet in 2002/03 was the replacement of older (mainly Daewoo and Daihatsu) cars with new Holden Barina vehicles that operate at a fuel economy of 7.2 litres per 100 km in urban cycle, which is 11% better compared to the Daewoo cars. One hundred and eight vehicles have been replaced so far, which resulted in $11,000 per annum savings of fuel costs and a 28 tonnes reduction of CO_2 emissions.

The new cars meet the stringent Euro IV exhaust emission standards (which will be fully in force in Europe from 2007).

Holden New Zealand Limited confirmed that, apart from good fuel economy and environmental performance, the new Holden Barina cars meet high safety standards. In accordance with the safety rating system used by LTSA, the vehicles score four stars, which appears to be the highest score for small and medium size cars (surpassed by only one model from the large size car category – Renault Laguna [cost range $39,000 - $59,000] that scored five stars).

It should be noted that ongoing engineering development of cars results in new features being introduced to engine and transmission systems (for example, GDI – gasoline direct injection and CVT – continuously variable transmission) that substantially improve fuel economy and, subsequently, reduce vehicle emissions.

HYBRID CARS

At the time of the September 2002 report, hybrid cars such as "Toyota Prius", Honda Insight" and "Honda Civic" were commercially available overseas but not in New Zealand. The situation is changing: in October 2003 Toyota announced the release of the Prius model at a retail price of $38,700 plus GST, and Honda announced plans to launch its "Civic Hybrid" in February 2004. While the Honda Insight represents more a concept model of hybrid car (2-door, 2-passenger vehicle with a limited cargo space), Toyota Prius and Honda Civic are very practical 5-seat vehicles.

A budget request for purchasing environmentally sustainable hybrid vehicles in 2004-2007 was considered but declined at the Council meeting on 25 March 2003. The request was based on an anticipated capital cost of $50,000 for each hybrid car. While the current retail price appears to be substantially lower, it is still more than double of the cost of the standard fleet vehicle.

LPG AS AN ALTERNATIVE FUEL

LPG (liquefied petroleum gas) is a fossil fuel and its sources are finite. With the depletion of Maui field, substantial amounts of LPG need to be imported to New Zealand from overseas, at higher prices.

Compared with petrol engines, LPG may create less CO_2 emissions (the difference can be as much as 14%). The use of LPG may result in a moderate reduction of urban air pollution as well. However, this relative advantage of LPG diminishes as petrol engines improve to meet stringent environmental standards.

LPG cars are generally converted from petrol fuelled cars, either by the original manufacturer or by a local converter. The emission performance of LPG vehicles, as well as their fuel economy, will depend upon the quality of the conversion.

The economics of the gas fuel may only be justified for high utilisation vehicles such as taxis and buses. The Christchurch central city shuttles (Yellow Buses) operate on LPG.

During the 1980s, the Christchurch Drainage Board supplied compressed biogas derived from sewage treatment process for a variety of vehicles. This was stopped in 1994 because of a number of operational issues (including that of having a single refuelling station in the city and a necessity for the vehicles to travel extra distances for re-fuelling).

The biogas at the Wastewater Treatment Plant is now used for other purposes, including electricity generation, which results in better economic and environmental outcomes. The gas is used at an efficiency of 65% compared to that of around 17% if used as a vehicle fuel.

DIESEL SUBSTITUTION FOR PETROL

The diesel engine is intrinsically more thermally efficient than the petrol engine. Therefore a diesel car may be more fuel efficient and, respectively, would emit less CO_2 than its petrol equivalent.

Small diesel cars are available in Europe that have a fuel economy index as low as 5.6 l/100 km in urban cycle. These cars are not currently available in New Zealand. The smallest diesel cars available are Audi A3 (engine size 1.8 litre) at a price around $54,000 and Volkswagen Golf and Passat (engine size 1.9 litre) in a price range of $37,000 - $56,000.

Emissions of smog-forming particles (PM) by the best performing diesel cars range from 17 to 29 mg/km compared to “practically zero” for the petrol cars such as Holden Barina. This is the main reason why none of the best performing diesel cars has been approved to the strictest Euro IV clean air standard. The higher emission rates of smog-forming substances is of a particular concern as this represents a very specific air quality problem in Christchurch. On this basis alone it would be difficult to support a technology that would have a negative impact (however minimal) on both ECan’s draft Air Plan and the City Council’s own desires to clean up the city’s air.

HYDROGEN FUEL CELL VEHICLES

The Council at its meeting on 26 June 2003 considered a report on fuel cell cars and resolved that *“the Council investigate the possibility of replacing appropriate components of its motor car fleet with fuel cell vehicles, on a staged basis”.*

In December 2002, Honda Motor Company delivered a hydrogen fuel cell Honda FCX to the City of Los Angeles. With four more cars delivered in 2003, the City would lease the five vehicles for two years and Honda Motor Company would provide the hydrogen fuel and refuelling infrastructure. At the time of the launch, Honda announced their plans “to lease about 30 fuel cell cars in California and Japan during the next two-to-three years” and further stated that “the company currently has no plans, however, for mass-market sales of fuel cell vehicles or sales to individuals”.

While there are numerous demonstration models of fuel cell cars produced by virtually all leading car manufacturers in Europe, USA and Japan, these cars are not commercially available now or in the near future.

Hydrogen fuel cell buses are being supplied by DaimlerChrysler for the European fuel cell bus project. In 2003, 30 Mercedes-Benz city buses start commercial operation in the cities of Amsterdam, Barcelona, Hamburg, London, Luxembourg, Madrid, Porto, Reykjavik, Stockholm and Stuttgart. From early 2004, three Mercedes-Benz city buses are to start a two year trial in Perth. Hydrogen for the Perth trial will initially be produced from petroleum products, with an intention to use, in the future, natural gas as a source of hydrogen. An advantage of fuel cell buses is that they (unlike cars) do not require an extensive network of hydrogen re-fuelling stations.

Availability and Cost of Hydrogen Fuel

Direct use of hydrogen in fuel cell cars means this hydrogen fuel needs to be manufactured and supplied, ideally through a ubiquitous distribution network. Compressed hydrogen is currently available in this country. It is produced by electrolysis from water using substantial amounts of electricity. At current prices, the cost of hydrogen fuel for a vehicle like Honda FCX would be in the order of $1.50 per km travelled (compared with 5 cents/km for petrol). For a fleet car travelling 13,000 km per year this would mean fuel costs of $19,500 per annum (compared to the current petrol cost of $840 pa). To some extent, the high cost of hydrogen fuel reflects the amount of energy required for the hydrogen production, compression and transportation.

Apart from high production costs, there is an environmental cost of producing hydrogen. In its Draft Eco-Efficient Motor Vehicles Strategy, EECA stated that "*any CO_2 emissions from energy used to manufacture, transport and store hydrogen for use as a transport fuel should be lower than the CO_2 emissions associated with the manufacture, transport, storage and use of fuels that the hydrogen is replacing. Until it is clear that any additional electricity demand is coming from renewable energy sources, using electricity to produce hydrogen as a transport fuel is unlikely to result in an overall reduction of CO_2 emissions. Other countries have come to similar conclusions, including a recent major report from the United Kingdom".*

There are examples of hydrogen on-site production from water by electrolysis using renewable electricity. In April 2003, a hydrogen fuel station opened in Reykjavik, to fuel the three fuel cell buses mentioned above. Iceland is renowned for its abundant geothermal and hydropower resources, so all the electricity for producing hydrogen comes from renewable sources. But Iceland is unique – the rest of the world relies on oil, gas, coal and nuclear power for a great deal of its electricity. While New Zealand acquires most of its electricity from renewable resources such as hydropower, geothermal sources and some wind power, at the margin electricity is produced from non-renewable sources such as coal, gas and oil.

It should be noted that direct use of pre-manufactured hydrogen is not the only way of fuelling fuel cell vehicles. Another way is to use petrol, methanol or gas as a fuel and have a "fuel reformer" (an on-board petrochemical plant) which transforms petrol from the fuel tank into hydrogen, which then is used in the vehicle fuel cell to produce electricity by a chemical reaction between the hydrogen and oxygen from the air. The generated electricity goes to an electric motor which produces motive power. This principle was used, for example, in a fleet of demonstration fuel cell buses operated between 1999 and 2001 in Chicago and Vancouver.

Large stationary fuel cell units are in commercial operation at thousands of sites around the world. Usually such plant uses natural gas or landfill gas as a source of hydrogen.

CENTRAL GOVERNMENT ACTION – CORRESPONDENCE WITH THE MINISTER OF ENERGY

The Council at its meeting on 26 September 2002 also resolved that *"the Council write to the Minister of Energy raising the need for Central Government to take action to facilitate the production and supply of biomass transport fuels and the benefits of subsidies or tax relief for hybrid and fuel cell vehicles".*

The Corporate Services Manager wrote to the Minister of Energy (Hon Pete Hodgson) raising the above issues and the Minister in his response outlined the work currently underway on biomass transport fuels. One important result of Government work was the approval in 2003 by the Environmental Risk Management Authority of the manufacture and use of petrol/ethanol blends (up to 10%). EECA and the Ministry for the Environment are investigating petroleum regulations for biodiesel blends and standards for 100% biodiesel. The Ministry of Transport is also assessing taxation issues associated with ethanol blends, and EECA has raised the taxation issue of hybrid and fuel cell vehicles with the Inland Revenue Department.

Other relevant government regulations include a change to low sulphur diesel fuel, which will become mandatory from August 2004.

Staff Recommendation:

1. That the information be received.

2. That staff continue to monitor technological progress by the motor industry and report annually on new opportunities becoming available to the Council and environmental improvements achieved.

Chair's Recommendation: That the above recommendation be adopted.