

**For information  
on 6 February 2003**

**LEGISLATIVE COUNCIL**

**PANEL ON ENVIRONMENTAL AFFAIRS  
PANEL ON TRANSPORT**

**Feasibility Study of Introducing Liquefied Petroleum Gas  
Light Vans and Light Goods Vehicles into Hong Kong**

**PURPOSE**

This note informs Members of the findings of the feasibility study on introducing liquefied petroleum gas (LPG) light vans and light goods vehicles into Hong Kong.

**BACKGROUND**

2. The Administration has been implementing various measures to reduce emissions from the vehicle fleet. At present, diesel light vans and diesel light goods vehicles are using ultra-low sulphur diesel (ULSD) for which a duty concession is provided, and pre-Euro models can also use particulate traps or catalysts provided for under the Government's retrofit programme in addition to ULSD to lower their emissions. To find out whether or not it is practicable to further reduce their emissions by replacing them with LPG models, we carried out a feasibility study to look at it. The study has now been completed.

**FINDINGS OF THE STUDY**

3. The Executive Summary of the study report is at the Annex. A full set of the report has been deposited with the Legislative Council Secretariat. The study has concluded that the introduction of LPG light vans and LPG light goods vehicles into Hong Kong is not practicable. One of the major problems is inadequate LPG filling supporting infrastructure: to support 68 500 LPG light

vans and LPG light goods vehicles, it is estimated that 153 additional LPG filling stations, or 612 LPG nozzles, will be required. Currently, 41 LPG stations are in operation, including 12 large-scale dedicated LPG stations. The number will increase to 43 within this year. This network has been established only after almost three years of hard work by all concerned. The existing LPG filling infrastructure will only be able to support the fleet of 18 000 taxis and 6000-odd light buses after they have changed to LPG vehicles. Further expansion of the LPG filling network will be limited: while there are 10 fuel station sites in the Lands Sales Programme, they will provide a maximum of only about 40 LPG nozzles, which are far from adequate to support the 39 200 light vans and 29 300 light goods vehicles if they were replaced by LPG models. Besides, the first of these fuel stations will only be commissioned by 2005 at the earliest.

4. The existing LPG storage terminal facility is another problem. We estimate that the maximum throughput of the existing LPG terminal facility at Tsing Yi is only able to support the entire fleets of taxis and light buses. Stretching the throughput further will increase the risk to the population within the consultation zone. As a prudent Government, we must take full account of this safety factor and explore all other alternatives. Moreover, in consideration of Hong Kong's special situation where the density of our urban areas is extremely high, the Government needs to balance safety risks with environmental benefits.

5. While the risk factor might be overcome through building a new LPG storage facility, the most conservative estimation is that it will take at least five years to complete. The average age of the existing diesel light vans and light goods vehicles is about seven years. Given the normal life of a diesel light van or light goods vehicle is around 10 to 12 years, we expect that most, if not all, of the existing more polluting pre-Euro diesel light vans and light goods vehicles, which at present are already more than 8 years old and share about 58% of the fleet, will either retire or will be replaced by the environmentally cleaner Euro III models (the prevailing standard) or Euro IV models, (the emission standard which we plan to introduce in early 2006 in parallel with the European Union) within this five years' time span. In terms of environmental performance, a Euro III vehicle emits about 90% less particulates and 50% less nitrogen oxides than a pre-Euro model. The environmental performance of a Euro IV vehicle will be very close to an LPG vehicle: a Euro IV vehicle is expected to emit only several percents of the particulates of a pre-Euro vehicle and about half of the nitrogen oxides by a Euro III vehicle. Therefore, the improvement to be gained by introducing LPG light vans and LPG light goods

vehicles after five years from now will be small. The additional reduction in particulates from the vehicle fleet will only be about 1%.

6. We would continue to monitor advancements in vehicle and motor fuel technologies and consider which cleaner alternatives could be introduced into Hong Kong, such as fuel cell technology and biodiesel. Meanwhile, for the category of light vans and light goods vehicles, we will introduce a draft regulation into the Legislative Council shortly to make the retrofitting of emission reduction devices a legal requirement for the pre-Euro models and work towards our plan to raise the emission standard for newly registered vehicles from the current Euro III to Euro IV standard in 2006 in parallel with the European Union.

**Environment, Transport and Work Bureau**

**February 2003**

## Executive Summary

### 1. Background

As part of an effort to explore possible option for further improving the air quality in Hong Kong, the Electrical and Mechanical Services Department (EMSD) has commissioned Det Norske Veritas (DNV) to undertake a feasibility study on introducing liquefied petroleum gas (LPG) light vans and light goods vehicles in Hong Kong. LPG is considered to be a suitable replacement fuel as it is a cleaner fuel that can significantly reduce emissions of air pollutants. It is also available in Hong Kong, although the storage facilities for it are limited.

### 2. Objectives of the Study

This study is to assess the feasibility of introducing LPG light vans and light goods vehicles in Hong Kong. The study has covered aspects including the technical feasibility, e.g. availability of LPG supply and supporting infrastructure, the associated risk implications and the commercial viability.

### 3. Purpose of this Report

Based on the results from Tasks 1 to 4 as set out below, this report contains the detailed information to recommend whether it is feasible to replace part or all of the fleet of diesel light vans and / or light goods vehicles with LPG ones in Hong Kong.

### 4. Scenarios

Scenarios representing six LPG light vans/ light goods vehicles introduction cases based on the Euro engine standards have been studied. The annual LPG fuel consumption, presented in Table 1, for the years 2001 and 2010 has been based on these scenarios. The two replacement scenarios are for diesel light vans equal or less than 4 tonnes (Scenarios 1 to 3) and for both diesel light vans and diesel light goods vehicles (i.e.  $\leq 4t$  and 4 to 5.5t, Scenarios 4 to 6). Table 1 also presents a sensitivity case which accounts for the possibility of the lower LPG fuel price attracting vehicle owners, such as private car and medium goods vehicle owners (above 5.5t but below 24t), to switch to LPG powered light vans or light goods vehicles.

**Table 1: Summary of LPG Light Vans/Light Goods Vehicles Replacement Scenarios**

Scenario	2001		2010		2010 (Sensitivity case <sup>1</sup> )	
	No of Vehicles	Tonnes LPG	No of Vehicles	Tonnes LPG	No of Vehicles	Tonnes LPG
1. light vans, pre-Euro (pre '95)	21,369	49,193	17,492	52,239	25,538	83,225
2. light vans, pre-Euro + Euro I (pre '97)	26,189	60,290	21,437	64,022	31,298	93,472
3. light vans, pre-Euro + Euro I + Euro II	39,215	90,277	32,100	95,866	46,866	139,964
4. light vans and light goods vehicles, pre-Euro (pre '95)	40,087	135,842	32,814	144,253	47,908	210,608

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5. light vans and light goods vehicles, pre-Euro + Euro I (pre '97)	48,519	164,415	39,716	174,595	57,985	254,908
6. light vans and light goods vehicles, pre-Euro + Euro I + Euro II	68,396	231,772	55,986	246,122	81,740	359,338

Note: (1) Sensitivity case assuming 2% annual increase in vehicle numbers

### 5. Task 1 : Vehicle Replacement Scenarios and LPG Demand Analysis

Task 1 of the study has identified six scenarios for introducing LPG light vans and light goods vehicles and estimated the LPG consumption for each. LPG availability and the commercial viability of replacing diesel vehicles are also discussed.

- (i) In 2001, there are 68,396 light diesel vehicles, including 39,215 light vans and 29,181 light goods vehicles. Over the past 10 years, the number of light diesel vehicles has shown an annual decrease of approximately 2.2%. Assuming that this trend continues, there will be around 55,986 light diesel vehicles in 2010, with this diminishing fleet of vehicles being used more extensively and running a higher mileage.
- (ii) LPG light vans and light goods vehicles have comparable road performance to diesel vehicles except the former are more environmentally friendly.
- (iii) The maintenance frequency and costs for LPG light vans and light goods vehicles are similar to those for conventional fuelled (i.e. petrol and diesel) vehicles, but the capital cost for such LPG vehicles may be 5 to 30% higher.
- (iv) There is currently no duty on LPG, and LPG prices at dedicated filling stations are lower than those at retrofitted filling stations. Based on the pump price at dedicated stations at the time of the study, LPG could cost up to 42% less than diesel but the actual cost difference will depend upon the price at individual LPG filling stations and the duty charged on diesel. However, LPG is less efficient than diesel in that one litre of LPG produces 45% less mileage than one litre of diesel. But still fuel cost per kilometer will still be lower for LPG than diesel.
- (v) Annual LPG demand for replacing all light vans would be 90,277 tonnes and for replacing all light vans and light goods vehicles would be 231,772 tonnes. The LPG demand is expected to grow in the future assuming they travel a higher mileage.

### 6. Task 2 : Feasibility of Utilising Existing Terminals

Task 2 of this study has considered the technical feasibility of increasing the LPG throughput at existing LPG terminals to meet the LPG supply requirements under the different scenarios of introduction of LPG light vans and light goods vehicles.

- (vi) As the throughput of the existing LPG terminals is already allocated for the supply of LPG taxis and also LPG light buses, there is no spare LPG terminal throughput for supporting LPG light vans and light goods vehicles.

- (vii) The possibility of increasing throughput of the existing LPG terminals is constrained, at individual terminals, by the tanker loading facilities and minimum storage requirements that are set to cater for typhoon situations. While the LPG jetty facilities could handle an increase in LPG shipment, the storage constraints makes it impracticable to extend the use of LPG to more vehicles other than 18,000 taxis and 6,000-odd light buses.
- (viii) The lack of space in existing terminals also restricts the feasibility of building additional LPG storage and loading facilities at the existing terminals in the medium term (2 to 5 years). Even if new storage facilities would be developed in other designated areas in Hong Kong, it would take over 5 years to have them completed.
- (ix) Even if additional storage and loading facilities could be built at existing terminals to such a scale as will provide adequate LPG supply to light vans and light goods vehicles, the additional LPG throughput at the terminals would lead to an unacceptable increase in risk levels to the population within the consultation zone of the LPG terminals. Also, the increased LPG demand will lead to an increase in the number of marine and road tankers transporting LPG to the terminals and filling stations, resulting in an unacceptable increase in transport risk.

### **7. Task 3 : Feasibility of Importing LPG from Mainland China**

This task has considered the supply of LPG across the boundary from Mainland China directly to LPG filling stations in Hong Kong, with respect to: LPG supply options, additional infrastructure requirements, transport risk, commercial viability and optimum supply option.

- (x) LPG suppliers in Mainland China have indicated that they can provide LPG with the same specification in Hong Kong.
- (xi) As there are currently no Ro-ro ferry pier for sea transport of LPG by tankers between Mainland China and Hong Kong, only road transport of LPG by tankers can be considered at this stage. Setting up ferry piers would be very expensive even if suitable sites could be identified.
- (xii) To ensure the responsibility of gas safety, the company importing LPG from Mainland China to Hong Kong would have to either apply for registration as a gas supply company in Hong Kong or to form agreements with the registered gas supply companies. Also, LPG road tankers have to meet Hong Kong specifications.
- (xiii) Comparing with LPG supply from local terminals, the transport risks for LPG supply from Mainland China would be lower for the Northern part of the New Territories but would be higher for Hong Kong Island and Kowloon areas due to longer travelling distance in the SAR.
- (xiv) The cost per tonne of LPG imported from China by road tankers is 75% higher than that of existing arrangement due to higher delivery costs. The traffic condition at the boundary would also greatly affect the road tanker delivery time and hence the reliability of gas supply.

**8. Task 4 : LPG Filling Station and LPG Vehicle Maintenance Workshop Requirements**

Task 4 of this study has reviewed the infrastructure support requirements for the LPG filling station network and LPG vehicle maintenance workshops for the different scenarios identified in Task 1.

- (xv) It was estimated that 88 additional LPG filling stations (assume 4 LPG nozzles each) and 301 additional LPG vehicle service bays would be required for replacing all light vans.
- (xvi) It was estimated that 153 additional LPG filling stations (assume 4 LPG nozzles each) and 525 additional LPG vehicle service bays would be required for replacing all light vans and light goods vehicles.
- (xvii) Since the LPG filling station network for taxis is still under development and potential sites for adding motor LPG filling facilities are limited, it is unlikely that it will be practicable to provide the filling capacity required for LPG light vans and light goods vehicles. It would also be difficult to provide LPG vehicle workshops of an adequate number to cater for their needs.

**9. Overall Conclusions**

Replacement of diesel light vans and light goods vehicles with LPG vehicles is not practicable because the supply of LPG from existing terminals is inadequate, increasing the throughput at the terminals would lead to an unacceptable increase in risks and it would be over 5 years down the road even if investment is forthcoming (which is highly doubtful) for setting up new LPG storage facilities in Hong Kong. The network of LPG filling stations and workshops for LPG light vans and light goods vehicles are also constraints that could not be resolved. These factors render introducing LPG light vehicles to Hong Kong infeasible.