

Paying for a Cleaner Bus Fleet

How Government can Break the Log Jam

November 2009

Eric Heimark

Helena Lalogianni

Mike Kilburn

Christine Loh

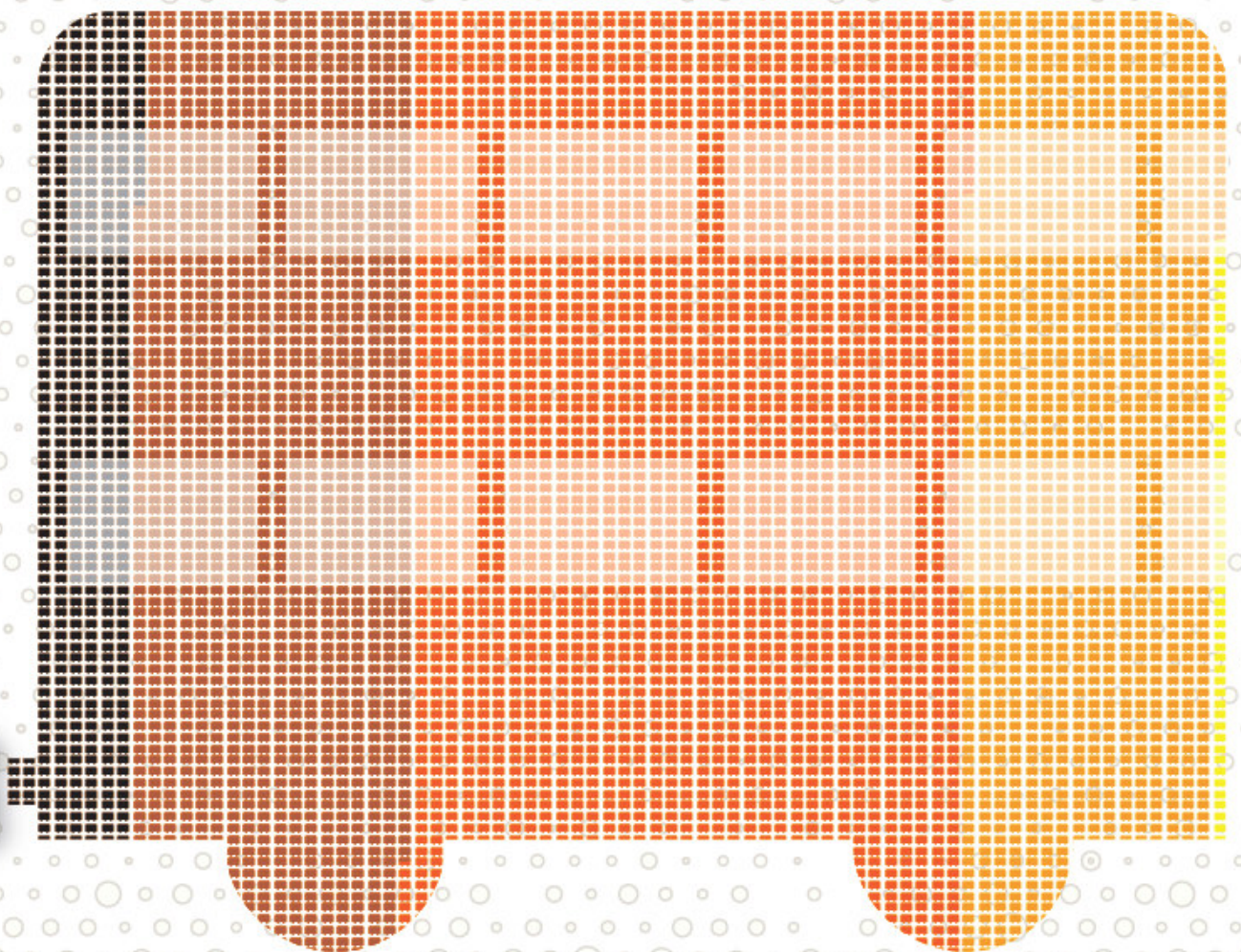


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Acknowledgements



This paper focuses on the legal and regulatory framework for franchised buses and examines how they operate in Hong Kong. This sector carries important implications for assessing Hong Kong's effectiveness in reducing roadside air pollution from buses.

While the bulk of the credit for this paper belongs to Eric Heimark (a Civic Exchange intern visiting from Yale University in 2009) and Helena Lalogianni (who contributed to the understanding of the bus franchise agreements), a number of people have provided important assistance. These include three other interns - Yves Wan, Nat Rudarakanchana, and Alistair Brown, who each made significant contributions to the content and accuracy of the finished product, to Bill Barron of the Hong Kong University of Science and Technology, for invaluable insight into the Hong Kong transport sector, Andrew Lawson of Civic Exchange, for guidance in setting the original direction, and Mike Kilburn to bringing the final product to print.

A number of subscribers to the Clean Air Initiative - Asia listserver, and SgForums - which has a chat room dedicated to Singapore's buses - also provided invaluable insight or sources of information. Thank you.

Introduction



The prima facie case for improving environmental standards in Hong Kong public transport is strong: population density is high and public transport is widely used, hence tightening environmental emission standards in franchised public buses carries a range of public health benefits.

Hong Kong is one of the most densely populated areas in the world, with a population of over 7 million inhabiting a land area of only 1,100 square kilometres (425 square miles). The resulting high population density has enabled the establishment of highly efficient transport systems and innovative support mechanisms, namely the Mass Transit Railway (MTR), the Octopus card electronic payment system, public ferries connecting outlying islands with Hong Kong Island and the New Territories, an escalator from Central to the Mid-Levels on Hong Kong Island, an electric tram service, and a well-developed network of tunnels and highways.

Based on usage, public transport in Hong Kong appears to be an unqualified success: every day over 11 million passenger trips are made on that system. Perhaps even more impressive, these trips account for over 90% of daily traffic.¹ Bolstered by its unique geography and density, Hong Kong has installed a myriad of affordable, reliable and safe public transport options that may not be economically or politically viable in other environments. By expanding the public transport sector, Hong Kong has been able to minimize operational expenses, reduce traveller opportunity costs from traffic, mitigate greenhouse gas emissions, and improve overall efficiency. Franchised buses account for over one third of the public transport passenger flow in Hong Kong.

Nevertheless, "dirty" public transport remains a very serious threat to Hong Kong's environment, especially air pollution, which imposes significant costs on visibility, public health, and the economy. According to the Hedley Environmental Index, from January 2004 to January 2009, Hong Kong air pollution was responsible for HK\$12.5 billion in direct health care costs and productivity losses, and HK\$87.5 billion in intangible losses.² That is an average of approximately HK\$2.5 billion in direct losses and HK\$17.5 billion in indirect losses per annum. While a sizable portion of the air pollution affecting Hong Kong originates in nearby Guangdong Province, recent studies demonstrate that Hong Kong's own emissions are the dominant sources affecting the territory 53% of the time, and roadside emissions are responsible for some of the most harmful health effects.³

¹ The Government of the Hong Kong Special Administrative Region, "Public Transport Introduction", Transport Department, http://www.td.gov.hk/transport_in_hong_kong/public_transport/introduction/index.htm (accessed July 27, 2009).

² Hedley Environmental Index, Dollar Cost, <http://hedleyindex.sph.hku.hk/> (accessed July 27, 2009).

³ Civic Exchange Relative Significance of Local vs Regional Sources: Hong Kong's Air Pollution (March 2007).

Hong Kong's commercial diesel fleet (franchised public buses, non franchised public buses and commercial light and heavy vehicles) is responsible for 90% of RSPs (i.e. suspended particulates smaller than 10 micrometers that have the ability to penetrate deep into the lungs), and 80% of nitrogen dioxide emissions from the entire road transport sector.⁴ Because of the high utilization rate, despite comprising less than one third of the vehicle fleet on Hong Kong's roads, the commercial diesel fleet is estimated to account for as much as 70% of the total distance travelled.⁵ The commercial diesel fleet is therefore the dominant roadside polluter in Hong Kong.⁶

Although franchised public buses are by no means the only diesel vehicles on Hong Kong roads, they are a sizable and highly visible segment of the commercial diesel fleet. Ferrying millions of passengers each day around Hong Kong Island, Kowloon, and the New Territories, heavy public buses are responsible for some of the most harmful emissions in terms of proximity to the population and continuous emissions in terms of operational hours, thereby contributing to about 40% of roadside emissions.⁷ Improving emissions from the franchised public buses is critical because of their extensive coverage of Hong Kong's road transportation network.

The franchised public bus transport sector presents a unique opportunity for government action, because bus operators are already subject to a legislative and regulatory framework that requires franchise operators to adhere to environmental performance standards for the purpose of reducing exhaust emissions. Since the regulatory framework already exists, the question is why the HKSAR Government has not bought forward the replacement of the older and more polluting buses in line with comparable cities like Singapore.

Singapore's public bus companies are investing in the newest Euro V engine standards and compressed natural gas (CNG) buses. Singapore has been substantially more proactive in replacing its older buses with environmentally friendlier models. Figure 1 shows that Singapore's commitment to upgrading its public bus fleet is significantly ahead of Hong Kong's, with 860 buses of its total fleet of 4,353 buses, or 20%, with engine classes above Euro IV and above, whilst Hong Kong's fleet comprises less than 1%, or only 53 buses. In addition, Singapore has also continued to order up to 500 clean-running buses per year to replace its oldest buses.⁸

⁴ Ibid.

⁵ Friends of the Earth (HK), Heavy Vehicles Standards, http://www.foe.org.hk/uploaded_files/heavy_vehicles_standard_1e1.pdf (accessed July 27, 2009).

⁶ Ibid.

⁷ Edward Yau: verbal statement in LegCo Environmental Affairs Panel, July 29, 2009.

⁸ Green Car Congress, Singapore Orders 400 Scania Euro 5/ EEV City Buses, September 8, 2008, <http://www.greencarcongress.com/2008/09/singapore-order.html> (accessed July 27, 2009).

Figure 1: Comparison of bus fleets in Hong Kong and Singapore by engine type

Engine Class	Hong Kong ⁹		Singapore	
	Franchised Buses	Planned year of Retirement	Public buses ^{10,11}	Replaced by (year) ¹²
Pre Euro	456	2012	0	-
Euro I	1,338	2015	2,700	2011
Euro II	2,688	2019	586	-
Euro III	1,233	2026	207	-
Euro IV	53	-	503	-
EuroV/EEV	-	-	357	-
Total	5,768		4,353	

Sources: Legislative Council Paper No. CB(1) 2312/0809(01) & SGWiki.com/wiki/buses

Singapore has shown that alternative policies in running a heavy bus fleet with a reduced environmental impact are both possible and effective.

⁹ Legislative Council Subcommittee on Improving Air Quality. Minutes of the meeting held on 14 May 2009 http://www.legco.gov.hk/yr08-09/english/panels/ea/ea_iaq/minutes/iaq20090514.pdf (accessed 10 September, 2009).

¹⁰ http://sgwiki.com/wiki/De-registration_of_Buses (accessed 19 August 2009).

¹¹ http://sgwiki.com/wiki/Singapore_Bus_Fleet (accessed 17 August 2009).

¹² http://sgwiki.com/wiki/Buses/Bus_Deployments (accessed 17 August 2009).

Overview of the Public Bus Network

INTRODUCTION

The operation of public bus services in Hong Kong is divided into two main sectors: franchised and non-franchised.

The franchised public bus sector is operated by five bus companies and comprises total bus fleet size of about 5,800 vehicles in circulation as at 2009. The five bus operators are subject to franchises awarded by the HKSAR Government and are regulated by the Public Bus Services Ordinance cap. 230 ("PBSO"), which provides for the granting of franchises to operate public bus services on specified routes, and the regulation of the operation and maintenance of such services. The five bus operators are:

- Kowloon Motor Bus Company (KMB);
- New World First Bus Company;
- City Bus Company (CityBus);
- New Lantao Bus Company (NLB); and
- Long Win Bus Company.

Non-franchised buses (NFBs) offer specialized and customized services in niche markets, to/from the airport, hotels, residential estates, and employees shuttle services. This paper deals only with the franchised bus sector.¹³

FRANCHISED BUSES

Hong Kong is one of the few large cities in the world that has no publicly-owned bus services. Instead, the HKSAR Government awards franchises to five privately owned bus operators, whom together operate about 5,768 franchised buses that cover some 700 routes.¹⁴

The Franchise Agreements

The PBSO provides for the granting of franchises by the Chief Executive in Council to operate public bus services on specified routes, and the regulation of the operation and maintenance of such services.¹⁵

¹³ As of 2008, there were about 7,500 non-franchised buses in operation. They are operated by private bus companies to provide specialized custom bus services, reduce crowding on franchised public buses, and operate in areas where franchised buses are not profitable. Where as franchised buses provide public transport in densely-populated areas, non-franchised buses serve several niche markets.

¹⁴ Legislative Council Panel on Environmental Affairs, Pilot Low Emission Zones and Replacement of Old Franchised Buses, July 8, 2009.

¹⁵ Public Bus Services Ordinance 230.

In addition, the PBSO imposes on the operators the requirement to operate a “proper and efficient service”, which includes but is not limited to the provision of extensive and frequent public bus routes for the carriage of passengers with a fare schedule that requires governmental approval from the Commissioner for Transport (the Commissioner). The key elements of the franchises are:

- The open bidding process for selecting and approving franchises;
- Guarantees by operators that they will maintain certain prices, routes, and a percentage of their fleet in service;
- An annual Forward Planning Programme agreed between the Commissioner and the operators, which monitors the acquisition of new buses and other capital expenditure;
- Provisions outlining the rates of guaranteed returns to the operators;
- Emergency powers for the Chief Executive to suspend or alter the fleet;
- Nationalisation and expropriation terms upon which the government takes possession of bus assets and revokes franchises; and
- Other administrative and maintenance features.

Franchises are granted for an initial period of 10 years, with the possibility to extend by a further 5 and then a further 2 years, or 17 years in total, subject to review.

FIVE YEAR FORWARD PLANNING PROGRAMME

The bus operators work on a five year rolling Forward Planning Programme, as required by Section 12A of the PBSO.¹⁶ The operators are required by the Commissioner to submit their five-year rolling programme each year in November, which the Transport Department is required to approve by April the following year. The programme covers the operators’ operations and maintenance, and includes routes and schedules, fleet maintenance, retirement of older vehicles and proposed capital expenditure (acquisition of new buses). There is no public participation in this process.

As part of this annual assessment, the Transport Department also monitors the bus operators’ fleet for compliance with an Agreement entered into in 1997, between the Transport Department and the bus operators. In this Agreement the bus operators have committed to retire buses from their fleets before the anniversary of the 18th year from first registration, or specifically, once they reach 17 years and 364 days in operation (the 18 year rule).¹⁷ Non-compliance with this Agreement is subject to financial penalties imposed by the Transport Department. It would appear that this is the only mechanism in the PBSO and the franchises, which determines the age of each operator’s bus fleet in use.

¹⁶ Public Bus Services Ordinance, Section 12A.

¹⁷ Legislative Council Panel on Environmental Affairs, Pilot Low Emission Zones and Replacement of Old Franchised Buses, July 8, 2009.

As the level of financial penalty is not publicly available, it is difficult to surmise whether the penalty is sufficiently prohibitive enough to ensure compliance with this 18 year rule, or whether the operators simply view these fines as a business cost, and continue to run older and more polluting buses.

Appendix II outlines the franchise terms for each of the five operators. It can be seen from the average age of the bus fleets at commencement of the 10 year franchises, that the Transport Department is indeed required to police the operators' bus fleets, as the average life of the bus fleets will exceed the 18 year rule by the time the franchises are due to expire their initial 10 year terms (indeed more than 83% of the total bus fleet will exceed the 18 year rule upon expiry of the current 10 year franchises in 2017).¹⁸

PROFIT CONTROL SCHEME

In its original form, the Profit Control Scheme provided bus operators with incentive to continually expand their capital base, (the acquisition of new buses). This effectively motivated the operators to earn greater profit levels on an ever-expanding capital base, by acquiring new buses. More recently, and since the rationalization of the franchised public bus sector commencing in 1997, the Transport Department has been reviewing the bus operators' guaranteed rates of return, with the objective of keeping bus fares at an affordable level to the public.¹⁹

The current franchises contain a guaranteed rate of return mechanism which governs the financial return to the operators, known as the Profit Control Scheme.²⁰ The operators' return is a function of the (net) fixed assets utilised by the franchisee in any given year. Prior to 1997, the bus operators enjoyed permitted returns of 16% on their net fixed asset levels. In 1997 however, the HKSAR Government and the Transport Department reviewed the bus operators' levels of permitted return, and this rate was adjusted to 13%. Since 1997, the HKSAR Government has taken into account a basket of factors²¹ when assessing franchised bus fare price levels, and in line with this regulation, maximum permitted returns to the operators are 9.7% per annum. It has been a political objective of the HKSAR Government to keep bus fares low to reduce discontent.

The Profit Control Scheme is reviewed every two years by the Transport Department and the Chief Executive in Council.

¹⁸ Public Bus Services Ordinance – individual franchises.

¹⁹ Legislative Council Brief, Review of the Basis for Considering Bus Fare Adjustments, January 10, 2006.

²⁰ Public Bus Services Ordinance 230 S 26.

²¹ Legislative Council Brief, Review of the Basis for Considering Bus Fare Adjustments, January 10, 2006.

FINANCIAL STRUCTURE DICTATION BUS OPERATOR'S BEHAVIOUR

The franchises provide for depreciation of buses calculated on a straight line basis (the same fixed amount every year, calculated as the total cost divided by the numbers of years), ranging from 12-15 years from the date of first registration or manufacture, whichever is applicable for new and used buses respectively. Once fully depreciated, residual values for buses are nominal compared to the acquisition cost of a new bus (as low as HK\$100), and hence represent a nominal asset value on the bus operator's balance sheet.

Separate from the HKSAR Government's overriding objective to keep bus fares at an affordable level to the public,²² the bus operators' behaviour should be dictated by the existence of the Profit Control Scheme as follows. Given the lifespan of the buses arising from the depreciation schedule (12-15 years), there is no incentive for the operators to utilise buses that are older and fully depreciated, as this lowers the value of assets in the bus operators' balance sheet. The operators' financial return is a rate of return (9.7%) on net fixed assets, the higher the level of net fixed assets, the higher the rate of return. The bus operators are therefore motivated (or should be), to continually increase the value of their asset base, so as to generate higher levels of net profit derived from the value of their fixed assets.

In theory therefore, the environmental impact of this motivation, combined with the 2006 Environmental Protection Department (EPD) requirement that new bus registrations must comply with engines of Euro IV and above, means that the bus operators should be continually renewing their bus fleets, and hence bringing forward the introduction of less polluting buses.

But this is not the case. We know that 99% of the bus fleet in circulation comprises engine classes of Euro III and below. The bus operators' commercial operations are being driven not entirely by the terms of the franchise agreements and the regulatory framework in place, but also by the HKSAR Government's overriding desire to keep bus fares low. The acquisition of new buses translates into higher operating costs for the bus operators, which in turn necessitates higher bus fares.

This leaves us with the question of how the HKSAR Government decides what the balance should be between affordable bus fares and a more costly, but less polluting bus fleet (and higher fares) that does not threaten public health.

²² Ibid.

The Environment and the Regulatory and Legal Framework

Hong Kong regulates exhaust emissions and emissions standards and certifications exist for all heavy-duty commercial diesel vehicles, including franchised and non-franchised buses.

Emissions from diesel engine buses comprise the following toxic substances. In newer diesel engine vehicle emissions, over 90% of the exhaust gas is carbon dioxide.

- Sulphur dioxide
- Particulate Matter
- Oxides of Nitrogen
- Hydrocarbons
- Carbon Monoxide
- Carbon Dioxide

REGULATING THE EMISSIONS DERIVED FROM HEAVY DIESEL BUS ENGINES

The internationally-recognized Euro emission standards have been defined in European Union directives and set acceptable limits for exhaust emissions. Hong Kong has adopted these standards and in October 2006 the EPD, mandated the Euro IV engine standard for newly registered commercial diesel vehicles. In addition, the EPD subjects all commercial diesel vehicles to annual environmental certification.

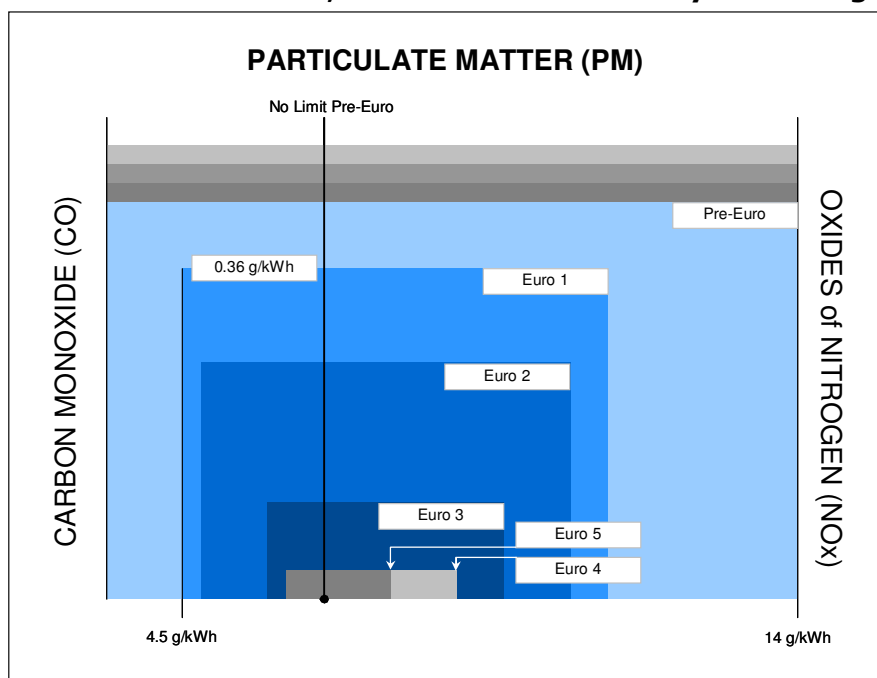
It is worth noting that the differences in emissions between the Euro engine standards are significant. For instance, when comparing Euro IV and Euro III emissions, the EPD notes: "a Euro IV commercial diesel vehicle emits about 80% and 30% less respirable suspended particulates (RSP) and nitrogen oxides (NOx) respectively, than a Euro III model."²³

Figure 2 depicts cumulative emissions limits for PM, CO and NOx, in the evolution of the Euro engine class, ranging from pre Euro engines to Euro V. Needless to say the emissions from the older Euro engine classes, particularly pre Euro, Euro I and Euro II engines, are many multiples higher than the newer environmentally friendlier engine

²³ Ibid. See Appendix I.

classes. In a comparison of pre Euro engines with Euro V engines, the reduction since 1990 in NOx emissions has been 86%, and similarly since 1993, the reduction in Particulate Matter (PM) emissions has been 95%. Appendix I compares emissions for Euro class diesel bus engines for NOx and PM.

Figure 2. Emissions of CO, PM and NOx from heavy diesel engines²⁴



However, this new Euro IV standard does not apply to vehicles that are already registered (99% of current fleet in circulation) and, the legislation does not require *existing* vehicles to improve their environmental performance. (see Environmental Initiatives of the Transport Department below)

There is one other form of environmental control. Buses already registered in Hong Kong are subject to two environmental checks: an annual Certificate of Road Worthiness examination, and a Certificate of Fitness examination.

EXISTING ENVIRONMENTAL CERTIFICATION

Certificate of Roadworthiness

The Certificate of Roadworthiness is an annual test designed to check general car safety and the level of emissions.²⁵ The certification includes tests on brakes, the fueling system, steering, and suspension. The certification also sets a cap on

²⁴ Source: Alexander Dennis Bus.

²⁵ "Vehicle Roadworthiness in Hong Kong," AngloINFO, <http://hongkong.angloinfo.com/countries/china/hongkong/vrt.asp> (accessed July 27, 2009).

emissions (i.e. the "maximum permitted smoke or vapour level") at 50 Hartridge Smoke Units (H.S.U.) for newer vehicles or 60 H.S.U. for older vehicles.²⁶

The H.S.U. scale runs from 0 to 100, with a lower H.S.U. representing less harmful emissions and a very high H.S.U. value making breathing extremely difficult. The Certificate of Roadworthiness' 50 H.S.U. maximum cap is comparable with the caps of a few developing nations, namely India²⁷, but is still less stringent than those of Thailand and Pakistan.²⁸ It is important to note that the H.S.U. test currently implemented by the Certificate is a test of smoke density, *not* toxicity.

Certificate of Fitness

While the Certificate of Roadworthiness is conducted annually, the Certificate of Fitness, in contrast, is required only on NFBs and mandated every three years, starting from the 13th year after the date of manufacture.²⁹ The Certificate of Fitness is more concerned with the safety of the bus frame, than with testing engine efficiency and exhaust emissions. During the test, "paint work," "seats," and "side panels" are inspected in order to ensure that they meet an acceptable standard.³⁰ Although all the "braking systems are overhauled," engine efficiency and smoke emissions are not tested.³¹

ENVIRONMENTAL INITIATIVES

With respect to the environment and specifically to the issue of emission standards, the franchises agreements have evolved. A comparison of older and newer franchises shows that the HKSAR Government intends to introduce cleaner buses into the franchised bus fleet.³²

The Transport Department is currently in discussions with the five bus operators to introduce measures to improve the emission standards of the existing bus fleet. Potential policy measures include the following options:³³

²⁶ Government Logistics Department, Road Traffic Regulation 2007, Hong Kong Government Gazette 150, http://www.gld.gov.hk/cgi-bin/gld/egazettegazettefiles.cgi?lang=e&extra=&year=2007&month=07&day=06&vol=11&no=27&gn=150&header=1&df=1&nt=s2&acurrentpage=12&agree=1&newfile=1&gaz_type=ls2 (accessed July 27, 2009).

²⁷ Gordon McGranahan and Frank Murray, eds. *Air Pollution and Health in Rapidly Developing Countries* (2003; repr.).

²⁸ "Emission Standards for In-Use Diesel Vehicles," Clean Air Net, http://www.cleanairnet.org/caiasia/1412/articles-58969_diesel.pdf (accessed July 27, 2009).

²⁹ Transport Department, "Vehicle Examination," Public Services, http://www.td.gov.hk/en/public_services/vehicle_examination/vehicle_examination/index.htm (accessed July 27, 2009).

³⁰ Ibid.

³¹ Ibid.

³² S26(1) and S26(2) of the Franchise Agreements.

³³ Legislative Council Panel on Environmental Affairs, *Pilot Low Emission Zones and Replacement of Old Franchised Buses*, July 8, 2009.

- By 2012 all pre Euro engine buses will have been retrofitted with Diesel Particulate Filters ("DPF") to upgrade their emissions standards to Euro IV equivalent or above;
- By 2015 all Euro I engine buses will have been retrofitted with Diesel Particulate Filters ("DPF") to upgrade their emissions standards to Euro IV equivalent or above;
- The operators are being "encouraged" to retrofit Diesel Particulate Filters ("DPF") on all buses with Euro II and III engines;
- The use of Ultra Light Sulphur Diesel ("ULSD") by the bus operators as a Transport Department minimum requirement; and
- The acquisition of new bus fleets with Euro V engine standards and hybrid buses.

In line with these measures above, those bus operators who have entered into recent franchise negotiations for renewal (KMB, CityBus, NLB), must meet certain measures to reduce the exhaust emissions of their bus fleets, as part of a Government Directive entered into between Transport Department and the bus operators in 2006-2007.³⁴

KMB for instance, which operates almost 77% (3,933 buses) of all franchised buses in Hong Kong, is required to progressively install Diesel Particulate Filters (DPF's) on 1,675 Euro II and III buses (42% of its fleet), and to reduce their emissions to meet the Euro IV standards. This upgrade scheme is required to be in place by 2010.³⁵

Notwithstanding the October 2006 legislation mandating Euro IV engines on newly registered buses, and initiatives by the HKSAR Government and Transport Department to introduce environmental performance standards into the franchises, 99% of all franchised buses in circulation on Hong Kong roads are below the Euro IV standard. The table below itemizes the total bus fleet in terms of engine classification:

³⁴ Legislative Council Panel on Environmental Affairs, Pilot Low Emission Zones and Replacement of Old Franchised Buses, July 8, 2009.

³⁵ KMB Co. 2008 Annual Report.

Figure 4: Comparison of franchised bus fleet by engine class

Engine Class	Hong Kong ³⁶	
	Franchised Buses	% of total fleet
Pre Euro	456	7.9
Euro I	1,338	23.2
Euro II	2,688	46.6
Euro III	1,233	21.4
Euro IV	53	-0.9
EuroV/EEV	-	-
Total	5,768	100

Sources: Legislative Council Paper No. CB(1) 2312/0809(01) & SGWiki.com/wiki/buses

ENVIRONMENTAL REGULATION WITHIN THE FRANCHISE AGREEMENTS

With respect to the environment and specifically to the issue of emission standards, as outlined in the section above, franchises recently entered into with the HKSAR Government have evolved compared to earlier agreements. There is clear intent within the government to introduce environmentally friendly buses with the specific purpose of reducing exhaust and noise emissions. Section 26 of the franchises states:

- S26(1) When acquiring new buses and setting specifications for such acquisition, the Grantee shall, as far as reasonable practicable, adopt the latest commercially available and proven technologies to reduce exhaust and noise emissions.
- S26(2) The Grantee shall adopt at such time and in such manner, such commercially available and proven technologies and products on its existing and newly acquired buses as the Commissioner may reasonably specify after consultation with the Grantee for the purpose of reducing exhaust and noise emissions in the operation of the Bus Service.³⁷

Three out the five franchises (see Appendix II) contain the amendment to section 26(2), which regulates the environmental performance of the bus fleets for both existing and newly acquired buses, including KMB, the largest operator. The older franchises only required section 26(1), which only set standards for newly acquired buses, not existing buses.

The franchises provide for the establishment of Passenger Liaison Groups intended to liaise, communicate with and receive the opinions of the public to assess and improve

³⁶ Legislative Council Subcommittee on Improving Air Quality. Minutes of the meeting held on 14 May 2009 http://www.legco.gov.hk/yr08-09/english/panels/ea/ea_iaq/minutes/iaq20090514.pdf (accessed 10 September, 2009).

³⁷ Public Bus service Ordinance Franchises.

the standards of the operators' service. Passenger Liaison Groups are required to meet at least once every 2 months. The issues of these groups are operational in nature however, and do not deal with matters related to emission standards, trade-offs between fare levels and the introduction of cleaner buses, or to the environment in general.

The franchises also provide for Passenger Satisfaction Surveys to be conducted by the bus operators, at the request of the Transport Department. This mechanism appears to be the only conduit through which the Transport Department gauges the public's reaction to:

- (a) The introduction of acceptable emissions caps;
- (b) Tolerance/pain threshold of passengers to fare increases in relation to acquiring cleaner buses; and
- (c) The trade-off between low fares, regular bus services and cleaner air.³⁸

Recent Passenger Satisfaction Surveys conducted on behalf of the Transport Department by the EPD and the Central Policy Unit in 2005 and 2006 have analysed the relationship of the fare setting mechanism (see basket of factors below) with the cost of the introduction of cleaner, environmentally friendly buses. These studies provided for fare increases of up to 15% (based on this criteria), and have been submitted to the Legislative Council's Environmental Affairs Panel for consideration. These projected fare price increases (up to 15%) have not been supported by the Transport Department, and this has been documented for impeding deliberation by legislators.³⁹

In assessing franchised bus fare adjustment applications for the purpose of making recommendations to the HKSAR Government, the Transport Department will include a basket of factors, which include:

- Changes in operating costs and revenue since the last fare adjustment;
- Forecasts of future costs, revenue and return;
- The need to provide the bus operators with a reasonable rate of return;
- Public acceptability and affordability; and
- Quality and quantity of services provided.

³⁸ Legislative Council, Paper No. CB(1)79/09-10, Background Brief on Fare Adjustment for Franchised Buses, October 23, 2009.

³⁹ Ibid.

THE FRANCHISED BUS FLEET AND ITS ENVIRONMENTAL PERFORMANCE

Of the current five franchised bus companies that operate in Hong Kong, KMB is the dominant bus services operator (and one of the largest private operators in the world).

Figure 4. Bus franchise agreements by company

Franchise	Primary Locations	No of Routes	No of Buses	Pssgrs per day	Franchise Length
Citybus	HK Island, Airport	110	~920	571,000	1 July, 2006 - 1 June, 2016 (Franchise 1)[Note 1]
					1 June, 2003 - 1 May, 2013 (Franchise 2) [Note 1]
Kowloon Motor Bus	Kowloon, New Territories	380	~3,900	2,700,000	1 August, 2007 - 1 July, 2017
New Lantau Bus	Lantau, New Territories	23	~100	47,000	1 April, 2007 - 1 March, 2017
Long Win Bus	North Lantau, Airport	18	~160	79,000	1 June, 2003 - 1 May, 2013
New World First	HK Island, Tseung Kwan O	91	~690	480,000	1 August, 2003 - 1 July, 2013

Source: Transport Department ⁴⁰

[Note 1]: "Citybus (Franchise 1)" refers to the franchise held by the Citybus Limited for the provision of Hong Kong Island and cross-harbour bus services, while "Citybus (Franchise 2)" refers to the franchise granted to the same company for the provision of North Lantau and Chek Lap Kok Airport bus services.

Upon expiry of the initial ten year term each of the bus operators have been awarded in their Franchises (see table above), the HKSAR Government is presented with a real opportunity to address the issues of Hong Kong's older and more polluting bus fleet. Given the 18 year rule, and assuming the Transport Department is diligently policing the age of the bus fleet, 3 of the 5 bus operators will have bus fleets that on average, exceed the legal permitted age of buses in circulation, and hence should be retired. This equates to 83% of the total bus fleet as at the date of commencement of the franchises that by 2017 under current law, must be replaced with new buses. See Appendix II.

Rather than extending the franchises (as is allowed under the PBSO), the HKSAR Government may explore ways to finance the acquisition of new buses that are less polluting and in line with other comparable countries like Singapore. As the table above shows, the five franchises are due to expire between May 2013 and July 2017. With HKSAR Government action and the involvement of private sector, it is possible that Hong Kong could renew 83% of its franchised bus fleet by no later than 2017 (based on the average age of bus fleets as at the date of franchise commencement).

⁴⁰ "Public Transport Introduction," Transport Department.

As of February 2009, 4,511 of Hong Kong's 5,768 franchised buses – approximately 77% of the franchised bus fleet, are still Euro II or below,⁴¹ and less than 1% of the franchised bus fleet has adopted the Euro IV standard.⁴²

The table below depicts the number of buses by Euro engine class emission standard in the fleets of the five franchised bus operators.

Figure 5. Classification of engine types by bus company and franchise

	Bus company						Total	
	Kowloon Motor Bus Company Limited	Citybus Limited (Franchise 1) [Note 1]	New World First Bus Services Limited	Long Win Bus Company Limited	Citybus Limited (Franchise 2) [Note 1]	New Lantao Bus Company Limited	No.	Cumulative (%)
Pre-Euro	371	48	34	3	0	0	456	7.9%
Euro I	938	312	82	0	4	2	1,338	31.1%
Euro II	1,487	370	475	136	167	53	2,688	77.7%
Euro III	1,099	10	72	18	0	34	1,233	99.1%
Euro IV	7 [Note 2]	13	18	0	0	15	53	0.9%
Total	3,902	750	681	157	171	104	5,768	100%

Source: Legislative Council Paper No. CB(1)2312/08-09(01) ⁴³

[Note 1]: "Citybus (Franchise 1)" refers to the franchise held by the Citybus Limited for the provision of Hong Kong Island and cross-harbour bus services, while "Citybus (Franchise 2)" refers to the franchise granted to the same company for the provision of North Lantau and Chek Lap Kok Airport bus services.

[Note 2]: The figure includes one bus that has been retrofitted with a Euro V engine for trial.

Notwithstanding the legislation of the Euro IV standard in 2006 by the EPD, the existence of the 18 year rule and the numerous measures undertaken by the Transport Department to improve emissions standards, Hong Kong's ageing fleet does not seem to be retiring from operation anytime soon. A July 2009 Legislative Council report summarized the fleet retirement programme as follows:

⁴¹ Ibid.

⁴² Ibid.

⁴³ Legislative Council Subcommittee on Improving Air Quality
http://www.legco.gov.hk/yr08-09/english/panels/ea/ea_iaq/minutes/iaq20090514.pdf
 (accessed September 10, 2009).

"Based on the age distribution of the existing franchised buses, it is anticipated that all the pre-Euro, Euro I and Euro II buses will retire by 2012, 2015 and 2019 respectively, while Euro III buses will retire by 2026."⁴⁴

If we are to rely on the above statement, Hong Kong's franchised public bus operators may continue to operate an ageing and heavily polluting fleet for at least another 17 years. If the rate of fleet retirement does not accelerate, Hong Kong's bus fleet will not be on a minimum of Euro IV engine bus standards for another two decades – and Euro IV is not even the highest currently available standard (Euro V came into effect in 2008)!

⁴⁴ Legislative Council Subcommittee on Improving Air Quality: Minutes of the meeting held on 14 May 2009 http://www.legco.gov.hk/yr08-09/english/panels/ea/ea_iaq/minutes/iaq20090514.pdf (accessed September 10, 2009).

Conclusion



Whilst the current legal and regulatory framework for the franchised bus sector appears to offer opportunities to reduce exhaust emissions, this will not be achieved if the overriding focus of the Transport Department is to maintain the lowest fares rather than to accelerate emissions reductions from buses and address the Hong Kong's very unhealthy roadside air quality. The ageing bus fleet and the lack of aggressive policy to introduce environmentally friendlier buses to the bus operators' fleets is a major contributor to the needlessly high health costs borne by the Hong Kong public.

At face value, it appears that the Hong Kong bus operators have no incentive to retire older buses and replace them with newer and less polluting vehicles. At least 77% of all franchised buses are on Euro II engines standards and below, and the last of these are not scheduled to retire before 2019, notwithstanding the following measures below:

- (a) Evolution of the franchise agreements (Section 26 (2)) to allow the introduction of environmental performance standards on both existing and new buses to cap exhaust emissions;
- (b) Introduction of the Euro IV engine standard in 2006 by the EPD on newly registered buses; and
- (c) Various measures undertaken by the Transport Department to reduce emissions;

Environmental pollution is a classic example of a negative externality (i.e. a spillover cost that buyers and sellers do not take into account in their transactions) that requires government intervention. The HKSAR Government needs to implement policies similar to those that are now common in high-income economies, to ensure that public transport is minimally harmful to the bus-riding public and to even larger numbers of people who live, work, walk and wait near congested bus routes.

Unlike the government-sponsored transit systems of many other cities, Hong Kong bus operators are private companies, and they therefore have a strong profit motive. Franchised bus operators in Hong Kong seek increased profits to maximize returns to their shareholders. There are a variety of ways that the bus operators can keep costs low, but the easiest and most effective way is to prolong the life of their existing vehicles, even if these vehicles are harming public health. Without effective and prohibitive policy that penalizes companies that use dirty buses, bus operators have no incentive to accelerate the rate at which they retire old vehicles.

When placing bus franchises out to tender, the HKSAR Government selection criteria ignores environmental performance – franchises are awarded to the most economical bidder. There is therefore no incentive currently in the regulatory framework (the PBSO) or the franchises themselves, for bus operators to improve their environmental performance as a prerequisite to being awarded contracts.

Hong Kong can begin to address the problem by playing to three of its historical strengths – privatization, competition, and innovation. For instance, by introducing “environmental performance” as a criterion for the granting of bus franchises, the HKSAR Government can encourage “green competition” in addition to low prices and corporate efficiency.

By enforcing the retirement of older buses (those exceeding the 18 year rule) or setting emissions caps standards, the HKSAR Government can prevent bus operators from undercutting each other by utilizing the cheapest, oldest, and dirtiest buses on the road – the HKSAR Government should legislate to keep a level playing field for all bus operators when it comes to the terms the bus operators are bidding for.

The HKSAR Government should help the public to understand the cost for new buses and cleaner air is not to be borne entirely by bus riders. The costs will in fact be borne by the shareholders of the bus companies and bus passengers. Where subsidies may be appropriate (such as to renew the bus fleet earlier as noted in this paper), the costs will also be shared by the public purse. By explaining how costs are shared, it will be more likely to win public and legislative approval.

The potential for improvement is substantial and achievable, and the benefits, namely cleaner air for the Hong Kong public, are enormous. A list of policy recommendations follows.

Policy Recommendations



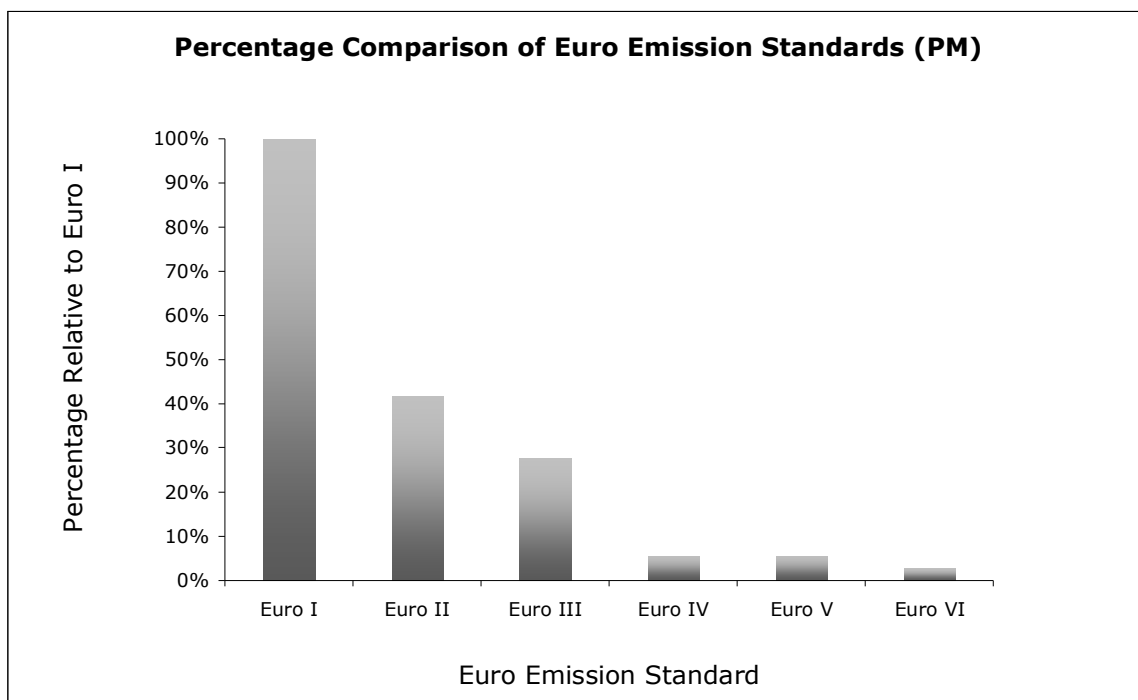
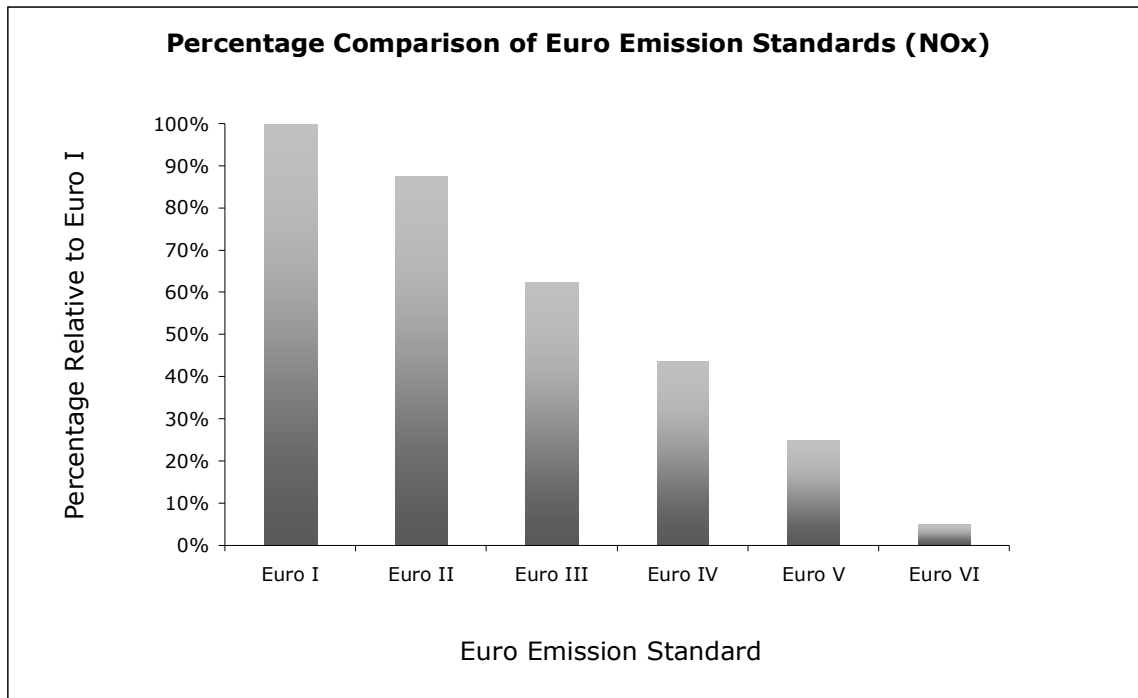
In order to improve Hong Kong's air quality standards there are a number of measures that the HKSAR Government could implement. These might include:

1. Setting a date for all roadworthy vehicles to meet minimum emissions standards (Euro IV is proposed), then mapping a progression to higher standards.
2. Requiring the retirement of all buses beyond 18 years from the date of manufacture. Currently the Transport Department is responsible for policing this rule under section 12A of the PBSO. This is the simplest way to ensure older and more polluting buses are retired from circulation, and this would not require any restructuring of the existing franchise agreements. Enforcement of the 18-year rule would achieve the retirement of up to 83% of the total bus fleet by 2017 (based on the average age of the bus fleets as at the date of the commencement of the franchises).
3. The introduction of public finance initiatives (as with the United Kingdom's adoption of the Public Finance Initiative model), and the creation of a legal and regulatory framework to assist both the HKSAR Government and the bus operators in financing the acquisition of cleaner and environmentally friendlier bus fleets.
4. After the next upgrade to Euro IV engine classes, the government should be exploring the next upgrade that could take place within a decade, where there will be even cleaner fuel source options available, such as natural gas, hybrid and electric buses. The 18 year rule will need to be renegotiated in the next few years on the understanding that Hong Kong's public health and environmental objective is also important and in need of constant review. The government should stay open minded on how it can skilfully use public funds to achieve this objective, as well as to keep bus fares affordable. The government should also adopt a new communication strategy to explain to the public that the cost for bus upgrades will in fact be shared by the shareholders of the bus companies, bus passengers and public funds, representing a more equitable allocation of the associated costs.
5. Reviewing the bus Franchise Agreements to:
 - (a) Incorporate environmental performance standards, especially for emissions of toxic pollutants (and possibly greenhouse gases);
 - (b) Incorporate "green competition," namely the use of more efficient vehicles and environmentally friendly company policies, as part of the bidding criteria when granting franchises; and
 - (c) Introduce environmental performance assessment by passengers in the Passenger Liaison Groups, as means to determine passengers' satisfaction of the bus services vis a vis the environment.

6. Amending the Certificate of Roadworthiness to more stringent limit emission levels, e.g. by using the CDST, a more stringent emissions testing system including reducing the Hartridge smoke emissions cap to 40 H.S.U, for all commercial diesel engine vehicles.
7. Commissioning and eventually publishing an independent study to analyze the most effective ways to reduce environmental pollution from heavy diesel commercial vehicles in Hong Kong, and the costs associated with these options. The study should also address the issue of how costs could be shared by the shareholders of bus companies, bus passengers and the public purse.

Appendix I

Comparative Emissions Standards for Diesel Bus Engines: Particulate Matter and Nitrogen Oxides



Source: <http://www.dieselnet.com/standards/eu/hd.ph> ⁴⁵

⁴⁵ Dieselnet: Regulatory framework emissions standards. EU Emission Standards for HD Diesel Engines, g/kWh <http://www.dieselnet.com/standards/eu/hd.ph>

Appendix II

Comparison of the five franchise agreements

Franchise	Start Date	Allowable depreciation for buses (yrs)	Total fleet at commencement	Average Age of fleet (yrs) at commencement	Expiry date / Average age of fleet upon 10 yrs expiry	Provisions in the Franchise for Environmental compliance
KMB Co.	1 Aug 2007	14	4089	8.7	2017 18.7 yrs	S26 (b) allows for the grantee to adopt commercially available and proven technologies on <u>existing and newly acquired</u> buses, for the purpose of reducing exhaust and noise emissions in the operation of the bus service.
New World First Bus Co. Co.	31 Jul 2003	14	765	5.1	2013 15.1 yrs	S26 only allows for the grantee to adopt commercially available and proven technologies on <u>newly acquired</u> buses, for the purpose of reducing exhaust and noise emissions in the operation of the bus service.
City Bus Co.	1 July 2006	15	765	9.6	2016 19.6 yrs	S26 (b) allows for the grantee to adopt commercially available and proven technologies on <u>existing and newly acquired</u> buses, for the purpose of reducing exhaust and noise emissions in the operation of the bus service.
New Lantao Bus Co.	1 Apr 2007	12	86	6.8	2017 16.8 yrs	S26 only allows the grantee to adopt commercially available and proven technologies on <u>newly acquired</u> buses, for the purpose of reducing exhaust and noise emissions in the operation of the bus service.
Long Win Bus Co.	1 Jun 2003	14	142	5.2	2013 15.2 yrs	S26 (b) allows for the grantee to adopt commercially available and proven technologies on <u>existing and newly acquired</u> buses, for the purpose of reducing exhaust and noise emissions in the operation of the bus service.



Room 701, Hoseinee House
69 Wyndham Street
Central, Hong Kong

Tel: (852) 2893 0213
Fax: (852) 3105 9713
www.civic-exchange.org