

## Recommendations to Hong Kong Special Administrative Region Government for Electric Vehicle Implementation

### INTRODUCTION

The Environmental Protection Department (EPD) has launched the “Hong Kong’s Climate Change Strategy and Action Agenda” (document) for public consultation regarding methods to combat climate change locally in Hong Kong.

Within the “Greening Road Transport” section (5), EPD clearly states Hong Kong’s transportation share, 18%, of the overall Greenhouse Gases (GHG), as well as its car ownership (83 car owners per 1,000 residents) is relatively low compare to other major international cities (i.e. Tokyo: 25% GHG, 350 car owners out of 1,000 residents, and London: 21% GHG, 360 car owners out of 1,000 residents)<sup>1</sup>. Based upon these statistics, one might draw the conclusion that the issue of transportation related GHG emissions and pollutants should not draw the immediate and concentrated effort of the government in addressing. However this conclusion is false, as recent policies and campaigns (i.e. “Replacement of Euro II commercial vehicles”)<sup>2</sup> of EPD highlight their effort to contain and minimize Hong Kong’s road side air pollution index (API) and transportation GHG emissions through the control of nitrogen oxide (NOx) and respirable suspended particle (RSP) emissions. When combined with the congested nature of Hong Kong’s urban landscape, the issue morphs into a critical issue requiring upmost attention.

Addressing this issue, the Hong Kong government envisions 30% of private vehicles will be a hybrid or EV while 15% of buses and goods vehicles will be a hybrid or EV by 2020.<sup>3</sup> Unfortunately, the plan and action to active this vision is not sufficient to achieve these stated goals, in fact lag behind the cities used as reference above. Given Hong Kong’s late start and pressing issue of the negative effects of air pollution on its population, (estimated at HK\$469 million since 18 August 2010)<sup>4</sup>, a more aggressive and focused approach to “green” the transportation in Hong Kong is needed.

Therefore the recommendations presented inside this proposal are targeted at addressing issues presented under the “Greening Road Transport” title of (section 5), particularly the implementation of electric vehicles (EV) in Hong Kong. The proposal will focus on three particular topics: 1. Targeting Transportation’s Largest Polluters, 2. Developing an EV Market, and 3. Encouraging EV Adaptation.

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<sup>1</sup> Environmental Protection Department. (September 2010). Hong Kong’s Climate Change Strategy and Action Agenda: Consultation Document. Section 5.10 and 5.11, p. 29. Retrieved 18 November 2010 from [http://www.epd.gov.hk/epd/english/climate\\_change/files/Climate\\_Change\\_Booklet\\_E.pdf](http://www.epd.gov.hk/epd/english/climate_change/files/Climate_Change_Booklet_E.pdf)

<sup>2</sup> Environmental Protection Department. (28 June 2010). EPD launches funding scheme for replacing Euro II commercial vehicles (Press Release). Retrieved 18 November 2010, from <http://www.info.gov.hk/gia/general/201006/28/P201006280134.htm>

<sup>3</sup> See Footnote 1, Section 5.13.a, p.30

<sup>4</sup> According to the Hedley Environmental Index (<http://147.8.71.207/pollution/graph.php>), estimated cost from 18 August to 18 November 2010 for air pollution related premature deaths, hospital bed days, doctor visits and asthma hospitalization costs.

## 1. TARGETING TRANSPORTATION'S LARGEST POLLUTERS

All governments face the pressure to produce tangible results within a short time period to showcase to their citizens how proactive and frugal their decisions and actions are. Acknowledging this pressure, this proposal believes the first action of the Hong Kong government should be directed at the largest sources of pollution in the transportation sector: 1. Non-Road Mobility Machinery, 2. Buses and Light Buses (public and private), and Commercial Vehicles.

### **Non-Road Mobility Machinery**

Non-Road Mobility Machinery (NRMM) consist of vehicles and machinery ranging from airplane tractors to container stackers to rubber tyred gantry (RTG) cranes to earth movers to front loaders<sup>5</sup> that perform specific task outside of the normal vehicle use of transportation. According the government's own figures, these vehicles represent only 2%<sup>6</sup> of the total road vehicles however their NOx and RSP emissions represent 7% (6,800 tonnes) and 11% (600 tonnes) of locally emitted NOx and RSP.<sup>7</sup> These vehicles impact to Hong Kong's overall air condition warrantees immediate attention to move beyond the original suggestion of labeling and encouragement of less polluting models. There are solutions already in the market to convert these vehicles to less polluting or zero emission types of power train to perform their intended task.

One such possible solution is the conversion to a hybrid combination, which would allow the vehicles to operate under both an internal combustion engine and electric motor without the range and power anxiety generally associated with EVs. One success case of this conversation is Hong Kong International Terminals (HIT)'s converse of their RTG cranes. After the conversion, HIT has realized a savings of 57% in diesel cost through the sharing of power between the diesel engine and the electric motor. The use of a hybrid model permitted HIT to shrink the overall size of the engine, which lowered the emissions associated with this particular vehicle for port management. HIT received the savings in diesel fuel saved, while Hong Kong received less emissions of NOx and RSP in addition to the reduction in noise pollution linked to the operation of industrial motors.

Hybridization is not the only option available for NRMMs as many have already been converted to electric (i.e. airport service vehicles) for zero emission operation. Furthermore, NRMMs are suitable for conversion due to their stationary or limited travel function increasing the need to minimize the amount of emissions and noise into the local environment.

### **Policy Recommendation**

*Incentivize the purchase or rental of hybrid or electric NRMMs with increasing disincentive for the use of non-hybrid/electric NRMMs.*

The government should offer a special grant of 15% of the NRMM's rental or current market value as a rebate to encourage the purchase or use of electric/hybrid NRMMs on projects. The incentive should be offered for a maximum of 5 fiscal years, whereas upon completion of the 5 fiscal year period the incentive should be removed and the disincentive will be the largest motivator for the operator.

<sup>5</sup> Environmental Bureau/Environmental Protection Department. Retrieved 18 November 2010 from [http://www.epd.gov.hk/epd/english/news\\_events/events/files/nonroad\\_proposal.pdf](http://www.epd.gov.hk/epd/english/news_events/events/files/nonroad_proposal.pdf)

<sup>6</sup> Ibid.; Civic Exchange. Response to Environment Bureau/Environment Protection Department Proposal Document, "A Proposal to Control Emissions of Non-road Mobility Sources". Retrieved 18 November 2010 from <http://www.civic-exchange.org/wp/wp-content/uploads/2010/08/Non-road-mobile-sources-CE-Submission.pdf>

<sup>7</sup> Ibid.

To further enforce and encourage the take up of hybrid or EV versions of NRMM, the government should use a disincentive first registration duty of 150% of the purchase value or import value with an annual tax of around 15% of the original purchase or import value for all non-electric/hybrid NRMMs. The tax should be raised to 50% of the original purchase [or imported] value upon the non-hybrid/EV NRMM's third year of registration or third year from manufacturing date. The relatively short time represents the realization of the re-export market and methods to avoid taxation. The disincentive method should be used to fund the incentive method.

Hybrid NRMMs, on the other hand, should be offered a first time registration of 40% of the original purchased value [or import value if imported as a second-hand model], while pure electric NRMMs should receive a waiver until 2020.<sup>8</sup> Both versions will receive a waiver of the annual road or license tax until the vehicle reaches its 6 year from registration [or manufactured date]; where upon afterwards the tax will be 20% for hybrid and 10% for electric. No system should remain tax free to encourage conservative usage.

### **Policy Recommendation**

*Create a government contractual preference for the use of hybrid/electric NRMMs on government projects and daily service.*

The government, being a large employer of NRMM services, should place as a condition in all contracts the allotted emissions output for all NRMMs used for the stated contract. Emission output to be based upon the calculation of the working condition, power train rating, capacity, and estimated hours of operation, all submitted to the government for approval of tender or usage. The government should offer a contractual preference to agencies or service groups employing the use of hybrid/electric NRMMs for the project on tender for the government. The preference should remain in force until the government statistics confirm that greater than 50% of all NRMMs are hybrid/electric.

### **Buses and Light Buses (Public and Private)**

As stated in the introduction, Hong Kong's car ownership is relatively small (18%) compared to reference cities, which reflects the high reliance on public and shared private transportation methods for mobility in Hong Kong. The use of buses and light buses is a large portion of the daily mobility usage, but also a large source of roadside pollution and emission. Either through the use of sub-Euro IV standard buses or non-liquefied petroleum gas (LPG) minibuses, or the amount of congestion created by poor route rationalization by the large bus operators, this segment of transportation has contributed a large and increasing portion of the Hong Kong roadside air pollution.

Worsening the situation is the vulnerability of these operations to sharp swings in oil prices, which account for around 30% of the operating costs. With oil prices forecasted to continue upwards with further unpredictable short-term down swings, these operations will become increasingly stuck in a difficult situation to remain profitable, as their desire for fare increases must be approved by legislature before implementation. Electrification and hybridization offer options out of this vicious

<sup>8</sup> The Hong Kong government should set 2020 as the target fiscal year that over 50% of NRMMs operating in Hong Kong to be electric or hybrid powered.

cycle, but the government will need to convince the operators of the benefits as well as taking a direct role in the conversion to get the operators to commence the switch.

#### **Policy Recommendation**

*Create a Hong Kong government electric bus trial through the direct purchase by the government of 10 electric buses to be distributed amongst the 3 largest fleet organizations.*

With the exception of 1 current bus under trial with Kowloon Motorbus Company (KMB), there are no electric buses in operation. Primary reason for the lack of uptake is the belief the use of electric buses will minimize both the use and capacity of the bus while increasing the cost of the operation without a chance to forward the costs to the passengers. Therefore, the government should purchase 10 electric buses via tender with the intent to give 3 buses each to the largest operators while retaining 1 bus for government use and study. All operators would be required to fully use the bus on an existing designated route and share data and experience with each other and the government. The project should have a 2 year time frame to avoid prolong testing with no progress forward towards electrifying the bus sector.

#### **Policy Recommendation**

*Create a hybrid bus purchase subsidy to reduce reluctance of local bus operators to the use of hybrid buses from a cost prespective.*

While the electric trial is running, the government should offer subsidies to the bus operators to retire, convert, or replace their sub-Euro III classified buses along the similar terms of the previous attempts by the government to remove sub-Euro III diesel commercial vehicles. Furthermore, the subsidy would be higher (about an extra 10%) should the bus companies elect to replace the diesel bus with a hybrid bus. Hybrid buses have proven to be quite successful in London with 56 buses under trial and another 300 set to join in 2011.<sup>9</sup> However, the subsidy should end in the same year the government mandates all future fleet bus purchases to be electric or hybrid.

#### **Policy Recommendation**

*Mandate the end of permitted diesel bus purchases by large fleet operators.*

Without a deadline to switch over to a new technology or new method of use, companies and people will not be motivated unless the subsidies are substantial. The Hong Kong cannot afford financially to continuously offer subsidies while the intended parties perform the minimum required service to continue to receive the subsidy. Therefore, referencing London again, who set 2012 as the time to switch all new purchases to hybrid or electric<sup>10</sup>, the Hong Kong government should set a target date for removing the diesel option.

The government should dismiss any objections raised on the grounds of lack of commercial available options, as London and Hong Kong are two large fleet bus markets, which would encourage manufacturers to rapidly ramp up their production of hybrid buses to meet the needs of these two

<sup>9</sup> Girard, Marie-Barbe, Principal associate, Commissioner's Delivery Unit, Transport for London. "Turning London Electric". Delivered at Making the EV transformation in Hong Kong. 4 February 2010. Retrieved 18 November 2010 from <http://www.civic-exchange.org/eng/upload/files/100204Marie-Barbe.pdf>.

<sup>10</sup> Ibid.

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markets as well as other markets working to convert. A deadline and termination of the subsidy must be set and matched or Hong Kong citizens will continue to pay a double subsidy to the bus operators without any tangible returns.

**Policy Recommendation**

*Hong Kong government should replace or convert 20 – 30 of its minibuses from various departments for trialing to develop a series of publicly available data and to promote the usage of pure electric minibuses.*

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Similar to the electric bus trial, the government should purchase 20 – 30 pure electric minibuses to push the electric conversion. Unlike the bus scenario, the government should not give these minibuses away instead convert a few of their fleet in various departments to gauge the performance of the electric version with the data and results available in public domains (i.e. internet) for others to review for their consideration on conversion. The plan should have an option to expand to 50 if needed.

**Policy Recommendation**

*Establish a program to buy aging and high pollution emitting minibuses and convert to electric for resell to the market while simulating a new market in electric conversations.*

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To effectively remove high pollution emitting minibuses, the government should set a side an adequate fund to buy these old minibuses, which are mostly operated by private individuals. The buyout should not exceed 20% of the value of a new minibus.

Instead of scrapping these minibuses after purchase, the government should set up a tender for their conversion to electric. Upon electric conversion completion, the government would offer these re-condition minibuses for sale at prices around 15% lower than a new electric minibus to give the operators two options to choose from, thus creating the necessary competition to drive down initial prices.

Moreover, this policy would create new business opportunities for companies to offer electric conversion services. The government backed market would work as a bridge to bring traditional automotive companies and service technicians to the electric drive train era with enough market incentive to convert their services accordingly without an additional government subsidy.

**Policy Recommendation**

*Provide a subsidy to convert remaining operators of minibuses (public/private) to electric with disincentives for inaction.*

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To convert the remaining minibus operators (private and public), the government should offer a subsidy of 15% of the purchased value to offset the extra cost of the electric version up until 2018. Additionally, the government should continue to offer zero first time registration charges and a low annual road tax of HK\$500 until 2018. Afterwards, the electric minibus's first time registration should be set at 25% of the value (electric conversions exempted) with an annual road tax not exceeding HK\$2,000, while at the same time increasing the road tax for diesel and LPG driven

minibuses by 25% with a further increase of 50% once the vehicle reaches 10 years. The disincentive should be used to offset the cost of incentives.

### Commercial Vehicles

In recent years, the government has attempted to remove sub-Euro II classified commercial vehicles from the road to tackle the amount of NOx and RSP emission from this segment of 38,100 vehicles (Pre-Euro and Euro I), who the government has labeled (in combination with the other Euro classifications) as producers of 88% and 76% of the total vehicular emission of RSP and NOx.<sup>11</sup> The scheme was only able to reduce the numbers on the road by 21,700 from 59,800, which the review within the Legislative Council accredited to the failure of the Legislative Council to accept the disincentive of raising vehicle license fees and the poor financial conditions for loan approvals.<sup>12</sup> The government now is implementing a scheme to replace Euro II classification vehicles in a similar manner: incentive with no disincentive.

Commercial vehicle conversions to hybrid or electric drive trains represent the near future of EVs due to the impact they have on the environment and the industry. Generally, commercial vehicles would be more inclined to convert to EV if the combination of lifespan operating costs, maintenance, and tax rebates place the vehicle below the standard lifespan cost of a diesel powered vehicle. Furthermore, commercial vehicles have a greater access to route knowledge (fixed traveling distance), parking facilities with an industrial power outlet for charging or the willingness to install such charging unit without the need of all owners to agree, and spend majority of their driving time in stop and go situations that consume fuel efficiency.<sup>13</sup> Furthermore, the conversion of the commercial vehicles to hybrid/electric would generate a large enough market for the manufacturing economies of scale needed to reduce the overall price of EVs.

### Policy Recommendation

*Expand the existing subsidy for Euro II upgrade to include hybrid/electric version with higher subsidies and disincentives for non-action.*

The government has witnessed the failure of the uptake to more efficient models through the delinking of incentive and disincentive. In order for the conversion to work, the legislators will have to approve the measure to drastically increase by 50% the license fee for all sub-Euro IV commercial vehicles with an additional 75% increase (based upon original fee + 50% increase) when the vehicle reaches 12 years in registration or from manufacturing date, whichever is achieved first. As an incentive, owners of commercial vehicles should be offered a rebate of 20% of their classification value to convert to Euro V standard and a rebate of 35% of the classification value to convert their existing vehicle to EV. An additional rebate should be offered for the cost of installing the necessary charging facility at the vehicle's main depot.

<sup>11</sup> Environmental Protection Department. (10 March 2010). Early Retirement of Old Diesel Commercial Vehicles (LC Paper No. CB(1) 1250/09—10(01)). Retrieved 18 November 2010, from [http://legco.gov.hk/yr09-10/english/panels/ea/ea\\_iaq/papers/ea\\_iaq0310cb1-1250-1-e.pdf](http://legco.gov.hk/yr09-10/english/panels/ea/ea_iaq/papers/ea_iaq0310cb1-1250-1-e.pdf)

<sup>12</sup> Ibid.

<sup>13</sup> Electrification Coalition. "Fleet Electrification Roadmap: Revolutionizing Transportation and Achieving Energy Security." Chapter 1.3 "Advantages of Fleet Operators". November 2010. Retrieved 16 November 2010 from: <http://electrificationcoalition.org/reports/EC-Fleet-Roadmap-screen.pdf>

Target time for offering simple Euro V upgrade should be immediately with expiration within 2 fiscal years of commencement of the program. Electric conversation on the other hand should remain on offer from Year 6 to Year 12 of the vehicle's registered years.

## 2. DEVELOPING AN EV MARKET

New technologies or methodologies need support and promotion before they are able to independently support themselves and EVs are no exception. However support is only one aspect of ensuring the success of EVs since they can remain supported by the government for years or decades without any commercialization outside of heavily subsidized usages.

### Policy Recommendation

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*Hong Kong government should generated the necessary guaranteed demand to attract and maintain EV suppliers by taking the initiative to convert 25% of its fleet vehicles to hybrid or electric by 2015.*

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Current prices of EVs are high when compared to the internal combustion engine (ICE) version of the same vehicle or option. Manufacturers state low demand from market prevents economy of scale to reduce prices while the market states a high selling price and concerns over the necessary infrastructure prevents purchasing. To move beyond this hurdle, this proposal has suggested in the previous section the government should aim to convert or replace 25% of its vehicular fleet to electric or hybrid by 2015. This ambitious target creates an immediate guarantee demand that attracts manufacturers.

The government has in the past trial tested some electric cars, hybrid cars, and electric scooters to promote EV usage in Hong Kong. Unfortunately, these trials have achieve nothing for creating demand needed by manufacturers to produce more thus reduce the overall price to the consumer. Whereas any announcement of a commitment by the Hong Kong government to convert 25% of its current fleet to electric or hybrid in 5 years will attract immediate attention of both the public and the necessary manufacturers, who can estimate the potential on offer from the government through the public accessible data on the number of vehicles the government operates. Similar positive support announcements have brought more attention and consideration to the EV market when GE announced its intention to purchase 25,000 hybrid/electric vehicles by 2015<sup>14</sup>.

With a guaranteed market not dependent on future lower prices, manufacturers are more comfortable to offer further vehicles in hybrid and/or EV format, which in time would lead to the economy of scale needed to bring the EV price to the mass market level.

### Policy Recommendation

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*Establish a working coalition of private and public players to develop an infrastructure supporting charging in various forms, payment of said charging, and integration of on demand EV usage.*

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<sup>14</sup> [www.msnbc.com](http://www.msnbc.com). "GE to buy 25,000 electric cars by 2015." 11 November 2010. Retrieved 18 November 2010 from: [http://www.msnbc.msn.com/id/40129534/ns/business-going\\_green](http://www.msnbc.msn.com/id/40129534/ns/business-going_green)

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The lack of charging stations in Hong Kong is a key anxiety for anyone considering purchasing an EV. Instead of an aggressive backing of implementing charging points in Hong Kong, the government has been seen more as a passive supporter of the charging stations, thus leaving the difficult initial task of roll out to the utilities and property developers. In defense of the Hong Kong government, they have allotted HK\$20 million for various EV trials<sup>15</sup>, but this pales in comparison to the amount of money (GBP20 million) and infrastructure the London government has allotted to ensure the successful role out of EVs in London.<sup>16</sup>

London is set to offer charging access to around 1,300 charge points inside the greater London by 2013 for a annual fee of GBP100 (~HK\$1,400) starting next spring.<sup>17</sup> With this commitment, the government has developed the necessary infrastructure, Source London, to promote and develop the best combination of private/public participation to achieve this goal in addition to positioning London as Europe's EV capital.

Infrastructure will be the key determination of whether or not EVs are successful. Without charging points, people will have range anxiety and uncertainty of ability to charge their vehicles. Without a holistic approach to the infrastructure issue, the government can be left with competing and non interchangeable systems<sup>18</sup> causing other concerns.

Recently, the Singapore government has signed an agreement with Bosch to develop charging stations in the city state in addition to the necessary infrastructure needed to support the various players involved in charging EVs. Bosch is working on creating an eMobility platform for a seamless integration of all aspects of transportation and EV networks, which could work within a single system.

In Hong Kong, the Octopus card system already allows its users to rapidly pay and enter transportation, shop, purchase food, pay services fees, pay for parking, and enter buildings without the need for a series of separate cards. The EV infrastructure is the ideal platform to expand the use of the Octopus card and to help encourage more EV uptake. Holders of the card could possibly pay for charging their EV or rent an EV all with one card and with little to no thought of the system.

As the Singapore and London cases show, the government must first establish its support (both financially and structurally) and second work to bring all parties of the EV platform into agreement for the creation of a holistic system to support EVs. Simply taking a passive supportive role will not suffice; the Hong Kong government must lead the development in a similar fashion as London and

<sup>15</sup>Choi, Katherine. Community Round Table Presentation. Delivered at the "Making the EV Transformation in Hong Kong" discussion. 4 February 2010. Retrieved 18 November from <http://www.civic-exchange.org/eng/upload/files/100204KatharineChoi.pdf>

<sup>16</sup>Girard, Marie-Barbe, Principal associate, Commissioner's Delivery Unit, Transport for London. "Turning London Electric". Delivered at Making the EV transformation in Hong Kong. 4 February 2010. Retrieved 18 November 2010 from <http://www.civic-exchange.org/eng/upload/files/100204Marie-Barbe.pdf>.

<sup>17</sup>Greater London Authority. "Mayor's electric vehicle charging network, Source London, to go live spring 2011." 6 November 2010. Retrieved 18 November from: [http://www.london.gov.uk/media/press\\_releases\\_mayoral/mayor%E2%80%99s-electric-vehicle-charging-network-source-london-go-live-spring-](http://www.london.gov.uk/media/press_releases_mayoral/mayor%E2%80%99s-electric-vehicle-charging-network-source-london-go-live-spring-)

<sup>18</sup>The GovMonitor. "Singapore Appoints Robert Bosch to Build Electric Vehicle Charging Infrastructure." 8 October 2010. Retrieved 18 November 2010 from: [http://www.thegovmonitor.com/world\\_news/europe/singapore-appoints-robert-bosch-to-build-electric-vehicle-charging-infrastructure-40181.html](http://www.thegovmonitor.com/world_news/europe/singapore-appoints-robert-bosch-to-build-electric-vehicle-charging-infrastructure-40181.html)



Singapore to move the EVs adaption. This proposal recommends a system similar to London where the government allocates a substantial sum of capital to develop the necessary network with multiple partners (public and private) on an agreed upon platform towards designated goals (i.e. “Be within 1 mile to a charging station.”<sup>19</sup>) by certain dates.

#### **Policy Recommendation**

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*Hong Kong government should invest in advanced battery research and development.*

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The heart of an electric vehicle is its battery, which also is the electric vehicle’s most expensive and limiting component. Current chemistries and manufacturing have helped bring the initial costs down while improving the life cycle and overall performance of the battery. However, the industry acknowledges the battery is still the most limiting aspect of the electric vehicle and only further development of new chemistries and manufacturing techniques will improve the situation. Hong Kong is well positioned with its ample research facilities to continue the necessary research with equally convenient access to manufacturers to take theory into practice.

The purpose of the Hong Kong government’s involvement stems its desire to present Hong Kong as a knowledge based economy and stimulate potential business as a result of research spend offs and/or licensing to the industry. Furthermore, Hong Kong is situated next to the future’s largest market for electric vehicles and an equaling large market for alternative energy (i.e. wind and solar) which batteries serve to play an important role in storing the created energy and supporting the grid in integrating these alternative sources of energy creation.

Furthermore, as EVs become more abundant on the road, the coming issue will be the recycling of those EV’s batteries when the service life is over. Without a sound knowledge of the potential second or third use for EV batteries, both the government and companies in Hong Kong could be facing the difficult task of depositing of batteries at their end of life due to international shipment restrictions and lack of facilities to handle such goods. With the necessary investment in advanced battery research, the Hong Kong government could seed the creation of a new business model for Hong Kong companies to take the lead in reusing and/or handling these said batteries.

### **3. ENCOURAGING EV ADAPTATION**

Once a market has been established, the next step is to expand the market beyond the earlier adopters and the government. To encourage the mass market adaptation of EVs, the government will need to create positive programs and systems of incentives to foster the necessary environment for the mass market to convert EV. The mass market will be mostly concern with the upfront cost and the reliability of the EV unlike the early adopters purchasing EVs for environmental beliefs or to be associated with forefront of technology.

#### **Policy Recommendation**

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*Extend the waiver of first time registration costs for EVs until 2018 and allow costs associated with installation of charging unit at personal private parking location to be offset by the purchaser on their tax liability.*

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<sup>19</sup> Source London. About Us. Retrieved 19 November from: <http://www.sourcelondon.net/about-us>

One of the key attractions to purchasing an EV is the current waiver of the first time registration tax. However, the government intends to end this waiver in 2014 just when a large number of EVs from the major manufacturers are attended to be available to Hong Kong. Pulling back this waiver while the initial purchasing price are forecasted to remain higher than petrol or diesel driven vehicles could result in the continued slow uptake of EVs in the Hong Kong market. The waiver must be kept until 2018.

Moreover, the government should allow for purchasers of EVs to offset the cost of purchasing and installing a charging station at their private car space against their total tax liability since the initial cost of the charging installation will be high. Having this incentive lessens some of the anxieties associated with owning an EV, “Where will I charge?” and “How can I afford the higher initial cost of the EV with the necessary cost of a charging point?” When the individual owner can control where and when on can charge, the adaptation will spread faster.

### **Policy Recommendation**

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*Increase the annual road tax on all internal combustion engine vehicles with engine capacities greater than 1,500cc by 25 – 50%.*

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Current government policy encourages the purchase of “environment-friendly” cars producing a lower output of Hydrocarbons (HC) and Nitrogen Oxide (NOx) with a higher fuel efficiency than similar vehicles.<sup>20</sup> With savings of 30%, the encouragement for many is high enough to justify the higher initial cost. Equally, the initial savings on the first time registration combined with the low HK\$440 annual road tax and relatively low maintenance cost over the life of the EV, should be adequate enough to justify switching for people but this has not been the case in Hong Kong. Therefore, if the government wants to attract the uptake of EVs, the government needs to make the disincentive higher for choosing a petrol vehicle over an EV.

The government should increase the annual road tax on vehicles with engine capacities greater than 1,500cc by 25% - 50%<sup>21</sup> to first discourage the purchase of larger engine vehicles and to increase the overall savings for choosing an EV higher. The increase in road tax would require a potential purchaser to look at the life time costs associated with owning a car. The higher initial cost of an EV should not be a prevention of purchase afterwards. The government must create the external forces to foster a more EV preferred purchasing market through the use of avoidance of tax payment.

### **Policy Recommendation**

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*Waive government rent for 5 years for private parking garages upon the completion of upgrading their electrical infrastructure to allow EV charging.*

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The cost in both time and money to reach a minimum agreement amongst 75% of the owners of a private parking garage, and the actual cost of electrical infrastructure upgrade needs an effective

<sup>20</sup> Environment Protection Department. “Tax Incentives for Environment-friendly Petrol Private Cars”.

Retrieved 19 November 2010 from:

[http://www.epd.gov.hk/epd/english/environmentinhk/air/prob\\_solutions/environment\\_friendly\\_private\\_cars.html](http://www.epd.gov.hk/epd/english/environmentinhk/air/prob_solutions/environment_friendly_private_cars.html)

<sup>21</sup> The 50% increase should be applied to cars exceeding 3,500cc in engine capacity to encourage EV uptake while encouraging people to consider downgrading the engine size if they do not purchase an EV.

incentive to justify the initial discussion and eventually the electrical infrastructure upgrade. The government should waive the quarterly government rent for any private parking garage that upgrades its electrical infrastructure to accommodate charging of EVs without any negative effect to the grid and the parking garage. The waiver should not be offered beyond 2014 and individual charging points will be the responsibility of the space and/or EV owner (covered previously).

### **Policy Recommendation**

*Mandate all new parking garages (public and private) to have 20% of said capacity designated EV charging.*

Current EV charging places are either in short supply or not effectively managed to prevent non-EVs from parking the said spaces and the charging outlet from being used for non-EV charging activities (i.e. vacuuming). Similar to government mandates requiring adequate parking spaces for vehicles driven or used by person with a disability to be located in a space convenient enter and exit with a wheelchair and near the main entrance of a building, the government should mandate all new garages have designated spaces for EV. The knowledge more locations and spaces for charging will be coming online will reduce the anxiety of owning an EV in the future.

The government should further monitor the speed and clustering of EV ownership to determine if the 20% mandate is either justify or requires adjustment to conditions district by district in a similar fashion to Transport for London's cluster observation. The government may need to make a further observation of popular locations for EV owners when reviewing the mandate.

### **CONCLUSION**

The era of electric vehicles is here and will not disappear as previous attempts have. The technology and the external forces encouraging the uptake will only continue as the world's oil supply reaches peak oil and developing economic juggernauts (i.e. China and India) continue their rapid ascent. The Hong Kong government can no longer only encourage and promote the ownership of EVs, they must shed their non-market interference stance to actively steer Hong Kong towards necessary targets to bring the transportation sector's contribution to the overall Greenhouse Gas pollution and emissions from its current 18% to a smaller overall number and impact.

Moreover, Hong Kong's urban topography encourages the uptake of EVs to minimize localized pollution black spots generated by the heavy concentration of vehicles without substantial pollution dissipation. The concentration of localized pollutants will only increase as areas are redeveloped to contain more people per a square kilometer than previous. In the end, Hong Kong must weigh the cost of proactive procedures versus the cost of reactive procedures and their trade off.

Finally, if the Hong Kong government can assume a more aggressive role in EVs, Hong Kong stands a good opportunity to develop new markets for local businesses and the potential to export these expertises to other locations (i.e. MTR in Shenzhen). Hong Kong's strength is its ability to adapt to challenges and to learn the best method to operate and prosper. Now is the time for government to plant the seed for future growth and health.