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EV PHASE 2 – SHARE AN ELECTRIC CAR

LTA and EDB seek proposals for an electric vehicle car-sharing programme in Singapore

Singapore, 8 December 2014 - The Land Transport Authority (LTA) and Economic Development Board (EDB) announced plans today to trial an electric vehicle (EV) car-sharing programme which will see the introduction of up to 1,000 EVs and the charging infrastructure to support their use.

2. The inter-agency Electro-Mobility Singapore (EMS) taskforce co-led by LTA and EDB issued a Request for Information (RFI) today. The trial will enable the Government to gain a deeper understanding of the operating models and support required for EVs to succeed on a larger scale in Singapore. At the same time, through the trial, the EMS taskforce aims to explore whether a one way car-sharing model, in which users pick up cars at an origin and return them at a different destination, can be viable for Singapore.

3. The taskforce welcomes the submission of proposals for a sustainable operational and business model. (Please refer to [Annex A](#) for more details on the RFI.) Interested parties can access the document on the Government Electronic Business (GeBiz) platform and are to submit their proposals by 27 February 2015.

4. Singapore concluded the first phase of the national EV test-bed focused on individual corporate users last year. (Please refer to [Annex B](#) for the key findings of EV Phase 1 Test-bed.) The EMS taskforce will now expand the scope of the test-bed in the second phase to explore fleet-based, shared car operations. Compared to privately-owned EVs, EV shared-car fleets have the potential of reaping economies of scale with higher daily mileage and potentially lower running cost. EV Phase 2 Test-bed will also allow the taskforce to gain a better understanding of the optimal charging infrastructure required to support widespread usage of EVs. It will thus facilitate the development of a large-scale charging infrastructure, laying the foundation for a nationwide infrastructure necessary to support the future proliferation of EVs.

5. Mr Yeoh Keat Chuan, Managing Director of EDB said, “The EV car-sharing programme aims to provide a sizeable platform for complementary industry players in the e-mobility ecosystem to develop, test and commercialise innovative e-mobility solutions. The pilot will help Singapore to be a regional leader in developing new technologies and innovative business models in the electric vehicles and associated charging infrastructure landscape. This is also aligned with Singapore’s position as a Living Lab to develop smart-sustainable city solutions that can eventually be exported to other cities in Asia and beyond.”

6. Said LTA’s Chief Executive Mr Chew Men Leong, “As we work towards a ‘car-lite’ society, car-sharing is one way to support a lifestyle that doesn’t require one to own or maintain a car, and where the majority of daily commute is on public transport, and the occasional travel which would be more convenient by car such as family outings on weekends or bulk shopping, can be enabled through participation in a car-sharing programme. We are also evaluating if one-way car-sharing can possibly complement Singapore’s existing public transport system by serving as a first mile/last mile connector to public transport nodes.”

About the Land Transport Authority (LTA)

The Land Transport Authority (LTA) is a statutory board under the Ministry of Transport. LTA plans the long-term transport needs of and spearheads land transport developments in Singapore. While serving commuters by providing an integrated and user-friendly transport system, LTA addresses wider issues such as sustainable development, economic growth, and community life. LTA looks forward to working with leading companies to develop innovative transport solutions, and making Singapore's transport system greener, cleaner, and more people-centred.

About the Singapore Economic Development Board (EDB)

The Singapore Economic Development Board (EDB) is the lead government agency for planning and executing strategies to enhance Singapore's position as a global business centre. EDB dreams, designs and delivers solutions that create value for investors and companies in Singapore. Our mission is to create for Singapore, sustainable economic growth with vibrant business and good job opportunities.

EDB's 'Home' strategy articulates how we are positioning Singapore for the future. It is about extending Singapore's value proposition to businesses not just to help them improve their bottom line, but also to help them grow their top line through establishing and deepening strategic activities in Singapore to drive their business, innovation and talent objectives in Asia and globally.

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Annex A – Key details on Electric Vehicle (EV) Car-Sharing Programme in Singapore

Objectives

Building on the earlier EV test-bed which was conducted from 2011 to 2013, EV Phase 2 Test-bed will commence in Singapore with a focus on car sharing. As part of the EV Phase 2 Test-bed, the EV car-sharing programme will trial a new transport option in Singapore as well as the viability of EV fleets, and seek to achieve the following objectives.

Transport

The proposed one-way (A→B) EV car-sharing programme seeks to complement existing efforts under the Land Transport Master Plan 2013 to provide Singaporeans with more choices to meet their mobility needs. One-way electric car-sharing can complement our public transport system by serving as a first-mile/last-mile connector to public transport nodes such as MRT stations and bus-stops. Car-sharing provides users with the option of on-demand car access without incurring the costs of car ownership.

Economic

The rollout of the EV fleet-based car-sharing programme gives industry players a large enough base to develop and test e-mobility solutions with the aim of eventually exporting them to other cities in the region. By serving as a living lab for e-mobility solutions, Singapore aims to be the regional leader in the innovation of EV technologies and the development of commercially viable business models.

Environment

EVs do not generate tailpipe emissions, thereby reducing the air pollution from vehicular traffic. They also generate net savings in carbon emissions after factoring in the energy from the predominant natural gas-fired power plants in Singapore. Due to the silent nature of EVs, the noise pollution would also be much reduced.

Strategic

Through the EV car-sharing programme, a large-scale EV charging infrastructure will be put in place, which would lay the foundation for a nationwide charging infrastructure, a critical requisite for potential EV proliferation, should EVs become commercially viable in the future. This will also enhance Singapore's standing as a Clean and Green City, and a Smart Nation.

Basic Scope

The EV car-sharing programme is a fleet-based trial of up to 1,000 fully-electric passenger cars, with a project duration of up to 10 years. It is envisaged to operate on a one-way car-sharing model. This differs from most of the local car-sharing services today which operate on a two-way model, where the car has to be returned to its original pick-up location. In a one-way car-sharing model, a user can pick up the electric vehicle from one location and return it at another.

Different One-Way Car-Sharing Models

The following possible one-way car-sharing models will be considered as part of the RFI process:

- i. Station-based** - Users are required to park/charge at designated EV car-sharing lots equipped with charging stations
- ii. Free-floating** - Users can park at any parking lot within public/private car parks and/or at any designated EV car-sharing lots which may or may not be equipped with charging stations
- iii. Hybrid** - A combination of station-based and free-floating models

Involvement of Consortium of Companies

The EV car-sharing programme will likely require the involvement of a consortium of companies that may include:

- i.** Car-sharing operators
- ii.** Charging infrastructure service providers
- iii.** EV manufacturers or providers

Such a consortium will be able to provide the hardware (electric vehicles, charging infrastructure, cabling, IT and communications infrastructure), software (fleet management system, payment) and maintenance services required to operate a fleet of EVs on a one-way car-sharing model.

Application of Smart Technologies

The RFI seeks proposals for an EV car-sharing system that will implement integrated smart technologies. According to the requirements stated in the RFI, the EV car-sharing system will provide registered EV car-sharing users with the ability to leverage on the location-based services in their smartphones to tell the availability of electric cars in the vicinity in real-time. With a simple touch of the screen, a user can conveniently pay to reserve the EV and his preferred destination lot. Thereafter, he can pick up and unlock the car and drive to his destination.

The car-sharing system will be integrated with LTA's online and mobile platforms such as MyTransport.SG and One.MOTORING, and Car Sharing Association's platforms.

To strengthen Singapore's position as a living lab for smart-sustainable city solutions, up to 5 per cent of the EV fleet will be used to test cutting-edge technologies such as smart sensors, driverless vehicles and advanced charging solutions that include wireless inductive charging.

Areas of Coverage and Allocation of Car Park Lots

The RFI will seek proposals from consortiums who intend to conduct the EV car-sharing programme across targeted geographical areas which can span HDB residential towns, CBD and city fringe areas, and Industrial Estates and Business Parks. The RFI proposals will include an indication of car park locations throughout Singapore, including allocations from the car parks run by HDB, URA and JTC.

Background of Electro-Mobility Singapore Taskforce

The Electro-Mobility Singapore (EMS) taskforce is co-led by LTA and EDB, and comprises members from different government agencies, including EMA, HDB, A*STAR, MTI, NEA, MEWR, SPRING, SCDF, URA and JTC, to coordinate the inter-agency efforts in the development and testing of e-mobility solutions in Singapore.

Annex B – Key findings from EV Phase 1 Test-bed

Key Findings of Market Perception Surveys

As part of the test-bed, two market perception surveys were administered to understand end-user views on the technology. A pre-test-bed survey administered in 2011 revealed the following:

- Purchase price was the greatest inhibiting factor, with respondents indicating that they would consider EVs only if they cost approximately the same as ICEVs.
- Concerns over range was the next major issue raised, with over 50% indicating insufficient range as an issue, even though only 4% of those surveyed travelled more than 80km a day.
- Respondents were also worried about the availability of personal and public charging infrastructure.

The above three concerns were highlighted again in a post-test-bed survey that was administered to test-bed participants at the end of 2013. While most of the participants (75%) had a positive experience using EVs, 86% of the respondents indicated that they would not purchase an EV from the open market in the near future due to concerns on high purchase price, limited technology, and limited charging infrastructure.

- On price, 66% indicated that price reduction is critical to encourage widespread EV adoption.
- On technology, 91% of the respondents indicated that EVs were easy to drive and operate. However, 75% of the respondents would like to see improvements in areas such as range, battery life, and time taken to charge their vehicles.
- On charging infrastructure, 79% felt that the EVCI and charging stations were easy to use. However, 61% also reflected that they would like to see a better distributed and wider public charging network to meet the charging needs of the EV community.

National Archives of Singapore

Key Findings of the CBA Study

Technical feasibility of EV deployment in Singapore

An analysis of the collated driving and charging data suggests that the use of EVs is technically feasible in Singapore. For example, the average EV daily driving distance was 46km, which is close to the national average of 50km for a normal passenger car, and is much lower than the EV manufacturers' reported range of 120-160km per charge. The driving patterns of participants are in line with those of corporate users, who tend to use the EVs as company vehicles for routine activities such as site-visits and meetings, and thus have shorter mileages compared to the national average. There were some instances where participants utilized their vehicles for longer-than-average trips. For instance, one of the EVs recorded a distance of 156km based on a single charge under local driving conditions.

An analysis of charging events shows that 81% of the charging events occurred at the participants' primary charging site, with the remaining charging events having occurred at a

non-primary charging station within the publicly-accessible EVCI. This is consistent with charging patterns of global EV users, who tend to charge mostly at home or at the work place, and use public charging infrastructure for opportunistic charging in-between trips.

The analysis of charging data¹ also suggests that the impact of EV charging today is not significant to our electricity grid, even in a scenario where a large percentage of private cars were assumed to be EVs. Studies by TUM CREATE showed that even if all private cars were assumed to be EVs, it would only increase the daily load on the power system by 4.8%.

Economic feasibility of EV deployment in Singapore

While analysis of the test-bed data suggests that Singapore is suited for the deployment of EVs, the CBA indicates that EVs are currently not economically feasible for adoption, even after factoring in the health and environmental benefits to society². This result is due to the high open market value (OMV) of an EV that is around three times that of a comparable ICEV. As the current tax structure for vehicles in Singapore is ad-valorem and progressive, this results in a greater tax burden for an EV³. Accounting for health damage costs from emissions significantly increases the social cost of ICEVs relative to EVs, but this is still insufficient to compensate for the difference in OMVs.

The CBA indicates that EVs will remain a costlier option as long as they remain a niche technology. Similar to the development of hybrid vehicles, prices of EVs are expected to fall as the price of the technology, including battery prices, continues to decline, and mass production achieves economies of scale. In the meantime, we note that new and innovative business models, such as fleet operations and car sharing, have emerged in other countries, and are able to improve the economic viability of EVs.

Emergence of EV Eco-system

The EV test-bed has laid the foundation for the EV ecosystem in Singapore, which has grown steadily to include new business models and companies. The test-bed saw the emergence of innovative business models like EV leasing and EV car sharing - Daimler, Downtown Travel Services, and Fulco Leasing provided EV leasing services, while Smove operated a small-scale EV car-sharing model with 5 Mitsubishi iMievs catering to a customer base of 450. Singapore's EV ecosystem has also grown to include a more diverse group of companies consisting of EV OEMs, charging station providers, and service providers. Some company examples include Bosch, ABB, Schneider Electric, BMW, Greenlots and Smove.

Outside the test-bed, there has been an increase in the number of e-mobility R&D initiatives and tie-ups within the community. Some examples include TUM Create's EVA electric taxi prototype that can travel 200km on a 15min charge and its VOI multi-purpose electric scooter. Other examples include the Autonomous Electric Shuttle and Toyota's micro EV Auto Body COMS that are used in Nanyang Technological University (NTU) and the National University of Singapore (NUS) respectively (see Figure 2).

¹ Based on the IEC 'Type 1' (also known as 'SAE 1772') standard, operating at single phase 16A 230V.a.c.

² EVs can be cleaner and more energy efficient than ICEVs. Although EVs do not emit CO2 emissions at the tailpipe, they cannot be considered emissions-free if the electricity generation is from fossil fuels. In Singapore, almost all of our electric power is generated from natural gas.

³ For instance, costs without taxes for a Nissan Leaf EV and its equivalent Nissan Sylphy ICEV are \$55,000 and \$15,000 respectively. After accounting for taxes and CEVs rebate, the prices for both vehicles are \$200,000 and \$110,000 respectively. Prices are correct as of May 2014.

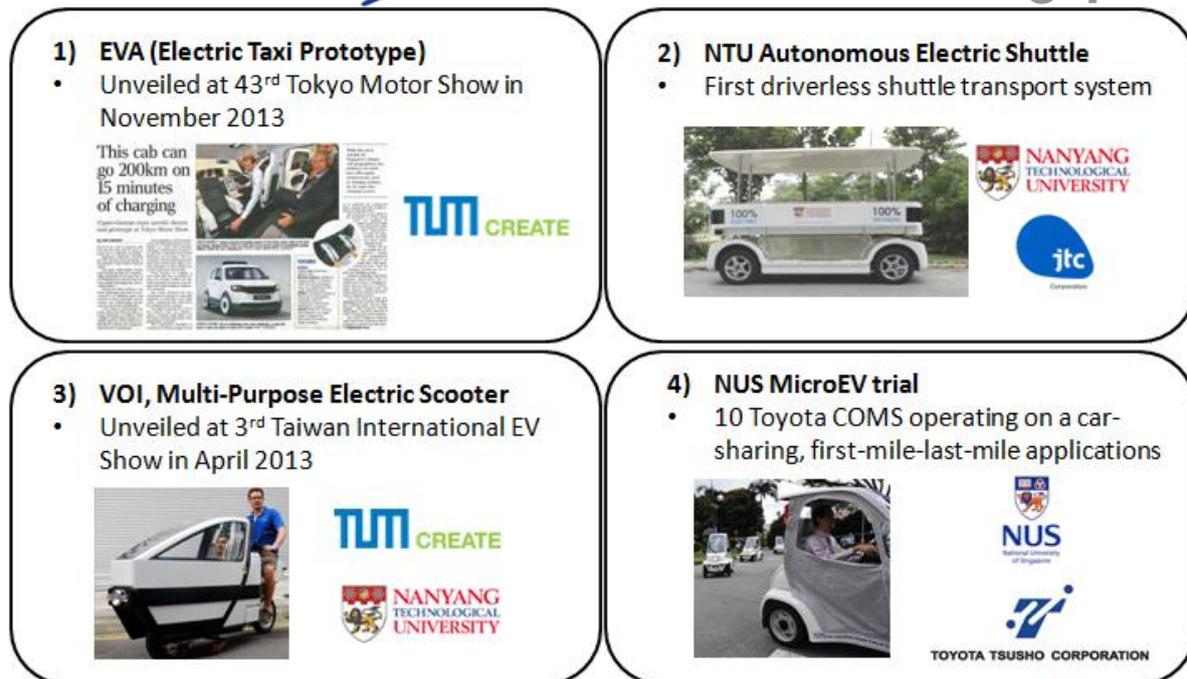


Figure 2: Some examples of research collaboration tie-ups within Singapore.

Moving Forward

High upfront costs will continue to be the greatest inhibiting factor to customer acceptance of the technology. In the short term, innovative business and operational models could help defray some of these upfront costs. However, further R&D is needed to accelerate technology breakthroughs to address the limitations of EV technologies and to bring down overall costs in the long run. Moving forward, the central management and continual development of charging standards, advancement of EV technologies, parking rules and the mapping and management of the public charging infrastructure could help overcome the worries of end-users with regard to the charging infrastructure.

There are plans to have a second phase of the EV test-bed that will focus on vehicle fleets which include EV car-sharing, E-commercial/logistic fleets and E-taxis. It is anticipated that fleets are likely to be early adopters as there is greater economic viability due its higher mileage and potential for greater cost savings. In addition, the natural incentive for these fleet operators to set up dedicated charging infrastructure for their operational needs will contribute towards the overall charging infrastructure development. New and innovative business models will also be explored.

LTA has also embarked on an e-mobility roadmap, and has awarded NTU ERI@N, to identify and prioritize R&D focus areas to lower costs and to help bridge existing technical gaps.

The government will continue to facilitate the introduction of EVs and EV public charging infrastructure, and prepare Singapore for the future possibility of widespread adoption of EVs.