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MEDIA RELEASE

Singapore's Electric Vehicle Test-bed Taking Shape

The inter-agency Electric Vehicle (EV) Taskforce led by the Energy Market Authority (EMA) and the Land Transport Authority (LTA) has appointed Robert Bosch (SEA) Pte Ltd ("Bosch") to design, develop, deploy, operate and maintain Singapore's EV charging infrastructure as part of the EV test-bed programme. Bosch will be collaborating with local partners SingTel (on the communications interface) and Greenlots (on the charging network) to deliver a reliable and integrated infrastructure solution for EVs. Singapore will be the first location outside of Germany to test out this integrated EV charging infrastructure solution developed by Bosch.

2 For a start, the charging stations will cater to the first batch of Mitsubishi i-MiEVs being brought in for the test-bed. EV models by other automotive manufacturers are expected to become available in 2011.

3 In this initial phase of the test-bed programme, Bosch will deploy 25 normal charging stations (full charge within 8 hours) and 1 quick charging station (full charge within 45 minutes). As each EV user in the test-bed will be supported by a normal charging station, Bosch will work closely with them to site the locations of these charging stations. The quick charging station will be sited at a location which the EV users can conveniently access.

4 The charging infrastructure will be scaled up over time, to match the take-up rate of EVs in Singapore. While the EV Taskforce has appointed Bosch to roll out the initial charging infrastructure for the test-bed programme, this does not restrict other players from setting up EV charging stations on a commercial basis.

5 "Worldwide, electric mobility solutions are emerging as a promising option for cleaner and less carbon-intensive road transportation. This programme will enable us to test and evaluate the overall costs and benefits of electric vehicles in Singapore's context. It is very much a part of our broader effort to foster innovative solutions for our energy challenges and to make Singapore a smart energy economy", said Mr Lawrence Wong, Chief Executive, Energy Market Authority.

6 "As a global supplier of technologies and services, Bosch is pleased to be appointed by the EV Taskforce to develop one of the most holistic EV charging infrastructures worldwide. The EV infrastructure will be based on our innovative 'eMobility solution'. It will offer a robust charging infrastructure, together with an innovative marketplace for EV stakeholders to run economically viable business models. Bosch's eMobility solution will support the development of a vibrant EV ecosystem in Singapore, significantly accelerating the acceptance of this future drive technology," said Mr Cem Peksaglam, President and Managing Director of Robert Bosch (SEA) Pte Ltd.

7 All interested companies and organisations, especially those with large vehicle fleets, are invited to participate as early adopters of EVs. This will provide a broader base for evaluation and testing of critical data, such as the performance of EVs as well as the ease of charging under local road conditions and environment.

8 "We look forward to the strong support of the business community in Singapore for this test-bed. The EV Taskforce is actively engaging corporate fleet owners to participate in the test-bed by taking up EVs. We look forward to working closely with all partners towards a cleaner, greener and more sustainable transport system", said Mr Chew Hock Yong, Chief Executive, Land Transport Authority.

9 Companies and organisations taking part in the EV test-bed may apply for the Transport Technology Innovation and Development Scheme (TIDES+). The enhanced TIDES+ scheme, administered by EDB and LTA, waives all vehicular taxes such as Additional Registration Fees (ARF), Certificate of Entitlement (COE), road tax and excise duty for the purpose of R&D and test-bedding of transport technologies. Vehicles approved under TIDES+ can enjoy the tax waiver for an initial period of six (6) years.

10 "This EV test-bed is an excellent example of how Singapore presents itself as a Living Laboratory for auto-manufacturers, charging equipment suppliers and EV component players to explore R&D and capability development activities in Singapore. We see opportunities in areas such as battery management systems, power electronics and electric drive systems and companies could leverage Singapore's electronics cluster and engineering talent to build new capabilities here", said Tan Choon Shian, Deputy Managing Director, Economic Development Board.

Refer to <u>Annex</u> for a factsheet in Electric Vehicles, its charging infrastructure and its battery technology.

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About the Energy Market Authority

The Energy Market Authority (EMA) is a statutory board under the Ministry of Trade and Industry. The EMA's main goals are to promote effective competition in the energy market, ensure a reliable and secure energy supply, and develop a dynamic energy sector in Singapore. Through its work, the EMA seeks to forge a progressive energy landscape for sustained growth. As co-chair of the EV Taskforce, EMA will identify strategic partners for test-bedding, review power grid regulation/licensing requirements for EV charging systems and develop codes and standards.

About the Land Transport Authority

Land Transport Authority (LTA) is a statutory board under the Ministry of Transport. LTA spearheads land transport developments and plans the long-term transport

needs for Singapore. As co-chair of the EV Taskforce, LTA helps ensure that relevant regulations, standards and infrastructure are in place. 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 Economic Development Board

EDB is the lead government agency for planning and executing strategies to enhance Singapore's position as a global business centre and grow the Singapore economy. We dream, design and deliver solutions that create value for investors and companies in Singapore. In so doing, we generate economic opportunities and jobs for the people of Singapore; and help shape Singapore's economic future.

'Host to Home' articulates how EDB is sharpening its economic development strategies to position Singapore for the future. It is about extending Singapore's value proposition to businesses not just in helping them improve their bottom line, but also in helping them grow their top line. EDB plans to build on existing strengths and add new layers of capabilities to enable Singapore to become a 'Home for Business', a 'Home for Innovation' and a 'Home for Talent'.

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FACTSHEET ON ELECTRIC VEHICLES

EVs are increasingly being seen as a sustainable mode of transport by countries worldwide as they are more efficient than internal combustion engine (ICE) vehicles and can help reduce carbon emissions. Likewise, there is potential for Electric Vehicles (EVs) on Singapore roads. While the cost of an EV is still significantly higher than that of an equivalent (ICE) vehicle, there is potential for the costs to come down with technology advancements.

Electric Vehicles – A Cleaner Mode of Transport

- Pure battery electric vehicles offer significant advantages in the areas of energy efficiency and pollution reduction as compared to conventional petrol and diesel internal combustion engine (ICE) vehicles.
- The EV motor system is more than twice as efficient as the ICE. The EV is also able to recover part of the energy expended during braking in a process called regenerative braking. Hence, overall efficiency for EVs is around 65% as compared to 18-23% for ICEs¹.
- EVs charged using electricity from renewable energy sources like solar and wind have virtually zero well-to-wheel carbon emissions². EVs charged using electricity generated from natural gas power generation (as is the case in Singapore) would also achieve some reduction in carbon emissions compared to conventional ICE vehicles, up to an estimated 66%.

EVs – Constraints of Charging Time and Travelling Distance

• Most EVs are powered entirely by lithium-ion batteries. A standard full charge at 3-6 kW (230 volt, 15 ampere) will take about 8 hours, although 'quick charging' technologies exist which can markedly reduce charging time by providing high levels of power to EVs. Typically, an EV battery can be quick charged within 30 - 45 minutes.

¹ Efficiency (%) is defined as the degree of effective use of energy drawn from the battery or fuel tank to move the vehicle.

² Well to wheel carbon emissions refers to the total environmental impact from the extraction of the fuel to the point it is used either directly or indirectly by the car.

- The commuting range of EVs depends on
 - the capacity of the batteries;
 - the type of routes traveled (such as city or highway driving);
 - whether air-conditioning is turned on (air-conditioning is energy-intensive and will drain the battery faster); and
 - driver habits/driving style.
- With current battery technology, a full charge would allow the EV to travel for a range of between 90 km to 160 km. This is more than the average driving distance of around 55km in Singapore. With further breakthroughs in battery technology in the next few years, it is expected that the range can be increased by 50%.

EVs – Higher cost due to expensive battery technology

- The upfront cost of the EV is currently much higher than its ICE equivalent due to the high battery cost.
- However, EV battery prices are likely to decrease with technological advancement and larger scale of production.
- Already, battery costs have fallen sharply by 30% since 2006. The lifespan of batteries is also expected to increase as technology progresses.

EVs – Two types of charging infrastructure for Singapore

 Bosch has been appointed the first Charging Service Provider (CSP) for Singapore's EV test-bed. It will design, develop, deploy, operate and maintain up to 60 normal charging stations and 3 quick charging stations by the end of 2011. The normal charging stations will comprise both outdoor models manufactured by Bosch and indoor models supplied by Bosch's subcontractor Greenlots.

Types of Charging Infrastructure

Types of Charging Infrastructure	Description	Electrical Power	Recharging Time
1. Public Normal Charger	Public normal chargers and residential normal chargers are the two types of normal chargers. Public normal chargers are installed in public locations like shopping mall and HDB car parks while residential normal chargers are installed in private premises. Normal chargers have a longer charging time of 7 to 8 hours compared to the quick chargers.	3 kW	7-8 hours
2. Residential Normal Charger		3 kW	7-8 hours
3. Quick Charger	Compared to the normal chargers, the quick chargers have shorter recharging time and hence, require more electrical power.	30-50 kW	30-45 min

A summary of the different charging technologies is listed below.

• Most EV users will rely on "normal charging", which will take about 7-8 hours for a full charge. For certain users such as taxi fleets, faster charging options will be required. The quick charging station available in the market today can charge the battery within 30-45 minutes.

Outdoor normal charger



Indoor normal charger



Enhanced Transport Technology Innovation and Development Scheme (TIDES+)

- TIDES+ is jointly administered by the Economic Development Board (EDB) and the Land Transport Authority (LTA). The purpose of this scheme is to support EDB's effort in attracting automobile companies to undertake knowledge-based manufacturing, Research and Development (R&D) activities and testing of vehicles in Singapore.
- Under the scheme, programs with new technology vehicles undergoing R&D and test-bedding in Singapore are granted Certificate of Entitlement (COE), Additional Registration Fee (ARF) and Road Tax exemptions upon approval. Duty exemption permits can also be applied from the Customs & Excise Department.

TIDES+ has been in effect since 1 July 2010 with a cap of 1300 vehicles. The tax exemption period has been extended to 6 years, up from 2 years under the previous scheme.

 Companies can apply for TIDES+ if they intend to purchase EVs under the EV test-bedding programme. Interested parties can email their interest to EMA_EV@ema.gov.sg and representatives from the EV Taskforce would get in touch with them shortly to complete the TIDES+ forms.

Background information on Singapore's Electric Vehicle Test-bed

- Since 2009, a multi-agency taskforce chaired by the Energy Market Authority (EMA) and Land Transport Authority (LTA), and comprising members across different government agencies, including the Agency for Science, Technology and Research (A*STAR), Economic Development Board (EDB), Ministry of Environment and Water Resources (MEWR), Ministry of Trade and Industry (MTI), National Environment Agency (NEA), Housing & Development Board (HDB) and SPRING Singapore has been set up to assess the benefits and feasibility of adopting EVs in Singapore.
- The EV test-bed will involve key industry players to examine infrastructure requirements and new business models arising from EVs, as well as to identify industry and R&D opportunities. The test-bed is open to all automobile manufacturers and technology companies interested in shaping the future of electric transport. The test-bed will run for three years, from 2010 to 2012.
- Besides Mitsubishi, the EV taskforce is in talks with Renault-Nissan to provide EVs to the Singapore market in 2011. Other auto-manufacturers are also welcome to participate in the EV trial as it is intended to be an open test-bed for all interested parties.
- The results of the test-bed will be instrumental in providing relevant policy recommendations pertaining to the commercial roll out of EVs beyond the test-bedding phase.

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