Bird & Bird ATMD

Legal Update

Moving to Greener Pastures: Developments in the market for Electric Vehicles in Singapore

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In 2014, the Land Transport Authority ("LTA") and the Intelligent Transportation Society Singapore developed the "Smart Mobility 2030" masterplan, which gathers perspectives from the public and private sector and provides key strategies and focus areas to enhance on. Given that 75% of air pollution is due to motorized traffic from internal combustion engine vehicles ("ICEV") and 20% of carbon emissions is due to land transport, one of the focus areas identified is "Green Mobility".

This focus area aims to develop a sustainable and environmentally friendly Intelligent Transport System in Singapore through, amongst others, promulgating the adoption of electric vehicles ("EVs") in Singapore. Indeed, over the years, Singapore has seen an increase in deployment of EVs and EV-related infrastructure. This article highlights the recent developments in the EV market in Singapore and considers how Singapore can encourage the uptake of EVs through regulation and policies.

Updates on Singapore's EV Market

Charging infrastructure

Across the globe, governments are trying to accelerate the uptake of EVs to cut emissions. This drive will only succeed if there are also mandatory requirements (or possibly incentives and subsidies) to promote EV charging stations. This market for EV charging stations has grown exponentially over the past few years and Asia Pacific has accounted of one of the largest market, followed by Europe and North America. Major factors that have driven the electric vehicles market are rapidly increasing sales of electric vehicles, supported by government initiatives and increasing fuel prices raising the demand of electric vehicles.[1]

To accelerate the adoption of EVs in Singapore, it is critical to plan for charging facilities to be readily accessible and available island-wide. There is an increasing number of charging facilities available in Singapore within the past few years, and there are ambitious plans to further increase this number. This follows from the three-year EV test-bed programme, launched by an EV task force that was set up by the Energy Market Authority ("**EMA**") and LTA in 2011, to study the infrastructure required to support EV deployment in Singapore.

[1] https://www.marketwatch.com/press-release/electric-vehicle-charging-stations-market-analysis-2019-global-industry-forecast-to-2023-by-size-growth-trends-share-and-regional-forecast-2023-2019-03-07

Leading efforts in the widespread deployment of charging points is Singapore Power Group ("**SP Group**"), a Government-owned electricity and gas distribution company in Singapore. SP Group plans to install 1,000 EV charging points by 2020, double the amount they initially planned. On 9 January 2019, they deployed their first wave of 38 EV charging points, which includes AC and DC chargers. These chargers also include "extra-high-powered chargers" of up to 350kW, which can charge more powerful electric models with longer driving ranges and a normal passenger car within 10 minutes[2].

Additionally, other private sector players have stepped up to provide EV charging systems. Greenlots, a global provider of open standards-based technology solutions for EV network, has partnered BMW to provide EV charging services across Singapore and has deployed 55 public EV charging stations across 39 locations. Red Dot Power, Singapore's electricity retailer, is investing S$500,000 to install at least 50 EV charging stations by end-2019. Further, BlueSG, which runs an EV car-sharing service in Singapore in collaboration with LTA, also aims to make its current 400 charging points available for public use by 2020[3]. Even Singaporean taxi company, Comfort DelGro, intends to introduce a DC fast charging service for EVs[4].

These charging systems must comply with the regulatory requirements set out by the EMA. Specifically, the required EV charging standard is TR25:2016, and can either be AC or DC chargers. In installing these charging systems, operators must also be compliant with laboratories that are accredited with the Singapore Accreditation Council.

The massive outlay in the development of electric vehicle infrastructure in the form of recharge stations and other policies, are expected to drive the market for EVs in Singapore over the next few years.

Use of EVs as public transport

There is also an increasing number of developments regarding the use of EVs as public transportation.

LTA and the Economic Development Board partnered with BlueSG to operate a car-sharing programme in Singapore, which was launched in December 2017. These EVs are scattered across Singapore, and users pay a fixed rate depending on duration of use. In its first year of operation (i.e. across 2018), BlueSG announced that they sold more than 20,000 subscriptions and 10,000 rentals[5], and they aim to reach a fleet of 1,000 EVs by 2020.

Further, EVs have also been deployed as taxis. In 2017, HDT Singapore has launched a fleet of fully-electric taxis in Singapore. These electric taxis are provided by BYD, which is the world's largest manufacturer of rechargeable batteries and EVs[6]. Singaporean taxi company Comfort DelGro has also put two electric taxis on the road in 2018, as part of a trial[7]. In August 2018, Grab (Singapore-based technology company offering ride-hailing, ride-sharing, food delivery and logistics services) has partnered SP Group to bring in 200 EVs, which will be progressively deployed from early 2019. EV drivers with Grab can enjoy preferential EV charging rates from SP Group and potentially earn up to 25% more in daily income compared to Grab drivers operating an ICEV, and 20% more than those operating a hybrid vehicle[8].

Regarding public buses, in October 2018, LTA awarded three contracts, worth a total of S$50 million, to private operators to operate electric buses in Singapore. Specifically, BYD (Singapore) and ST Engineering Land Systems were both awarded contracts worth S$17 million and S$15 million respectively to operate 20 single-deck electric buses, while Yutong-NARI Consortium was awarded a contract worth S$18 million for 10 single-deck and 10 double-deck electric buses. These buses are slated to arrive from 2019 onwards[9].

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[2] https://www.channelnewsasia.com/news/singapore/38-electric-vehicle-charging-points-rolled-out-sp-group-11101228
[3] https://www.straitstimes.com/singapore/transport/bluesg-will-open-charging-stations-to-privately-owned-electric-vehicles-from)
[4] https://www.channelnewsasia.com/news/technology/new-fast-charging-station-electric-cars-comfortdelgro-10924582
[5] https://www.bluesg.com.sg/news/successful-first-year-bluesg
[6] https://www.edb.gov.sg/en/news-and-resources/news/byd-to-launch-fleet-of-100-electric-taxis-in-singapore.html
[7] https://www.straitstimes.com/singapore/transport/comfortdelgro-electric-cabs-start-plying-the-roads-this-week
[8] https://www.grab.com/sg/press/business/grab-invests-in-new-electric-vehicle-fleet-enabled-by-sp-groups-fast-charging-dc-network/
[9] https://www.straitstimes.com/singapore/transport/contracts-worth-50-million-for-60-electric-buses-awarded-to-3-firms-lta

Growing supply of EVs

Singapore has received much flak from open criticism by Tesla Chief Executive Officer Elon Musk for imposing a S$15,000 carbon tax surcharge on the Tesla Model S in 2016. Recently, Musk expressed reluctance in supplying Teslas to Singapore, lamenting that the Government is "not supportive of electric vehicles".

In the contrary, car manufacturers are increasingly looking to supply their EVs in Singapore. BMW began selling its EVs in Singapore back in 2014. In 2012, the Nissan LEAF was launched in Singapore, with the most recent model of the LEAF to be launched in the 2nd quarter of 2019. In 2018, Hyundai launched its Ioniq Electric model and Renault launched the Zoe, a compact hatchback EV. More recently in 2019, Nissan launched the Nissan Serena e-Power, an electric Multi-Purpose Vehicle, and has committed that all its new models arriving in Singapore will either be fully battery-operated or hybrid by 2022.

Evidently, there is significant promise in the EV market in Singapore, as car manufacturers are increasingly beginning to supply of EVs here in response to the rising eco-consciousness of Singaporeans and the Government's support for an electrified transportation system.

Green tax rebates

The Singapore Government gives tax rebates for clean vehicles. Before January 2018, tax rebates and surcharges for car emissions fell under the Carbon Emissions-Based Vehicles Scheme ("**CEVS**"), which only considered a vehicles' carbon dioxide ("**CO2**") emissions. The rebate or surcharge ranged from S$0 to S$30,000.

However, from 1 January 2018 onwards, the CEVS was replaced by the Vehicle Emission Scheme ("**VES**"), which measures vehicular emissions on 5 pollutants: CO2, hydrocarbons (HC), carbon monoxide (CO), nitrogen oxides (NOx), and particulate matter (PM). The applicable rebate or surcharge, ranging from S$0 to S$20,000, depends on the band that the vehicle is placed in and this banding is determined by the worst-performing pollutant, out of the five, to encourage consumers to select models with lower emissions across all pollutants. In measuring the CO2 emissions level for EVs, LTA takes into account the CO2 emitted during production and distribution of electricity at 0.4g CO2/ watt-hour.

The table below (adapted from the LTA website) shows the banding system and the applicable rebate or surcharge:

Band	**CO_2 (g/km)**	**HC (g/km)**	**CO (g/km)**	**NO_x (g/km)**	**PM (mg/km)**	**Rebate or Surcharge**
A1	**A1**≤90	**A1**≤0.020	**A1**≤0.150	**A1**≤0.007	**A1**=0.0	S$20,000 *rebate*
A2	90<**A2**≤125	0.020<**A2**≤0.036	0.150<**A2**≤0.190	0.007<**A2**≤0.013	0.0<**A2**≤0.3	S$10,000 *rebate*
B	125<**B**≤160	0.036<**B**≤0.052	0.190<**B**≤0.270	0.013<**B**≤0.024	0.3<**B**≤0.5	S$0
C1	160<**C1**≤185	0.052<**C1**≤0.075	0.270<**C1**≤0.350	0.024<**C1**≤0.030	0.5<**C1**≤2.0	S$10,000 *surcharge*
C2	**C2**>185	**C2**>0.075	**C2**>0.350	**C2**>0.030	**C2**>2.0	S$20,000 *surcharge*

Within the first month of implementation of VES, 15% of vehicles registered qualified for tax rebates[10]. Only 0.1% of cars qualified for the A1 banding and these are all EVs, because even the cleanest ICEV will emit PM and hence not qualify for the S$20,000 tax rebate.

[10] https://www.straitstimes.com/singapore/transport/only-15-of-new-cars-get-green-tax-break

Case Studies

Norway

Norway is considered the leader in EV use, and aims for all cars sold to be zero-emissions by 2025. By the end of 2018, EVs occupied 30% of the market share, the highest in the world.

Norway's success is attributable to the numerous incentives by Government over the years to encourage EV use. EVs enjoy privileges on taxes and tolls such as exemption from registration tax (50%), exemption from Value Added Tax (25%), exemption from road tax, exemption from road tolls or ferry tolls (from 1997 to 2007), and reduction in company car tax. Norway also imposes a progressive tax system on cars, calculated by a combination of weight, CO2 and NOx emissions. Comparing between an ICEV Volkswagen Golf and an EV Volkswagen Golf, the EV model is cheaper by about US$ 4,300 USD (S$ 5,800) notwithstanding its higher import price[11]. Thus, EVs are more preferable to ICEVs as they are more cost-effective both in the short run and the long run. Further, EV owners also enjoy non-financial perks such as access to bus lanes and, up until 2017, free municipal parking.

Interestingly, over the years, the charging infrastructure struggled to keep up with Norway's rising EV uptake. In 2015, for every 72,000 EVs on the road, there were less than 10,000 charging points. This problem has been particularly bad in the northern Norway where one resident has even resorted to installing a charging station in the city's downtown on his own[12]. However, the Government has responded by installing more charging stations across the country and Norway's charging infrastructure is now improving.

Overall, Norway's success in promoting EVs is not an overnight one. Norway is one of the early adopters of EVs, and started promoting them since 1989. Many of the policies and incentives were introduced since the 1990s – for example, the exemption from road tax was introduced in 1996, and the exemption from parking fees for EVs was introduced in 1999. Similarly, Singapore may learn from Norway's numerous incentives, to make EVs a more attractive alternative to ICEVs, though it should note that it should not expect to achieve immediate results.

China

In China, the Government aims for EVs to make up 20% of vehicle sales by 2025. China's EV market expanded by 72% from 2016 to 2017, and it has a larger EV market than Europe and the United States combined. According to the EV Index by McKinsey, which measures EV uptake in various countries, China is ranked second, just behind Norway. Further, Shenzhen is the world's only city with 100% electric buses.

Success in China's EV market is due to a decade of generous subsidies on EVs as well as tight regulations on ICEVs. BYD, a Chinese company and the world's second largest EV maker after Tesla, received about US$590 million in subsidies from both local and central Government, which helped propel BYD into the global EV market.

To encourage demand for EVs, the Chinese Government offered subsidies of up to RMB 110,000 (S$22,030) per unit. Further, EV cars are conferred preferential treatment. For example, non-EVs are banned from central Beijing one day a week whereas this ban does not apply to EVs; and in some cities where the number of vehicle licenses are capped each month and car owners must ballot for these licenses, EVs owners are assured of a vehicle license. However, from 2019 onwards, China intends to slash subsidies available to EVs with a range of less than 300km by 30%, and completely end these subsidies in 2020. EVs with a range of 400km or more will enjoy a 10% increase in subsidies, to encourage production of more efficient EVs.

This decrease in subsidies follows from a decade of the Government's heavy investment into EV subsidies, tax incentives and construction on charging infrastructure across the country[13]. Instead, China now intends to promote EV uptake through supply-side regulations, essentially transferring the burden of subsidising EV

[11] https://elbil.no/english/norwegian-ev-policy/
[12] http://bellona.org/news/transport/electric-vehicles/2018-03-one-electric-car-owners-cry-for-help-from-norways-northern-reaches
[13] https://qz.com/1463563/your-next-car-could-be-electric-and-chinese/

development to automakers[14]. From 2019 onwards, car manufacturers must earn credit points from manufacturing EVs equivalent to 10% of the total vehicles they produce, and this percentage will increase to 12% in 2020. If they fail to meet such quotas, they will acquire negative credits, which must be offset by buying positive credits from other companies or by reducing the production of ICEVs. Otherwise, they face sanctions such as new models not being approved or production halt for ICEVs. Car manufacturers must also meet more stringent fuel standard policy. Consequently, companies that traditionally manufacture ICEVs must now accelerate the production of electric models to fall within these regulations. Under this new policy, China's EV sales are projected to reach 33% by 2030[15].

Unlike Norway, China adopts a combination of both supply side and demand side regulations and incentives to promote EV uptake. Further, the success of EV adoption in China may also be due to the wide variety of EVs available, with at least 75 different models available ranging from cars made by foreign car makers, like Tesla and Ford, to local car makers, like BAIC, Zhidou and Kandi. Given the financial toll in providing subsidies and tax cuts to consumers who purchase EVs, Singapore may consider supply-side regulations as a more sustainable approach to encouraging EV uptake.

Other considerations

Notwithstanding the significant environmental benefits that adoption of EVs can bring, there remains certain challenges to using EVs, which Singapore must be prepared to grapple with.

End-of-life for EV batteries

EVs are powered by lithium-ion batteries. In end-of-life EVs, retired batteries could still retain 70 to 80% of their initial capacity. By 2029, there will be an estimated 3 million used battery packs coming out of EVs every year, which amounts to around 108GWh available storage capacity[16]. However, these lithium-ion batteries, if left to decompose in landfills, could release toxic chemicals and heavy metals like cobalt and nickel that could pollute the soil or waterways. Further, even manufacturing of lithium-ion involves intense mining of rare earth metals and transportation across long distances, which could be costly on the environment.

Instead of disposing them in landfills and given the available storage capacity in used EV batteries, they can be reused for various purposes like storing electricity from solar panels and wind turbines. Toyota has committed to install retired batteries outside 7-Eleven stores in Japan to store power from solar panels and use it inside the stores. BYD is also using retired batteries to power wireless transmission towers to run energy storage systems in Shen Zhen[17]. Tesla has worked with recycling companies to recycle most of their battery packs in both US and Europe.

Regulations may be used to promote such positive behaviour amongst car manufacturers and consumers. In China, carmakers are responsible for the recovery of EV batteries and are required to set up recycling channels and service outlets to collect used EV batteries to be transported to recycling companies. They must also establish a maintenance service network for EV owners to repair or exchange their EV batteries conveniently. Further, the Government implemented the Regulations on Battery Recycling and Traceability Management Platform, under which all EV batteries will have a unique ID to track the batteries during the entire lifecycle, and stakeholders must update and upload the battery information onto the platform[18]. In the United Kingdom ("**UK**"), regulations exist to ensure that EV batteries are properly treated and recycled, and are banned from being incinerated or sent to the landfill. The burden is on the manufacturer of such batteries to ensure compliance with such regulations[19]. Currently, Singapore lacks regulations on recycling e-waste like lithium-ion batteries, which might pose significant problems in the future regarding disposal of EV batteries. However, the Government has responded by proposing to introduce the Resource Sustainability Bill that will impose obligations on producers of lithium-ion EV batteries to recycle them later in 2019.

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[14] https://www.forbes.com/sites/jackperkowski/2018/07/13/china-shifts-subsidies-for-electric-vehicles/#35f833b05703
[15] https://www.dbs.com/aics/pdfController.page?pdfpath=/content/article/pdf/AIO/072018/180706_insights_china_leads_the_way.pdf
[16] https://www.idtechex.com/research/reports/second-life-electric-vehicle-batteries-2019-2029-000626.asp
[17] https://www.bloomberg.com/news/features/2018-06-27/where-3-million-electric-vehicle-batteries-will-go-when-they-retire
[18] https://www.idtechex.com/research/articles/all-ev-batteries-born-after-august-2018-in-china-will-have-unique-ids-00015455.asp
[19] https://www.gov.uk/guidance/regulations-batteries-and-waste-batteries

Clean energy sources

Notwithstanding EVs emit fewer pollutants than ICEVs, how green EVs actually are depends on how the electricity grids are powered. In Norway, around 99% of the electricity is generated from hydropower, which makes EVs extremely environmental friendly. Contrastingly, in China, the world's largest producer and consumer of coals and where coal forms 60% of the country's energy mix, a significant number of EVs are being powered by electricity derived from burning of coal, making EVs less environmentally friendly than those in Norway. Singapore derives most of its power from natural gas, which is still a fossil fuel and is non-renewable, albeit less unclean than coal. To fully reap the benefits of EVs, a concurrent shift to renewable sources of energy is desirable.

Similarly, the carbon footprint of EVs depends on where the EV battery was manufactured. According to German auto management consultancy Berylls Strategy Advisors, to manufacture a car battery that weighs more than 500kg for Sports Utility Vehicles might emit up to 74% more CO2 than producing an efficient conventional car if made in a coal-powered factory in a place like Germany. It was also estimated that the average German car owner could drive an ICEV for 3 and a half years, or more than 50,000km, before a Nissan Leaf with a 30 kWh battery would beat it on CO2 emissions in a coal-heavy country[20]. Currently, no clear guidelines on acceptable CO2 emission over the life cycle of EVs have been enacted by countries adopting EVs.

Singapore's approach moving forward

Singapore's current regulation and policies are likely to encourage people to switch from using ICEVs to EVs, which would reduce the pollution from traffic and create more business opportunities for the EV market. However, more can be done to promote the uptake of EVs and, in attempting to do so, Singapore must also tread carefully.

Unlike Norway, which has many incentives such as free parking and access to bus lanes for EVs, Singapore does not have as many incentives and EVs only receive a tax rebate of $20,000 under the CEVs. Singapore may consider dolling out more subsidies to reduce the purchase price of EVs, to encourage consumers to make the switch, for example exemption from certain taxes on cars or increased rebates for EVs. However, this may place an excessive burden on Singapore's financial resources, and may not be wise in the long-run. Indeed, countries like China are beginning to experience the pinch of excessive subsidies, which has led to them revising their EV policy and rolling back some subsidies. And in any case, the S$20,000 rebate for EVs in Singapore is already quite a significant figure. Alternatively, instead of subsidizing the purchase price of EVs, Singapore may consider subsidizing parking fees or Electronic Road Pricing ("**ERP**") charges on EVs. Further, non-financial incentives may be implemented such as a nationwide policy that EVs can have priority parking in carparks, or enjoy priority in getting a Certificate of Entitlement. These policies may be implemented on a short-term basis, for example 5 years, to test its efficacy and discourage motorists from viewing them as an entitlement to owning an EV.

Charging infrastructure must keep up with the adoption of EVs. The increasing deployment of charging systems across Singapore is a good sign that the country is preparing for an electrified transportation system. Nonetheless, more can be done such as installation of charging infrastructures in residential areas such as HDB parking lots or condominium parking lots, since car owners living in non-landed properties cannot build their own charging system at their disposal. Regulation may also be introduced to mandate that each public carpark should have a certain percentage of EV charging systems, and this percentage can increase over the years in alignment with the increasing number of EVs registered.

In the past, majority of the EVs in the market come from premium brands like BMW and Porsche, which made them less affordable. However, with an increasing number of EVs in the market coming from more affordable brands such as Nissan and Toyota, EVs are becoming more accessible to the masses. To further encourage this, regulations may be implemented to increase the supply of EVs in Singapore, by restricting the proportion of ICEVs that importers may import compared to EVs. This may take the form of a credit system, similar to the Zero Emission Vehicle ("**ZEV**") programme in California. In California, each

[20] https://www.bloomberg.com/news/articles/2018-10-16/the-dirt-on-clean-electric-cars

automaker is assigned ZEV credits and automakers are required to maintain ZEV credits equivalent to a certain percentage of non-EV sales. Each vehicle sale earns the automakers credits based on the type of EV and its battery range. The credit requirement in 2018 would require 2.5% of sales to be ZEVs, and this credit requirement will rise to require 8% of sales to be ZEVs. This credit system may be applied in Singapore with relevant modifications.

Additionally, to tackle the issue of the batteries in end-of-life EVs, comprehensive legislation should be implemented to govern how these lithium-ion batteries should be treated. Similar to UK's approach, legislation may mandate that these batteries must be recycled, and that disposal of retired EV batteries in landfills is prohibited entirely. The burden may be placed on EV manufacturers and importers to set up a comprehensive EV battery recycling system and make it convenient for EV users to recycle or change their EV batteries, similar to China's approach. Information on recycling EV batteries should be promoted to EV buyers so they understand the recycling process. A failure to adhere to such regulations may entail criminal penalties such as fines and/or public denouncement, as deterrence and to reflect the importance of EV battery recycling. Policies may also be used to encourage collaboration between automakers or importers and recycling companies. As at the date of writing, the Resource Sustainability Bill has not been tabled and it remains to be seen whether this Bill adequately addresses such concerns.

Lastly, in order to truly reap the benefit of EVs, Singapore should turn to more sustainable energy sources to power our electricity grid. This would further lower the CO_2 emissions attributable to EVs, and emulate Norway's success in a truly green electrified transport system. Singapore may also consider mandating that the batteries in the EVs being imported must be manufactured from factories powered by renewable energy. Though, in doing so, Singapore must carefully evaluate the pros and cons to ensure this does not compromise the supply of EVs.

Conclusion

The adoption of EVs reduce emissions, new technologies are shaving off charging times, and nearly every major automotive brand has announced significant future electrification plans. EVs are clearly on the uptrend. According to a feasibility report by the EMA and LTA, the average distance travelled by a Singaporean is about 46km which is well within the range of EV's average of 156km. Thus, Singapore is well-placed to embrace EVs, and a range of incentives and policies can help accelerate the adoption of EVs. However, in embracing this new wave, Singapore must also be cautious in implementing a sound regulatory framework to combat other issues that might arise, such as implementing regulations dealing with end-of-life EV batteries, and also ensure that the policies implemented to encourage EV uptake are sustainable and effective in the long run.

Results may not be achieved overnight, and there remains some way to go before Singapore's transportation system is fully electrified. Nonetheless, it is clear there is significant promise in Singapore's EV market, which would provide business opportunities for new market players such as charging companies, recycling companies or battery maintenance companies.

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