Electric Vehicle Market Sector and Potentials in Pakistan.

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1 INTRODUCTION TO SMEDA

The Small and Medium Enterprises Development Authority (SMEDA) was established in October 1998 with an objective to provide fresh impetus to the economy through development of Small and Medium Enterprises (SMEs).

With a mission "to assist in employment generation and value addition to the national income, through development of the SME sector, by helping increase the number, scale and competitiveness of SMEs", SMEDA has carried out 'sectoral research' to identify policy, access to finance, business development services, strategic initiatives and institutional collaboration and networking initiatives.

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3 OBJECTIVES.

- To review EVM Sector strength ,opportunity, threats, weakness
- To Explain existing opportunity for investors in this sector.
- To Provide brief introduction regarding EVM and its Process flow
- How Electric vehicles work
- To Provide a road map in identification of area and capacity.

4 CONCEPT AND IMPORTANCE OF ELECTRIC MOTORS.

Electric motive power started in 1827, when Hungarian priest Anyos Jedlik built the first crude but viable electric motor, provided with stator, rotor and commutator; the next year, he used it to power a tiny car In 1835, professor Sibrandus Stratingh of the University of Groningen, the Netherlands, built a small-scale electric car, and between 1832 and 1839 (the exact year is uncertain), Robert Anderson of Scotland invented the first crude electric carriage, powered by non-rechargeable primary cells. American blacksmith and inventor Thomas Davenport built a toy electric locomotive, powered by a primitive electric motor, in 1835. In 1838, a Scotsman named Robert Davidson built an electric locomotive that attained a speed of four miles per hour (6 km/h). In England a patent was granted in 1840 for the use of rails as conductors of electric current, and similar American patents were issued to Lilley and Colten in 1847

The first mass-produced electric vehicles appeared in America in the early 1900s. In 1902, the Studebaker Automobile Company entered the automotive business with electric vehicles, though it also entered the gasoline vehicles market in 1904. However, with the advent of cheap assembly line cars by Ford Motor Company, the popularity of electric cars declined significantly.[14]

Due to the limitations of storage batteries at that time, electric cars did not gain much popularity; however, electric trains gained immense popularity due to their economies and achievable speeds. By the 20th century, electric rail transport became commonplace due to advances in the development of electric locomotives. Over time their general-purpose commercial use reduced to specialist roles as platform trucks, forklift trucks, ambulances, tow tractors and urban delivery vehicles, such as the iconic British milk float; for most of the 20th century, the UK was the world's largest user of electric road vehicles.

Electrified trains were used for coal transport, as the motors did not use precious oxygen in the mines. Switzerland's lack of natural fossil resources forced the rapid electrification of their rail network. One of the earliest rechargeable batteries – the nickel-iron battery – was favored by Edison for use in electric cars.

5 IMPORTANCE OF ELECTRIC VEHCILES.

By replacing the conventional vehicles with EVs, Pakistan's **fuel import bill** will be reduced as most of the finished petroleum products used in transport is imported. Homes equipped with solar roof-tops can charge their EVs with clean energy virtually for free as long as the sun is shining

6 HOW ELECTRIC VEHICLES WORK.

The emergence of metal–oxide–semiconductor (MOS) technology led to the development of modern electric road vehicles. The MOSFET (MOS field-effect transistor, or MOS transistor), invented by Mohamed M. Atalla and Dawon Kahng at Bell Labs in 1959, led to the development of the power MOSFET by Hitachi in 1969, and the single-chip microprocessor by Federico Faggin, Marcian Hoff, Masatoshi Shima and Stanley Mazor at Intel in 1971. The power MOSFET and the microcontroller, a type of single-chip microprocessor, led to significant advances in electric vehicle technology. MOSFET power converters allowed operation at much higher switching frequencies, made it easier to drive, reduced power losses, and significantly reduced prices, while single-chip microcontrollers could manage all aspects of the drive control and had the capacity for battery management. Insulated-gate bipolar transistor (IGBT) technology made possible the use of the synchronous AC three phase motor, by creating a synthetic three phase alternating current from, for example, a DC traction battery pack. This technique was developed by Hughes and GM and used in their US Electricar in 1995, but still used the heavy (26 count 12 Volt) lead acid, series

connected batteries. GM later developed an electric pickup truck and then the EV1. This motor and controller was kept alive and used in converted cars by AC Propulsion, where they introduced the lithium battery that Elon Musk later saw and embraced. Another important technology that enabled modern highway-capable electric cars is the lithium-ion battery, invented by John Goodenough, Rachid Yazami and Akira Yoshino in the 1980s, which was responsible for the development of electric vehicles capable of long-distance travel.

In January 1990, General Motors' President introduced its EV concept two-seater, the "Impact", at the Los Angeles Auto Show. That September, the California Air Resources Board mandated major-automaker sales of EVs, in phases starting in 1998. From 1996 to 1998 GM produced 1117 EV1s, 800 of which were made available through three-year leases.

Chrysler, Ford, GM, Honda, and Toyota also produced limited numbers of EVs for California drivers. In 2003, upon the expiration of GM's EV1 leases, GM discontinued them. The discontinuation has variously been attributed to:

- the auto industry's successful federal court challenge to California's zero-emissions vehicle mandate,
- a federal regulation requiring GM to produce and maintain spare parts for the few thousands EV1s and
- the success of the oil and auto industries' media campaign to reduce public acceptance of EVs.

During the late 20th and early 21st century, the environmental impact of the petroleum-based transportation infrastructure, along with the fear of peak oil, led to renewed interest in an electric transportation infrastructure. EVs differ from fossil fuel-powered vehicles in that the electricity they consume can be generated from a wide range of sources, including fossil fuels, nuclear power, and renewables such solar power and wind power or any combination of those. The carbon footprint and other emissions of electric vehicles vary depending on the fuel and technology used for electricity generation. The electricity may be stored in the vehicle using a battery, flywheel, or supercapacitors. Vehicles using internal combustion engines usually only derive their energy from a single or a few sources, usually non-renewable fossil fuels. A key advantage of electric vehicles is regenerative braking, which recovers kinetic energy, typically lost during friction braking as heat, as electricity restored to the on-board battery.

7 POTENTAIL OF ELECTRIC VEHICLES.

Pakistan already has a significant market for hybrid vehicles with Honda's Vezel, Toyota's Prius and Aqua, and other models seen on the roads. The Automotive Development Policy (2016–2021) and the launch of China-Pakistan Economic Corridor (CPEC) are encouraging foreign investments for the new automobile brands to enter Pakistani market, while the leading manufacturers in the automobile industry in Pakistan are interested in introducing EV models with a wide range of prices which target consumers of diverse income groups. Several members of the international automobile industry including South Korea, China, and Japan also believe that Pakistan has a high potential market for EV technology, and local businesses are collaborating with them to bring EVs in Pakistan

Karakoram Motors is a Pakistani automobile manufacturer based in Karachi, Sindh, Pakistan. Karakoram Motors is the authorized assembler and manufacturer of Dynasty IT electric cars.

Rahmat Group is bringing electric cars to Pakistan. As per Dawn News, the Group has already acquired 25 acres of land to establish Electrical Complex at Nooriabad. At the initial stage, the group will produce electric buses to tap the transport market, and in the second phase, a manufacturing plant would be established at the complex to produce electric cars and two-wheelers. As per the reports, Rahmat Group will partner with two Chinese manufacturers to turn its plans into a reality. One company will handle the electric car production while the other will assemble electric vans and trucks. The group also plans to develop lithium batteries for buses, cars and two-wheelers. Rahmat Group has signed an agreement with Chinese EVs manufacturer **BYD**.

Chongqing Changan Automobile Limited has signed an agreement with **Master Motors** of Pakistan to assemble and sell their cars in the country. **Jinbei** has collaborated with Zenith Automotive (Pvt) Ltd. to distribute and sell its Electric vehicles across the country.

Al Haj Automotive Private Limited recently signed an agreement with **Proton** as the exclusive authorized distributor and assemblers of Proton vehicles in Pakistan and have plans to launch their Electric vehicles in the country. The agreement signing ceremony was held in Kuala Lumpur.

BMW has introduced their top of the line electric cars, the i3 and the i8 in Pakistan. **Nissan**, **Hyundai**, **Audi** and **Renault** are already in talks with the Ministry of Industries and Production for producing locally manufactured electric cars in the country. **Audi** has launched its e-Tron 50 Quattro in Pakistan in April 2020.

8 INITIATIVES BY GOVERNMENT OF PAKISTAN

On 5 November 2019, Pakistan's federal cabinet had approved the first-ever national Electric Vehicles (EV) policy in a bid to tackle effects of climate change and offer affordable transport. The Key Points of Electric Vehicles Policy 2020-2025 are following

- Exemption of customs duty and additional sales tax on the import of 4 wheels electric vehicles.
- Only 1% sales tax on locally manufactured electric vehicles (power up to 50/kwh).
- Also 1% sales tax on light vehicles (power up to 150/kwh).
- Import duty on the import of batteries and charging equipment is reduced to only 1%;
- Federal Excise Duty (FED) will not be applicable on the manufacturing or sales on EVs
- Only 1% tax on the import of electric vehicles parts and spare parts.
- The would-be no registration fee of electric vehicles.
- No annual renewal fee for electric vehicles producer in the ICT sector.
- There would be no custom duty on the import of plant and machinery.

In the first phase, the government will focus on converting 30 per cent of the total number of vehicles, mainly cars and rickshaws, into EVs by 2030. According to policy, 100,000 cars and 500,000 bikes and rickshaws will be converted to EVs in next 4 years, and more than 3,000 CNG stations that have been shut due to gas shortage will be converted to EV charging stations. Pakistan is also planning to set up special units of electric car manufacturing in the Special Economic Zones being established under the China-Pakistan Economic Corridor.

In November 2019, MoU was signed between Pakistan's Minister of Science and Technology Fawad Chaudhry and CEO of Airlift to introduce battery buses for Pakistan's public transport system.

On 8 July 2021, Prime Minister Imran Khan inaugurated the production of electric motorcycles in partnership with Jolta Electric. Pakistan Electric Vehicles Policy 2020-2025 approval resulted in electric motorcycle manufacturing.[34

Roads, transmission equipment, maintenance infrastructure, turbines, and the like all need to be considered. Moreover, the construction of a wind farm necessitates the use of heavy industrial equipment. Developers will need to invest in roads capable of

accommodating significant weight. To do so will require the cooperation of landowners and, in some cases, the local community.

9 CHARGING INFRASTRUCTURE.

The charging infrastructure for electric vehicles in Pakistan has not been fully developed yet.

In January 2017, Dewan Motors with BMW inaugurated Pakistan's first public charging station for electric and plug-in hybrid electric vehicles in Emporium Mall, Lahore. Dewan Motors had installed another station for plug-in hybrid and electric vehicles at Dolmen Mall in Karachi in February 2017.BYD has also plans for setting up charging stations in Pakistan which will be done in association with the leading oil company in the country, Total Parco.[38]

The first set of EV chargers located at PSO Fuel station in Jinnah Super Markets (F7), Islamabad

In July 2020, The first charging station was set up at one of PSO stations located in Islamabad by Barqtron Energy Company. According to Federal Ministry of Energy, 24 more charging stations are being planned to be added at PSO stations across Pakistan.


PSO
Electric Vehicle Charger
CHARGING
STATION
Electro