

The Techno-Commercial Analysis of MG ZS EV Electric Vehicle

By

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A special thanks go to the Teachers of the KIT College of Engineering, who helped me to identify problem statement and gave suggestion about the actual working of Electric Vehicle. In the present world of competition, there is a race of existence in which those are having the will to come forward to succeed. Project is like a bridge between theoretical and practical working. With this willing, I joined this particular project. Also, I would like to bring to light the HR Manager Neha Kumari Ma'am who gave me this wonderful internship opportunity at Vardhan Consulting Engineers, Bangkok, Thailand.

EXECUTIVE SUMMARY

The MG ZS EV is not just India's first pure Electric Internet SUV, but also a catalyst for change. At MG, we believe change begins with a few, the ones who lead from the front and inspire others to do the same. A step in the same direction, MG ZS EV, the global SUV is designed for the few who would like all the benefits of a zero tail pipe emission vehicle but in style. The MG ZS EV does not compromise on aesthetics, has an excellent build quality, would thrill you with its performance and is powered by i-Smart EV 2.0. Style, substance, performance – all comes packed with the MG ZS EV.

M/s Vardhan Consulting Engineers "VCE" is a management consulting firm, which provides consultancy to energy and infrastructure developers to raise debt and equity for their projects in terms of project finance (non-recourse debt) and private equity. For doing this the techno-commercial analysis and consultants at VCE prepare an analytic report of the projects and perform the analysis and figure out the importance and requirements of EVs.

Our services include:

- Feasibility Analysis, Detailed Project Report, Financial Analysis(IM).
- Financial Closure through Debt or Private Equity for Project Finance.
- On-site and Off-site Project Management and EPC-Management Services.
- Documentation and Transaction Services for Sale of Project.
- Project Development and Transfer of Rights at NTP.

As an Engineering Design Intern at VCE, I was provided with the opportunity to work on a case and help VCE in preparing a project report on techno-commercial analysis of Tata Nexon EV.

1. INTRODUCTION

Project Background

Road EVs include a large range of vehicles from electric two-wheelers, three-wheelers (rickshaws), cars and electric buses. Also, plug-in electric vehicles can be classified into two types: battery electric vehicles (BEVs), and plug-in hybrid electric vehicles (PHEVs). BEVs have an electric motor in place of combustion engine and use electricity from the grid stored in batteries. Plug-in hybrid electric vehicles (PHEV) use batteries to power an electric motor and liquid fuel such as gasoline or diesel to power an internal combustion engine or another propulsion source.

EVs can go beyond the above-mentioned technology-based classification and can be classified based on their attributes such as i) charging time, ii) driving range and iii) the maximum load it can carry. Of these attributes, the two most important characteristics of an electric vehicle of concern to the consumer are:-

1. Driving range (i.e. the maximum distance an EV can run when fully charged).
2. Charging time of batteries (i.e. the time required to fully charge the battery) and charging time depends on the input power characteristics (i.e. input voltage and current), battery type, and battery capacity.

The central and state governments have launched schemes and incentives to promote electric mobility in the country and some regulations and standards are also in place. While the country stands to benefit largely by switching its transport from IC engines to electric motor-powered, there are challenges like lack of charging infrastructure, high initial cost and lack of electricity produced from renewable energy. Still, e-commerce companies, car manufacturers, app-based transportation network companies and mobility solution providers have entered the sector and are slowly building up electric car capacity and visibility.

The National Electric Mobility Mission Plan 2020 was launched by the Government of India in 2020 to improve national fuel security through the promotion of hybrid and electric vehicles.

In India, electricity is mainly produced by burning coal, which produces a great number of greenhouse emissions. With the introduction of EVs and charging infrastructure, the electricity demand will go up a lot and the whole point of introducing EVs to reduce GHG emissions would be ineffective if all this electricity was produced by burning coal.

Moreover, India's Distribution companies hold debts and are unable to suffice the energy requirement of the whole country adequately. If EVs were to enter this equation, the sudden increase in electricity requirement would put extra load on these companies. Moreover, there are a lot of factors that would go into deciding the pricing of the electricity as well as the demand on the grid.

MG Motor :

MG Motor, or Morris Garages, is a British marque known for its sports cars and mini cars. It was founded in 1924 by Cecil Kimber. Over the years, with its glorious history, the ownership of the company has changed hands across diversified business conglomerates to finally being owned by Chinese state-run SAIC Motor. For the uninitiated, SAIC is the seventh largest automotive design and manufacturing company in the world.

Nearly two years ago, in September 2017, MG Motor India inaugurated its manufacturing facility in Halol, Gujarat and announced its plans for India. These included introducing a premium mid-size SUV in the heart of the market, followed by an all-electric SUV. The program also included opening of 120 MG touch-points across the country by June 2019 and increase it to over 250 showrooms by September.

2. MG ZS EV

MG Hector has received good response from the market even after stiff competition. MG has now launched its second SUV in the Indian market, which is an EV. The MG ZS EV is the electric version of the ZS that is sold in the foreign markets.

MG ZS EV is longer than the usual compact SUVs that are available in the market. MG ZS EV is a crossover which means it is smaller than MG Hector, but larger than a compact SUV.

The battery of the EV has gone through various rough testing because of which it is IP67 certified and survive the Indian climate. MG ZS EV is available in two variants namely, Excite and Exclusive. Just like the MG Shield package that is offered with the Hector, MG offers with the ZS EV.

The comprises of an extended warranty up to 8-year or 1,50,000 km warranty on the lithium-ion battery and 24x7 roadside assistance for five years which is only for the private buyers



2. Figure 1. Front View of MG ZS EV



Figure 2. MG ZS EV

TECHNICAL SPECIFICATIONS:

1. Performance and Drive:

“What it’s like to drive and how quiet it is”

MG ZS EV performance depends on the driving mode that you are in. There are three driving modes from which you can choose from, namely Sport, Eco and Normal.

The Sport mode maximizes the performance, the Normal mode offers a balance between range and performance while the Eco mode maximizes the range of the battery. The handling of the SUV is neutral and it absorbs most of the bumps and potholes of our Indian roads.

Table 2. Performance

Parameters	Values
Acceleration 0 - 100 km/h	8.5 sec
Top Speed	140 km/h
Electric Range	340 km
Total Power	142.7 PS
Total Torque	353 Nm
Drive	Front

2. Battery and Charging:

The battery is the heart of an EV. Which is why we do everything possible - and sometimes what’s not - to ensure that it is the safest and the most cared for thing in your car.

MG ZS EV range is 340 km as per MG. However, the range in daily use may vary on the driving habits of the driver and the condition of the traffic. The battery can be recharged up to 80% in 8 hours from the household outlet, but the DC charger will take just 50 minutes to charge the EV from 0-80%.

Table 3. Charging time for different Scenarios



Figure 3. Side View of MG ZS

Whenever the ZS SUV is put on charge, the MG logo on the front grille glows up to indicate that the SUV is getting charged. Once the glowing stops, it means the charging is complete. Interestingly, the battery level reaches from 0 to 80 percent battery capacity within 50 minutes thanks to a 50kW DC fast charger installed at dealerships. On the other hand, a 7.4kW AC home charger, which will be set up at the owners' homes or offices, will take around 6-8 hours for a full charge. What's more, MG India will also provide an on-board portable cable free with the ZS EV that can be plugged into a wall socket.



Figure 4. Charging



Figure 5. Back View of MG ZS EV

3. Energy Consumption:

Electric Vehicle Database Real Range

Table 4. EVDB Real Range

Parameter	Values
Range	220 km
Vehicle Consumption	193 Wh/km
CO2 Emissions	0 g/km
Vehicle Fuel Equivalent	1.8l/100km

SAFETY STANDARDS:

Table 5. Safety Standards

Safety Rating	
Adult Occupant	90%
Child Occupant	85%
Rating Year	2019
Vulnerable Road Users	64%
Safety Assist	70%

1) Dual Airbags:



Figure 6. Dual Airbags

MG ZS EV comes with 6 airbags, which include dual front airbags, front-seat side-impact airbags, and side-curtain airbags that work together with the seatbelts. We made sure that MG ZS EV is always armoured to save your life.

2) ABS with EBD & Corner StabilityControl



Figure 7. ABS with EBD & Corner Stability Control

EBD coupled with ABS helps monitor vehicle control by applying more or less braking pressure to each wheel in order to maximize stopping power. It also keeps you from skidding when you brake really hard.

Electronic Stability Control improves the car's stability by detecting and reducing lack of traction. Electronic Stability Program detects loss of steering control and automatically applies the brakes to help steer the car where the driver intends to go.

3) Brake Assist

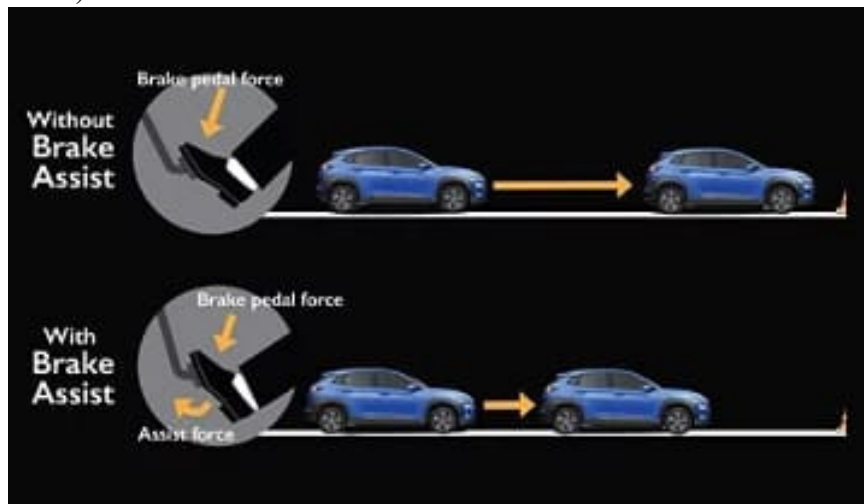


Figure 8. Brake Assist

A travel sensor attached to the brake pedal allows the Brake Assist system to detect when the driver attempts an emergency stop and, regardless of the amount of pressure actually applied, apply maximum braking force until the car is brought to a halt. Hence, keeping you and your car safe in emergency situations.

4) INTELLIGENT BATTERY TEMPERATURE CONTROL MANAGEMENT



Figure 9. INTELLIGENT BATTERY TEMPERATURE CONTROL MANAGEMENT

The battery of the MG ZS EV has an inbuilt Temperature Control Management System that ensures optimal battery output irrespective of extreme hot or cold temperature conditions.

WEIGHT AND DIMENSIONS:

Tata Nexon EV dimensions 3993 mm in length, 1811 mm in width and 1606 mm in height, with a wheelbase of 2498 mm, you can also check Tata Nexon EV dimension converted into CM (centimetre), Inches and feet for all variants of the car.

Table 6. Weight and Dimensions

Parameter	Values
Length	4314 mm
Width	1809 mm
Height	1620 mm
Wheelbase	2585 mm
Kerb Weight	1966 kg
Ground Clearance	205mm

CHARGINGINFRASTRUCTURE:

1. Home and Destination Charging (0 to100%)

Chargingispossiblebyusingaregularwallplugorachargingstation.Publiccharging isalwaysdonethroughachargingstation.HowfasttheEVcanchargedependsonthecharging station (EVSE) used and the maximum charging capacity of the EV. Charging an EV differs bycountry.SomeEuropeancountriesprimarilyuse1-phaseconnectionstothegrid,whileother countries are almost exclusively using a 3- phaseconnection.

2. Fast Charging (10 to 80%)

Rapid charging enables longer journeys by adding as much range as possible in the shortest amount of time. Charging power will decrease significantly after 80% state-of-charge has been reached. A typical rapid charge therefore rarely exceeds 80% SoC. The rapid charge rate of an EV depends on the charger used and the maximum charging power the EV can handle.

- Max. Power: maximum power provided by chargepoint:
- Avg. Power: average power provided by charge point over a session from 10% to 80%
- Time: time needed to charge from 10% to80%
- Rate: average charging speed over a session from 10% to80%

OTHERFEATURES:



Figure 12. Best Features

Table 7. Other Features

Parameters	Values
Cargo Volume	350 L
Drive modes	Multi-Drive Modes(Drive&Sports)
Thermal management system	Liquid Cooled
Gradeability(%)	34%
Roof Load	75 kg
Max. Payload	410 kg
Seats	5 people
Isofix	Yes, 2 seats
Turning Circle	5.1 m
Car Body	SUV
Energy efficiency(Wh/km)	100*
Roof Rails	Yes

3. EVCOMPARISON

Here we are comparing MG ZS EV with different electric vehicles available in the Indian market like TATA Nexon EV and Hyundai Kona EV.

**** TATA Nexon EV vs MG ZS EV vs Hyundai Kona EV ****



Figure 13. TATA Nexon EV vs MG ZS EV vs Hyundai Kona EV

PRICE:

Tata Nexon EV is expected to be priced between Rs 15-17 lakh, while the MG ZS EV would come as more premium with a price tag around Rs 25 lakh. Hyundai sells the Kona EV at Rs 23.71 lakh.

Table 8. Price Comparison

Tata Nexon EV	MG ZS EV	Hyundai Kona EV
Rs 15 - 17 lakh (estimated)	Rs 25 lakh (estimated)	Rs 23.71 - 23.90 lakh

*All prices, ex-showroom.

DIMENSIONS:

Based on the Nexon facelift, the Tata electric SUV measures 3,994 mm in length, 1,811 mm in width and 1,607 mm in height. It has a wheelbase of 2,498 mm and a ground clearance of 205 mm.

Table 9. Dimension Comparison

Parameters	Tata Nexon EV	MG ZS EV	Hyundai Kona EV
Length	3,994 mm	4,314 mm	4,180 mm
Width	1,811 mm	1,809 mm	1,800 mm
Height	1,607 mm	1,611 mm	1,570 mm
Wheelbase	2,498 mm	2,585 mm	2,600 mm
Ground Clearance	205 mm	161 mm	158 mm

MG ZS EV is based on the standard ZS SUV. It measures 4,314 mm in length, 1,809 mm in width, and 1,611 mm in height. Dimensionally, the Hyundai Kona EV measures 4,180 mm in length, 1,800 mm in width, 1,570 mm in height and it has a wheelbase of 2,600 mm.

SPECIFICATIONS:

Table 10. Specification Comparison

Parameters	Tata Nexon EV	MG ZS EV	Hyundai Kona EV
Battery	30.2 kWh	44.5 kWh	39.2 kWh
Power	129 PS	150 PS	136 PS
Torque	245 Nm	350 Nm	395 Nm
Range	300 km	340 km	452 km

TATA Nexon EV will be powered by a 129 PS of power and 245 Nm of torque generating electric motor combined with a 30.2 kWh lithium-ion battery. The SUV will come with two driving modes, which are Drive and Sport. It will be able to accelerate to 100 kmph from standstill position in 9.9 seconds, while the SUV will be able to run 300 km on a single charge, claims the automaker.

The MG ZS EV, on the other hand, draws power from an electric motor that churns out 150 PS of power and 350 Nm of torque. The electric motor is clubbed with a 44.5 kWh battery pack. The SAIC owned automaker claims this electric SUV will be able to run 340 km on a single charge.

Hyundai Kona EV is powered by a Permanent Magnet Synchronous Motor (PMSM), which churns out 136 PS of peak power and 395 Nm of torque output. It gets a 39.2 kWh battery on board and the SUV offers 452 km of range on a fully charged battery.

ET AUTOVERDICT:

The Economic Times (ET) Auto Verdict tells us that For any EV, the range is a very important criterion and among these three electric SUVs, the Hyundai e-SUV offers 452 km on a single charge, while the MG ZS EV and Tata Nexon EV are claimed to be offering 340 km and 300 km respectively. The Hyundai Kona EV has an edge over its two upcoming rivals, at least on the range front.

4. CONCLUSION

This project deals with the Techno-commercial analysis of MG ZS EV by Tata Motors which was an extension of MG ZS (crossover). In the project report, I have analyzed all the necessary specifications, requirements, comparisons pros and cons etc.

MG Motors India will start selling the electric SUV in five cities: Delhi-NCR, Hyderabad, Mumbai, Ahmedabad and Bengaluru. The carmakers have clocked almost 3,000 pre-launch bookings of the SUV.

This report will help customers to analyses and to decide whether the car meets their needs or not, or should they get into EVs and buy this car. It would be an amazing experience for the users those who are trying EVs for the first time.

Inspired from various elements of the celestial bodies and Nature. Tata EV is all packed to fulfil your style quotient.

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