Overcoming ‘Range Anxiety’ in Electric Vehicles

Entry challenge Caselet
The Indian Automotive Industry is currently in a growth stage. The automobile produc-
tion and sales (in India) is expected to grow at higher rates over the next decade
than in most other auto hubs. However, with each make of auto product, additional
combustion-engine-based vehicle we manufacture and use, we will be adding car-
bon dioxide and other pollutants, using additional fuel, and putting excessive load
on our already saturated city infrastructure and traffic.

According to a no. of studies, Electric Vehicles (EVs) are less polluting, have better
total-cost-of-ownership (TCO) and are expected to rapidly become affordable for
Indian Customers. However, range in electric vehicles always troubles the driver
with the thought of whether he will be able to make it to the destination without
running out of battery (charge), hence the term Range Anxiety was coined. In fact
based on a study, Range Anxiety was considered as the primary barriers for Electric
Vehicle buying.

The data in Table no. 1 clearly shows about delineation of EV Cars options currently
available in India. While companies like Tesla and Nissan is offering the EV range
greater than 200 kms, the cost goes beyond the affordability range in an already
cost sensitive Indian Market.

<table>
<thead>
<tr>
<th>Where?</th>
<th>Vehicle?</th>
<th>Range</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>Tata Tigor Electric</td>
<td>100 km</td>
<td>Rs. 12 lakhs</td>
</tr>
<tr>
<td></td>
<td>Mahindra eVerito</td>
<td>110 km</td>
<td>Rs. 10 lakhs</td>
</tr>
<tr>
<td></td>
<td>Mahindra e2o Plus</td>
<td>110 km to 140 km</td>
<td>Rs. 7.5 – 8.5 lakhs</td>
</tr>
</tbody>
</table>

**Table no. 1: Indian Electric Vehicles**

Electric vehicle range depends on the way energy is gained and the way energy is consumed.
Figure no. 2 shows both categories of parameters that affect the range of EVs. While speed, driving style, auxiliary loads, aerodynamics and vehicle weight affect the range of EVs in the same way as they do for Internal Combustion engine vehicles, factors like ambient temperatures and battery cooling significantly impacts only the range of EVs. Improvements in Battery and Charging technologies may play a significant role in reducing the range anxiety.

While it is a challenge to eliminate EV Range Anxiety, the advancement of electronics and In-Vehicle Network provides an opportunity to analyse the data, generate insights and develop innovative solutions to resolve this problem. Figure 3 shows some of the parameters that can be measured and analysed in an Electric Vehicle.
Solution Required:
In the development of Electric Vehicles, with the understanding of different parameters that influence range, different insights that could be generated with data and your own blue-sky idea, how can Tata Motors come up with a solution on eliminating the range anxiety?

Figure 3: Few parameters that can be measured and analysed in EVs*