

## Chapter 27

# Evaluation of Make or Buy Approaches for Batteries Used in Electric Cars: A Comprehensive Make–Buy Analysis With Qualitative Factors Defending the Decision to Make Batteries

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### ABSTRACT

*The electrification of the vehicle has led to fundamental changes in the automotive value chain. Resulting in original equipment manufacturers (OEMs) to decide between manufacturing in-house and source the either product or component from joint ventures or suppliers. As electrical vehicle differs fundamentally from fuel-based counterparts, OEM must be adaptive with their manufacturing strategies. The value creation in the design is the replacement of engine-gear system with battery. Hence, battery is the critical component to be considered in manufacturing strategy. The decision making in finding less expensive and profitable way of either making the product or buying components from a capable supplier in global competitive environment is a serious discussion. In this chapter, the author is studying and applying the make or buy strategy to Tesla battery production.*

### INTRODUCTION

The automotive battery, the energy counterpart of the electric car is the single most motivational commodity that must be considered in proposing a strategy for manufacturing. Not only cost, but it determines the features of the car. For a potential supplier, it is important to evaluate the parts – intermediate or all the battery they want to focus in the value chain and which parts will be sustainable to keep for the original equipment manufacturers- known as OEM. This evaluation should occur before supplier strategize for

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batteries, site locations planning and production set and ramp up. Such decisions are important not only for their future position in the value supply chain but also to normalize the financial economics.

The manufacturing of battery involves high capital investment, which further entails to the set up and maintenance of supply chain of raw material. This is another reason why batteries are termed as cost drivers of any electric vehicles. Thus, it is foremost to assess the different make or buy strategies to produce and expand electric vehicles to the market. The financial implications are heavily influenced by battery manufacturing costs directly proportional to driven by economies of scale, which further fluctuates because of the volume uncertainty due to uncertain market conditions and development. Due to the hazy innovations in unleashing battery technology lead to investment risks as producer does not want to bid on less promising bid. Due to dynamic market conditions and non-exempted adaption to the changes due to continuous improvement and development of the electric vehicle, the position of the producer change and evolve over time. The production model whether vertical integration or partial integration is followed must be evaluated as well. (Huth et al., 2015). The model proposed in this paper is evaluating the battery value chain and other possible derivatives such as customer experience, supplier base, innovation in technology and architecture important to design strategies and further subject to financial implications and dynamic market conditions and other existing uncertainties. The author's focus is to study the influence of volume uncertainty on the economies of Scales, the financial values of a technology leap, level of engagement, and impact of change in the value chain over time in overall contribution model. The goals of this paper are -

- To study the manufacturing process at America based electric car producer and their core vision.
- To study the advantages and scope of improvement in established manufacturing set ups.
- To apply Make or Buy Analysis over Battery business.
- To choose the applicable Make-Buy framework and apply to qualitative factor to conclude the decision.

## **Literature Review**

The value chain of the electric vehicle batteries is phased over two important steps – Process 1: Cell manufacturing Process 2: Battery packaging. Each of these processes includes sophisticated engineering and demands effective capabilities. For example, Cell manufacturing, unlike solar cells, requires complex and layered technological skills for the controlling of the electro-chemical body. Not all manufactures possess either the competency or capability to produce. On the contrary, battery packaging has most similar practices across the industry. Packaging is assembling of fabricated parts. And setting up a facility for the cell manufacturing and automation involved in the ramping up production in such facilities is also a considerable value addition to the investment. Above all, the economies of scale reduce the cost in the long run as it reduces the fixed costs due to efficient utilization and capacity rates. The flow chart in Figure 1 presents the value chain of Battery.

*Figure 1. Battery value chain*



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