55 kWh battery energy storage technology development

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Our chosen Technology is that of electricity storage via battery for the purpose of vehicle mobility. We will refer to it within our descriptions as "battery" This is a level 3 technology. It serves the major subsystems found in electric vehicles

The working principle and architecture of an electrical battery are depicted in the below.

Figure 1.1: Lithium-Ion Battery (Technology ID# 1.000) working principle and architecture

Figure 2.1: DSM of the battery and technology hierarchy

Our technology of interest is identified in the DSM above with green highlighting. it is portrayed in the context of the consuming technology of interest, electric vehicles, where we identified the typical consuming technology systems for reference. The diagram on the right is a dependency tree that has been extracted from the DSM. The battery storage technology consumes technology related to battery chemistry, including cathode, anode, catalyst, and semi-permeable membrane technologies. Battery technology also consumes technology related to the design of the shipping, manufacturing, material supply chain, and internal circuitry technologies

We provide an Object-Process-Diagram (OPD) of the Battery technology in the figure below. This diagrams captures the main object of the technology (Battery), the value-generating processes and different instruments associated with their characterization by Figures of Merit (FoM).

Figure 3.1: OPD representation of a battery pack

An Object-Process-Language (OPL) description of the roadmap scope is auto-generated and given in OPL_Battery. It reflects the same content as the previous figure, but in a formal natural language.

The first two (shown in bold) are mainly used to assess the battery itself. These FOMs are often used for evaluation of the battery performance. The other rows represent additional FOMs for a rechargeable battery.

Note: basic reminders (as we rediscovered them) about the units and relationships:

Table 4.1: Alignment to Strategic Drivers

We position ourselves as a battery supplier of a mid-market, non dominant electric vehicle. We explore the performance of our competitors in 2016-2019 across our two fundamental FOMs of our battery pack: Energy

intensity (Wh/kg) and Cost Intensity of energy ($/kWh). The graph provided below is based on this benchmark of battery packs performance used in different medium-size electric vehicles on the market.

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