Life Cycle Analysis – Buffalo Project

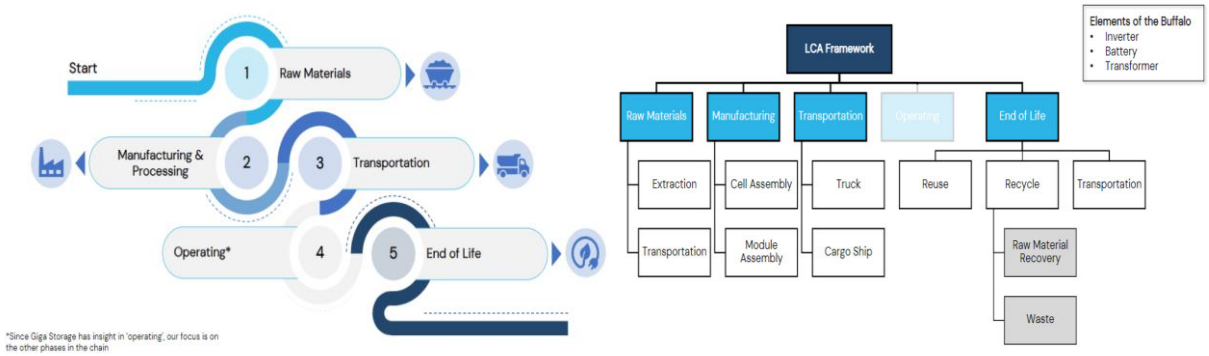
Situation & Approach

GIGA Storage, founded in 2018, is a developer, investor, and operator of large-scale energy storage projects in Europe. Our mission is to fasten the shut-down of fossil-fuelled power plants by realizing large-scale energy storage systems and by smartly operating these systems with our IT-platform. GIGA Storage is contributing to connecting more sustainable energy projects to the grid, with a more efficient use of that electricity grid.

GIGA Storage is operating in a capital-intensive industry where investors as well as other stakeholders demand clarity about the carbon footprint of battery projects. As the company is growing, we feel the urge to honestly report on our impact. By executing a life cycle analysis, GIGA Storage is providing insight on the negative impact connected to the development of our energy storage systems. The central question handled in the analysis was: "What is the environmental impact during the life cycle of the Buffalo project?"

Life cycle analysis – Citys Consultancy Rotterdam

The analysis by Citys Consultancy was based on the framework as exposed below. The supply chain of the Buffalo project was divided into 5 phases, of which 4 phases were deemed significant to analyse. The operating phase will be analysed in a separate assignment concerning the CO_2 avoidance by operating the Buffalo Battery and other energy storage projects realized by GIGA Storage.



1. Raw Materials

An overview of all the components used in the transformers, inverters and battery modules of the Buffalo project was created. The mean component mass and the material composition of LFP-C battery were scaled to the Buffalo project and compared with the actual data set of Buffalo. Based on this comparison the carbon footprint of mining the raw materials was determined with a maximal deviation of 2.6%.

2. Manufacturing & processing

For the Manufacturing part of the LCA framework, Citys analysed the Cell Assembly and Module Assembly. The emission during the cell assembly is responsible for 5.31% of the total CO_2-eq. of the Raw Materials and the manufacturing phases. The emission during the module assembly is responsible for 0.60% of the total CO_2-eq. of the Raw Materials and assembly phases in the LCA framework. Combining the emissions of Raw Materials & Manufacturing the total emissions add to 5,705,876.54 kg CO_2-eq. The positive electrode, the battery invertor and the module casing are the biggest contributors.

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3. Transportation

As the battery and transformer come from China, the kilometres travelled are extensively high. The distance covered by the inverter is relatively low as it comes from Germany. The combined CO_2-eq. emissions for transportation by trucks (4.48%) and cargo ships (95.52%) add to a total amount of 26.355,41 kg CO_2-eq.

4. Operating

The operating phase is deemed disposable in considering the life cycle impact of the Buffalo project. The operating phase contributes in a positive way by avoiding CO_2 emissions. A closer insight will be provided in the CO_2 avoidance report.

5. End-of-Life

By reusing and recycling raw materials and battery systems the CO_2 footprint of the Buffalo project is reduced. The End-of-Life phase impacts the CO_2 footprint with -2,858,498.41 kg CO_2-eq. Citys used the 50/50 allocation approach based on battery capacity. Note that this impacts the outcome hugely.

Besides analysing the supply chain of the battery energy storage system, Citys analysed the environmental impact of the infrastructure developed for the Buffalo project, consisting of the concrete and wiring. The total carbon footprint of the foundation of the Raw Materials, Manufacturing, Deposit, Dismantling, Transportation and Recycle is 175,840.53 CO_2-eq. For a more detailed insight we refer to the Sustainable concrete report of GIGA Storage.

Conclusion

What is the environmental impact during the life cycle of the Buffalo?

Cradle to Gate impact (Raw materials, manufacturing & transport)	=	**5,732,837.03 kg CO_2-eq.**
Total impact	=	**3,080,093.50 kg CO_2-eq.**