Our contribution to CO_2 reduction and resource efficiency.

The CO_2 footprint plays a central role when it comes to energy consumption. The EU has committed itself to becoming climate neutral by 2050 (European Parliament, 2020). In addition, the German federal government has set itself the goal of implementing a 55% reduction in CO_2 by 2030 (Press and Information Office of the Federal Government, 2021). This goal makes government intervention in market activity necessary. In this context, there are currently various ideas and pilot projects on how the necessary energy savings can be implemented.

One of the projects was developed at the Fraunhofer Institute for Industrial Engineering and Organization (IAO). It resulted in a business model for energy storage in smart neighborhoods. The word neighborhood does not necessarily describe a connected residential complex, but can also include larger spatial aggregates down to small towns. We see our product as the only existing solution to achieve these goals and to achieve a clear reduction in CO_2 emissions. One advantage over conventional power storage systems with lithium-ion technology is the saving in cooling and heating required for lithium cells. The cooling and heating, i.e. the consumption of a lot of energy, is converted into heat and in turn into CO_2.

The service life also plays an important role, increasing the CO_2 savings by a factor of five. Ultimately, we have a CO_2 saving of over 80% compared to the lithium cell in operation. Our investigations and research have shown that the production of conventional batteries for each kilowatt hour

Storage capacity consumes 350 to 650 megajoules (equivalent to 97 to 180 kWh) of energy and produces between 150 and 200 kilograms of CO_2. This means that a very large battery of 100 kWh, as used in large-scale storage, produces between 15 and 20 tons of CO_2 emissions before the storage system has even been properly put into operation.

Our product is already supported by renewable energies and for a conventional single-family home storage system only requires around €1.50 in electricity costs to produce the LTO cells and, of course, the drinking water of our fitters for assembly.

The problems surrounding the environmental friendliness of batteries are often discussed. For example, lead-acid batteries - as the name suggests - contain a toxic heavy metal and a strong acid. Nickel-cadmium batteries have even been banned due to the harmfulness of cadmium. Despite their technical sophistication, lithium-ion batteries are problematic primarily because lithium is a raw material that is often extracted under ethically questionable conditions and also causes environmental damage.

Given that the production chain for battery cell manufacturing is very energy-intensive overall, there is room for improvement. The positive electrode paste and the negative current collector cause particularly high emissions.

LTO storage from Hyposto Energy as a more sustainable alternative

First of all, you have to remember that LTO cells do not cover exactly the same range of applications as lithium-ion batteries. In many cases, they can even replace lithium-ion batteries entirely.

In the context of energy storage, the long lifespan of LTO cells means having a storage device that really pays for itself both technically and financially - quite the opposite of lithium-ion batteries. These are donated to the university at the end of their short lifespan. The problem here is that there is no sustainable solution for recycling and disposal. Our product is 100% recyclable and can be repaired if damaged.

Life Cycle Assessment of LTO cells

You have to look at all phases of the life cycle in order to evaluate environmental compatibility. When considering the entire topic of the energy transition, not only the functional advantages of an energy storage device should be examined, but also the entire life cycle of the product. To assess the sustainability of a product, taking all "life phases" into account, the so-called life cycle analysis or **life cycle assessment** is usually used.

The environmental impacts (removals from the environment and emissions into the environment) during all phases that a product goes through, i.e. production, use and disposal, are taken into account, as are the processes of each individual step (e.g. production of raw materials). The method is an important tool for assessing the ecological compatibility of energy storage systems.

With regard to the usage phase, the environmental friendliness of LTO cells depends primarily on the electricity mix used for charging. In this respect, there are no differences to other electrochemical storage technologies.

However, LTO cells have a very high level of efficiency, meaning they are particularly energy efficient. The environmental friendliness of LTO cells depends extremely on the materials they are made from. Commercial electrochemical cells are about ten times less toxic than lithium-ion batteries and are generally much more environmentally friendly and are also present in some commercial models. Research is currently trying to find powerful, inexpensive and environmentally friendly new electrolytes or even to do without them altogether.

Our cooperation with the LTO manufacturers Shengquan and Yinlong also aims to remove harmful electrolytes in the future. This would also greatly benefit the ecological balance. Even though LTO cells are made from almost non-toxic materials, it is to be hoped that their ecological balance will improve through further optimization, while lithium-ion batteries are by far the more environmentally harmful technology.

Activated carbon is usually used as electrode material. Since it can be made from practically any form of biomass, it has only slightly different properties depending on the source material. Even industrial waste such as apple pulp, cherry stones or PET residues can be recycled as activated carbon for electrode material in LTO cells. This makes very sustainable production possible.

Sustainability LTO technology vs. lithium-ion battery

As a user, you can improve the ecological footprint of the LTO capacitor by using green electricity, for example, as in this application from the feed-in of renewable energies (photovoltaics or wind energy).

Theoretically, it is possible to manufacture LTO cells only from environmentally friendly and sustainable raw materials in the future. Basically, LTO cells are a very innovative and resource-saving storage technology. They could completely replace lithium-ion batteries or other types of rechargeable batteries in the future. Hyposto Energy GmbH has taken on the task of efficient and sustainable energy storage and this is to be solved within the framework of our product.

Customer benefits LTO storage from Hyposto Energy GmbH

In the future, the green energy requirements of every household will increase, starting with the use of heat pumps. Our storage enables the use of stored energy for the heat pump, instantaneous water heater, sauna stoves or other devices. This ensures that powerful devices can continue to be used at night.