# CARBON FOOTPRINT AND SOCIAL IMPACT ASSESSMENT OF STATIONARY BATTERIES IN DISTRIBUTION GRIDS

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## Introduction

The European project STORY (Added value of **STOR**age in distribution s**Y**stems) demonstrates and evaluates innovative approaches for energy storage systems in the residential and industrial sectors. The project has a focus on the benefits of energy storage in distribution systems [1]. STORY includes six demonstration activities, which range in size from individual buildings to the district level, and are located in five member states. The knowledge gained from the activities feeds into a business model analysis and a large-scale impact assessment, which are used to evaluate the large-scale integration of small-scale storage units in the European distribution networks.

In this paper, we present selected project results of the environmental and social impacts.

## Methods

To evaluate the environmental impacts Life Cycle Assessment (LCA) is performed for different storage implementation scenarios.

According to ISO 14040 [2] LCA addresses the environmental aspects and potential environmental impacts (e.g. use of resources and the environmental consequences of releases) throughout a product's life cycle from raw material acquisition through production, use, end-of-life treatment, recycling and final disposal (i.e. cradle-to-grave).

In more detail, network development scenarios with and without battery energy storage are compared [3].

Figure 1 shows a simplified scheme of the scenarios including the system components and energy flows most relevant for the environmental assessment. Each scenario provides electricity to households and electric vehicles. The electricity consumption is covered by local PV plants and electricity from the grid. Surplus electricity from PV is injected into the power grid.

The network development scenarios are characterised by:

- the installed power from renewable energy sources (PV power plants in the distribution grid),
- the installed capacity of electric vehicles, and
- the installed storage capacity and the storage unit type (lithium ion battery installed in households or a community size lithium ion battery energy storage system connected at the MV/LV transformer station supplying the LV network).

Similar to LCA, Social Life Cycle Assessment (sLCA) incorporates the traditional LCA methodological steps while having social impacts as a focus. sLCA, in principle, follows the ISO 14040 framework and is used to assess the social and sociological aspects of products, their actual and potential positive as well as negative impacts along the life cycle, from the extraction of raw-materials, till the final disposal. sLCA is complimentary to traditional environmental LCA.

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An sLCA has two main objectives:

- to enable a comparison of products/services and processes for decision making; and
- to identify potential improvement within the system in order to reduce social impacts.

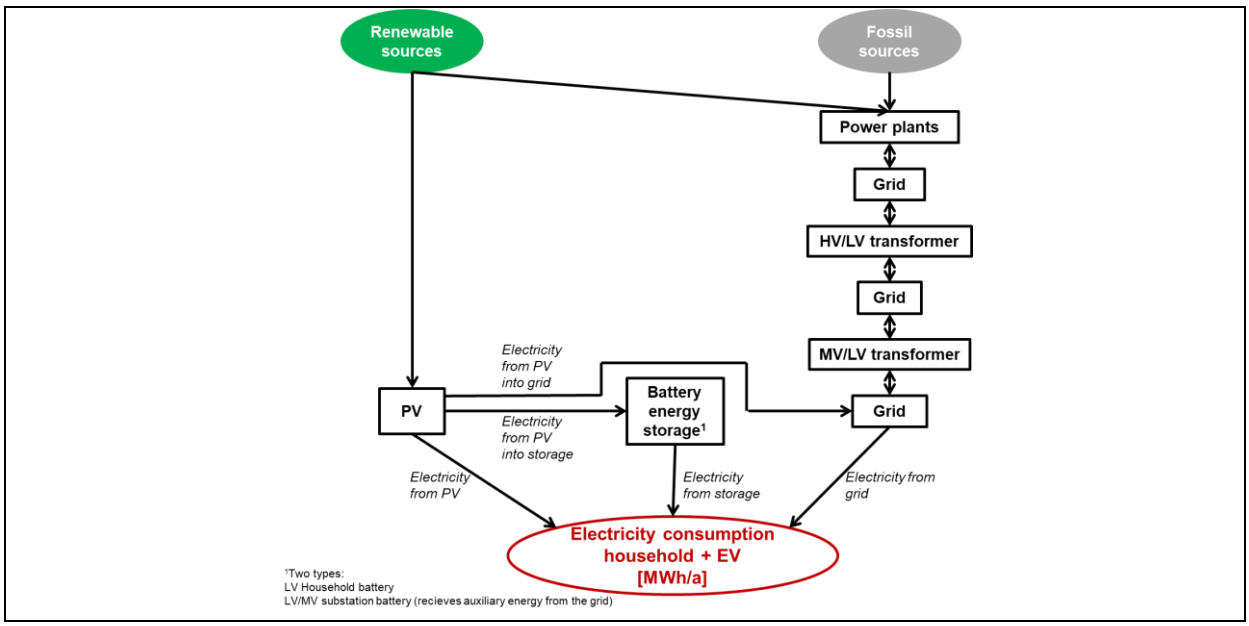


*Figure 1: Simplified scheme of the investigated scenarios showing energy flows and system components most relevant for LCA*

## Results

Within the STORY project, different environmental impact categories (e.g. cumulated primary energy demand, acidification potential) are investigated. In this paper, we will show the climate impact (so-called carbon footprint) of the battery-energy storage systems in distribution grid networks.

In addition, from the sLCA, the evaluation of large scale battery storage implementation using appropriate social indicators (e.g. employment, health and safety, prevention of forced and compulsory labour) will be presented.

## References

[1] STORY contributors, “STORY – A vision of our future energy system”, http://horizon2020-story.eu/ (accessed on 2019/11/19).
[2] EN ISO 14040 Environmental management – Life cycle assessment – Principles and framework (ISO14040:2009).
[3] J. Zupančič, A.F. Gubina, M. Antončič and A. Tuerk, “Deliverable 7.3: Report on large scale impact simulations” STORY – added value of STORage in distribution sYstems, European Union’s Horizon 2020 research and innovation programm, grant agreement No 646426, http://horizon2020-story.eu/wp-content/uploads/d73_20181031.pdf (accessed 2019/11/19).

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