Life cycle analysis of Fronius GEN24 PLUS inverters (2023 update)

Critical review report and statement

Reviewer: Dipl.-Ing. Karsten Schischke

Berlin, 11 May 2023

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1 Basic data

Title of the study:
Lebenszyklusanalyse von Fronius GEN24 PLUS Wechselrichtern (Life cycle analysis of Fronius GEN24 PLUS inverters)

In detail, the study includes the following models:

- PRIMO GEN24 PLUS 3.0 and 6.0 (3 kW, 6 kW, single-phase)
- SYMO GEN24 5.0 PLUS (5 kW, three-phase)
- SYMO GEN24 10.0 PLUS (10 kW, three-phase)

Commissioner of the LCA study:
Fronius International GmbH

Practitioner of the LCA study:
Harald Pilz, to4to – together for tomorrow

Final version of the LCA study:
Version 1.0 dated 31 March 2021
Updated calculations and results as of 20 March 2023

Reviewer:
Karsten Schischke, Group manager Policy, Ecodesign and Circular Materials at Fraunhofer IZM, Berlin

2 Critical review process

The review was carried out by an external expert, based on ISO 14044:2006, 6.2.

The review was carried out at the end of the LCA study at a point in time when the data collection and evaluation had essentially been completed, but individual aspects were still explicitly intended for clarification in the course of the critical review.

In 2022/23 Fronius and the LCA practioner updated the LCA results with latests improvements of data models and calculations and provided revised results on 27 March 2023 to the reviewer. Besides minor corrections data updates refer to

- more accurate modelling of individual materials and components,
- revised transportation model to account for latest insights in logistics,
- coverage of night consumption in the use phase.

The initial review included the evaluation of the life cycle inventory model.

The initial review included an analysis of individual data sets in consultation with the commissioner and the practitioner of the LCA study. In particular, a comparison was made with secondary data from the electronics database of the GaBi software. Implausible data in the Ecoinvent database were discussed, mostly at the suggestion of the LCA practitioner, and communicated with the database provider for clarification. Adjustments to this secondary data were made, where advised, with the consent of the reviewer.

Comments were documented in particular on the basis of a commented draft version of the LCA study report and were taken into account and incorporated by the LCA practitioner. Comments and the implementation of suggestions and requirements were documented in a separate table.

Comments of the reviewer concerned in particular

- modelling of selected components (especially electronics),
- procedure for the selective updating of outdated secondary data,
- allocation of the use of secondary materials,
- modelling of the use of renewable energy for manufacturing,
- modelling of the use phase and assumptions on product lifetime,
- allocation of the benefits of PV systems to PV modules and inverters,
- modelling of disposal or recycling,

- methods for cost assessment of environmental impacts,
- selection of sensitivity analyses and their comprehensible presentation.

All questions and requirements on the part of the reviewer were answered by the author of the study in such a way that conformity with the requirements of ISO 14040 and ISO 14044 was established.

The critical review verified that

- the methods used to carry out the LCA are in accordance with the ISO 14040 and 14044 standards;
- the methods used to conduct the LCA are scientifically and technically valid;
- the data used are appropriate in relation to the objective of the study;
- the interpretations reflect the identified limitations and the objective of the study;
- the documentation of the study is transparent and consistent.

To exchange information on the progress of the study and to discuss interim results and open questions, online meetings with the investigator took place on the following dates:

- 28 January 2021 (review kick-off meeting)
- 4 March 2021
- 25 March 2021 (final review meeting)

In the period from 16 February 2021 to 4 March 2021, Fraunhofer IZM carried out a comparison with selected data from the GaBi database, to complement the analysis of the LCA practitioner.

The reviewer had access to

- draft versions of the report
- component parts lists and their assignment to generic data sets
- photographic documentation of the equipment layout

- product data sheets

In the course of the meeting on 4 March, the author of the LCA study explained in detail the underlying calculation model in Excel, which enables the modelling of a large number of scenarios.

The updated calculations were discussed with the reviewer in meetings on

- 16 December 2022 (scoping LCA update review),
- 16 March 2023 (final results presentation and review meeting).

Documentation provided on the updated LCA results comprised

- comprehensive results presentation (dated 20 March 2023),
- Excel tool with all relevant background calculations

The reviewer checked the revised results for plausibility and against the above listed criteria.

3 Review statement

It is confirmed that the life cycle assessment study meets all relevant criteria and complies with the principles of good scientific practice.

Conformity with ISO 14040 and ISO 14044 is established for the study "Lebenszyklusanalyse von Fronius GEN24 PLUS Wechselrichtern" and its results, including revised results as of March 2023.

Berlin, 11 May 2023

- Karsten Schischke -
Fraunhofer IZM
Dept. Environmental and Reliability Engineering