

# Comparison of the critical review process of LCA with the verification in ETS

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**Abstract** All technical and also all human-based processes have a certain level of uncertainty. The verification in European Emissions Trading System (ETS) was assessed in order to derive uncertainty information applicable to LCI data review. ETS uses a single verifier, LCI data review was calculated as three-party review. The absolute quota of errors and the quota of relevant errors in the data check were evaluated. Transferred to LCI data review as part of the LCA critical review process it can be estimated, that in 1 of 70 studies errors in the LCI data will not be found by a reviewer. In most of these cases such errors will not be relevant to the results. From the relevance in ETS it can be estimated, that in about 1 of 500 cases relevant errors might not be found.

## 1 Introduction

Although everybody familiar with technical and scientific processes is aware of the possibility of errors, there is little material on the uncertainty of the review process of LCA. This article aims not on the uncertainty assessment of single data used in LCI and how the significance of the results is influenced by such uncertainties. It is aim to assess the review process by itself. Reviewing data by human (electronically assisted) means will necessarily lead to errors, too.

There are various methods to assess the uncertainty of processes. From comparison of a similar review process in the European Emissions Trading System (ETS) the uncertainty of a single expert data review is calculated. It needs some explanation on the verification process in ETS in order to show, how similar the processes of LCI data review and ETS data verification are.

## **2 Data verification in the Emissions Trading System (ETS)**

In ETS all participating installations have to report their annual carbon dioxide emissions to the national authorities. These reports need to be verified by an independent expert defined as a competent, independent, accredited verification body or person with responsibility for performing and reporting on the verification process in accordance with the requirements established by the relevant Member State, the EU ETS Directive and the MRG [1-3].

The verifier shall verify the report "with an attitude of professional skepticism recognizing that circumstances may exist that cause the information contained in the annual emissions report to be materially misstated" [1]. The ETS verifier's task is similar to the LCA reviewer's task to ensure that the data used are appropriate and reasonable in relation to the goal of the study [4].

It is acknowledged that a LCA review is not a verification of the LCA report but a review according to a set of methods, the uncertainty found at ETS verifiers' performance is the minimum uncertainty to be expected in the LCA data review. In order to give insight into the comparability of the ETS verification and LCA data review, more details on some of the ETS verifier's tasks are given. It is ETS verifiers' task to

- understand each activity undertaken by the installation, the sources, source streams within the installation, the metering equipment used to monitor or measure activity data, the origin and application of emission factors and oxidation/conversion factors, any other data used to calculate or measure the emissions, and the environment in which the installation operates [3]

A base of the verification ("strategic analysis") is a complete understanding of the processes and all data used for calculation. A materiality level of 5% (2% at higher emissions) has to be applied.

In risk assessment, the ETS verifier shall

- assess the risk of misstatements with regard to the complexity of the operator's activities and emission sources and source streams

Finally he has to carry out a verification plan by gathering data in accordance with the defined sampling methods, walkthrough tests, document reviews, analytical procedures and data review procedures, including any relevant additional evidence, upon which the verifier's verification opinion will be based.

Regardless how deep the single LCA reviewer assess the LCI data used for calculation, their tasks are similar to those of ETS verifiers. The strategy elements of ETS verification (strategic analysis, risk of misstatement assessment, review plan) are also applied to LCI data review. Nevertheless LCA reviewers experience very different quality and personal intention of their colleagues in such processes.

### **3 Uncertainty of ETS verification**

Both ETS verification and LCA review are multi-step processes. While at ETS the operator of an installation has to prepare the preliminary report, that step can be compared to the LCA practitioner's collecting of data and modeling of the systems. Second step is ETS verification and LCA review respectively. Unlike ETS this is the last step in LCA review. In ETS the reports are provided to the national authorities, where they are checked and compared to other external data again. In this third step, where several persons and data bases are involved, at least most of the errors in verification shall be surfaced.

Form the evaluation of the five years 2005 (first year of ETS) until 2009 (last fully checked year) the total number of errors from verification in Germany were taken with regard to incorrect total CO<sub>2</sub>-emissions at (sub-)installation level. Altogether 8,764 verifications at (sub-)installation level took place in this reference period. The total number of errors was 117 (1.34%). In one of about 70 reports errors can be found.

### **4 Expanded uncertainty and application of results to LCA**

The total number of errors does not provide sufficient insight into their relevance. While at an installation of several million tons of CO<sub>2</sub>-emissions 5,000 tons of CO<sub>2</sub> is quite insignificant, the same amount of incorrect reporting at a small emissions installation (up to 25.000 tons of annual CO<sub>2</sub> emission) is highly relevant. This corresponds to the question if an error in LCI data review is relevant for the overall interpretation of the LCA results or not.

In order to introduce the relevance into the calculation, the combined standard uncertainty of uncorrelated input quantities [5] was calculated from the (sub-)installations report data before and after correction by the authority. The combined standard uncertainty of ETS verification was calculated to 0,179 %. For further calculation the expanded uncertainty (at 95% confidence level) was used by multiplication with 2.

The expanded uncertainty of the ETS verification process was calculated to about 0,36%. This value describes the single verifier's performance uncertainty. At most of the LCA reviews, three independent reviewers look into the details of LCI data. By having three independent entities, the uncertainty can be divided by the square root of three leading to a total uncertainty of the three-party review with regard to the relevance of about 0,2%.

## 5 Result and conclusions

LCI data are not only uncertain by themselves, also application of the data in modeling and evaluation of the results adds to the overall uncertainty. While the range of uncertainty of the data by themselves lead to the question how significant results are, uncertainties of the data use can only be found by the practitioners and the reviewers of a LCA. They are not always aware, that also the complex process of LCA review might oversee errors resulting in relevant misstatements.

It is acknowledged, that ETS verification and LCA review is comparable only to a certain extend. However results from this exercise provide an idea about the uncertainty of LCA results after being reviewed according to ISO. From this comparison it could be concluded, that in 1 of about 500 reports LCI data may have relevant mistakes not found by the review panel according to ISO 14040.

## 6 References

- [1] German Emissions Trading Authority, Verification Guidance for EU ETS (translated from German Leitfaden zur Erstellung von CO<sub>2</sub>-Emissionsberichten), Berlin 2008
- [2] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 finally amended 23 April 2009
- [3] Commission Decision 2007/589/EC of 18 July 2007 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council
- [4] International Standard (ISO); Norme Européenne (CEN): Environmental management - Life cycle assessment: Principles and framework. ISO EN 14040 (2006)
- [5] JCGM 100:2008; Evaluation of measurement data — Guide to the expression of uncertainty in measurement