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Summary of the Peer-review of Comparative Life Cycle Assessments of MR-16 Lamps (4W, 5.5W and 7W LED-based LV halogen replacement lamps) vs. Equivalent 20W & 35W LV Halogen Lamps

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PACTE-LED

Summary of the Peer-review of
Comparative Life Cycle Assessment of
PACTE-LED Lamps
(4W, 5.5W and 7W LED-based LV halogen replacement lamps)
vs.
Equivalent 20W & 35W LV Halogen Lamps

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Foreword

The PACTE-LED project is subsidized by ADEME (French Environment & Energy Management Agency). It is aimed at reducing the energy consumption of 20W and 35W low voltage spot lamps in hospitality applications by a factor of 4 while carefully managing the introduction of the new LED technology to avoid consumer rejection. This is the reason why extensive physical measurements and perception tests have been performed by independent third-party laboratories.

The contact person at ADEME for the PACTE-LED project is M. Bruno Lafitte (bruno.lafitte@ademe.fr). The PACTE-LED project is managed by INGELUX. The contact persons are M. Grégory Duchêne (duchene.ingelux@espace-carco.com) and Christophe Marty (marty.ingelux@espace-carco.com).

This document is a summary of the peer-review report written by CSTB about the comparative life cycle assessments (LCA) performed by Philips in the framework of the PACTE-LED project, task 6 (eco-conception). The goal of this task is to study the environmental benefits of switching from traditional halogen lamps to LED replacement lamps considering every step of the product life cycle.

Philips engineers performed the LCAs of Philips products (3 PACTE-LED lamps and 2 Accentline halogen lamps). CSTB Reviewers performed the peer review of these LCAs according to the objectives defined by the PACTE-LED project: verification of the quality of the study, assessment of the environmental benefits of replacing the considered halogen lamps by PACTE-LED lamps.

PHILIPS engineers who performed the LCA are:

- Steffen SCHOLL, environmental engineer in charge of performing the LCAs, steffen.scholl@philips.com
- Sait IZMIT, project leader in charge of the development of the PACTE-LED lamps, sait.izmit@philips.com

The peer review was performed by the following CSTB reviewers:

- Francis GRANNEC, environmental engineer, LCA expert, francis.grannec@cstb.fr
- Pierre RAVEL, environmental engineer, LCA expert, authorized third-party reviewer for the French program concerning environmental and sanitary characteristic assessment (FDES) on building and construction materials and components (www.inies.fr and www.afnor.org), pierre.ravel@cstb.fr
- Christophe MARTINSONS, lighting expert, head of CSTB lighting, electromagnetism and electricity division, christophe.martinsons@cstb.fr

This summary presents the opinion of CSTB on the LCAs which were carried out by Philips during the PACTE-LED project. It points out the elements that were conducted in compliance with the ISO 14040 and 14044 standards as well as the main deviations from the requirements of these standards. In this case, possible improvements are suggested.

The results of the LCAs performed by Philips are only applicable to France.

Any communication made by Philips or CSTB about the peer-review must include an explicit reference to the present document, which must be made available in its entirety and without change.

This peer-review summary can only be distributed, communicated or published in its entirety and without change.

Summary of the peer review

The CSTB peer-review shows that the LCAs were carefully performed by Philips. The resulting environmental assessment of the lamps is accurate.

The life cycle assessments performed by Philips indicate that PACTE-LED lamps are better for all the environmental impact categories (Midpoints) than equivalent halogen lamps of the same brand, over their whole life cycle. The results show that the environmental benefits of using PACTE-LED lamps to replace equivalent halogen lamps are unquestionable.

Summary of conformity points and strengths of the LCAs performed by Philips

- LCAs covered the whole life cycle of the lamps. Detailed manufacturing data relative to LEDs were collected by Philips over a period of two years.
- Third-party measurements confirmed the physical characteristics of the lamps.
- Sensitivity analyses were performed on the main parameters concerning the environmental impacts: lifetime and energy consumption. Both studies confirmed the robustness of the benefits of the LED lamps in comparison with the halogen lamps over the whole life cycle.
- The end-of-life scenario was built with data given by Recylum, the body in charge of collecting and recycling lamps in France.
- Break-even points were determined by studying the increase of the environmental indicators with the lamp operating time. They indicated that PACTE-LED lamps have better environmental indicators than equivalent halogen lamps, even after a relatively short time of use.

Summary of deviations from requirements of the ISO 14040 and 14044 standards

- Although Philips presented the life cycle inventory data during a peer-review meeting, Philips did not provide a methodological report of their LCAs which could have allowed CSTB to check the details of all the calculations.
- Justification and demonstration of the cut-off rule were not provided.
- The allocation procedures used for the collection of data and LCA modeling were missing.

Areas of possible improvements

- Environmental impact indicators results could also be provided as a function of “lumen hours” or “candela hours”. These functional units are useful to compare LCA results between different lighting applications and not only lamp retrofit.
- CSTB performed independent lifetime tests on PACTE-LED lamps but results were not known at the time of the peer-review. Lifetime values could be updated in a future assessment.
- The times of “environmental return on investment” given by the break-even points relied on the assumption that PACTE-LED lamps will reach their stated lifetime value. If, for a reason or another, the PACTE-LED lamps are to be replaced sooner, the break-even points would be different. Therefore, it would be interesting to study how the break-even points vary when other lifetime figures are assumed.
- Some data on halogen spots are very old (collection period from 1996 to 1998). These data sets could be updated.
- Production data relative to chemicals used in the process of the LED manufacturing could be more precisely taken into account in a further assessment.
- Air and water emissions of some of the production sites could be added, as some data was not available during the course of the study.
- Packaging of raw material and intermediate products could be taken into account, as this data was not available in the course of the study.
- The impacts of missing production data could be more accurately assessed in a future study.