



Life Cycle Assessment (LCA) Optimized Certification

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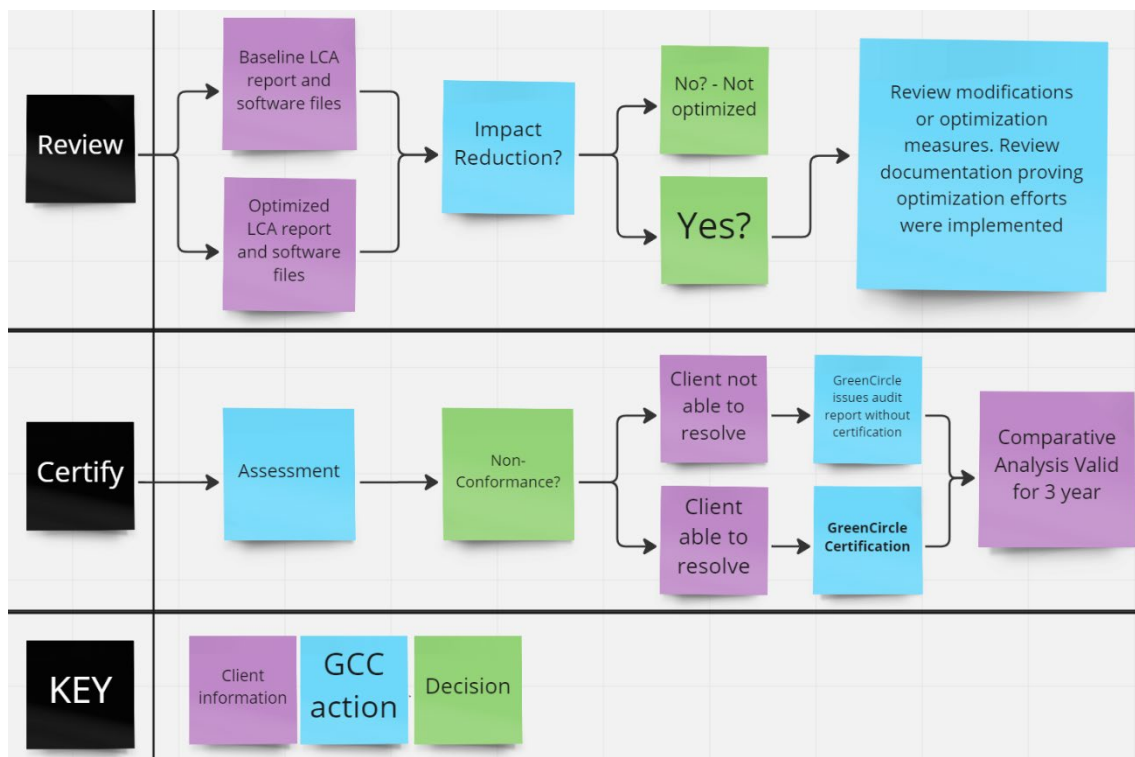
1.0 Background

Life Cycle Assessment (LCA) Optimization Certification demonstrates an organization's commitment to continuous improvement within the overall life cycle impacts of their products. As the market demand for LCA continues to grow, so does the demand for companies to demonstrate continuous improvement toward life cycle impact reductions. GreenCircle Certified, LLC's Life Cycle Assessment Optimized certification was created for those organizations who make positive changes to their products and/or operations that reduce the overall life cycle impacts of their products.

During the audit process, GreenCircle Certified, LLC (GreenCircle) will:

- Obtain a complete understanding of the product's life cycle,
- Review and audit the baseline and current LCAs or comparative LCA that were completed, and
- Verify the modifications to the product(s) and/or manufacturing process that were incorporated to reduce the environmental impacts of the product(s).

GreenCircle will validate the overall reductions of the product(s)'s life cycle impacts based on these implemented changes. To do so, GreenCircle will verify and certify percentage reductions for various impact categories (i.e., global warming potential, embodied energy, ozone depletion, etc.). GreenCircle will validate the reduction in environmental impacts of a product by comparing a baseline LCA to the LCA of the





optimized product. GreenCircle will also analyze and review the documentation and evidence for any changes to the product ingredients/raw materials, packaging, manufacturing operations, transportation or use phase of the product(s).

2.0 Goals

To validate the reduction of environmental impacts of a product based on documented and measurable changes to the product, manufacturing process, and/or use phase after the completion of baseline and current LCAs.

3.0 Company Qualifications

To qualify for LCA optimization a company must first complete an ISO 14040/44 compliant baseline LCA or have participated in an industry-wide LCA in which the company submitted life cycle inventory data and participated in the study against which they would like to compare. The company must then complete an optimized product LCA, or comparative LCA, in accordance with ISO 14040/44 standards which includes the same system boundary and functional unit of the baseline and optimized product LCA (i.e., cradle-to-gate or cradle-to-grave). The LCA should be critically reviewed by a third party. However, if the LCA's are not critically reviewed, GreenCircle Certified can provide that service as part of the LCA optimized certification process. The company is required to demonstrate that the changes in life cycle impact and subsequent reduction in environmental impacts to the product life cycle stages (raw materials, transportation, manufacturing use phase and end of life) are the result of implemented changes to the product and/or manufacturing process. Optimization resulting from actions outside the company's control including updated life cycle data sets, improvements (greening) of the electrical grid or any other changes due to external factors will not count towards the LCA Optimized Certification.

During the proposal development process, GreenCircle will conduct initial interviews with the client to understand the products, operations and implemented optimization measures to verify if the proposed product(s) will likely qualify for an audit and possible certification. It is not guaranteed that a product will be certified for Life Cycle Assessment Optimized certification until a thorough audit is completed by GreenCircle.

4.0 Document Requirements

To qualify for certification a company must be able to provide the following:

Multi-Attribute Optimization – Optimized LCA

GreenCircle may request supporting documentation or data review meetings to discuss and understand any of the following items:





- A copy of both the original baseline LCA report for the product(s) being analyzed and a second LCA report, or comparative LCA report, for the optimized product(s) after making improvements towards impact reductions.
 - Both LCAs must be critically reviewed to conform to ISO 14040/44 and have at least a cradle-to-gate scope. Note: if the LCAs are not critically reviewed, GreenCircle can provide this service as part of the LCA optimized certification process
 - Impact reductions must be achieved for the specified functional unit
- LCA Software files (SimaPro/GaBi) of previously completed LCAs for the product being analyzed.
 - Information on the validation period and type of assessment methodology for both LCAs, or comparative LCA
 - LCA software, practitioner, and /critical reviewer if applicable details involved in development of both LCAs , or comparative LCA
- LCAs are required to follow consistent and widely recognized methodology based on ISO 14040/44. Both the baseline LCA and optimized LCA must include:
 - Goal and Scope Definition
 - Goal of the Study
 - Functional Unit
 - System Boundary: identify any excluded processes or non-attributable processes
 - Cut-off Criteria
 - Modeling software utilized
 - Data quality analysis describing consistency, accuracy, representativeness, and completeness of data used in the studies
 - Data Sources table clearly identifying all model inputs and data source including vintage (what year the data was collected)
 - For electricity data: identify grid mix and document any assumptions/utilization of renewable energy
 - Life Cycle Inventory Analysis
 - Allocation methodology
 - Raw Materials and Product Recipe Overview and documentation of any proxies
 - Manufacturing Process Overview
 - Final Product Shipping
 - Cradle-to-grave or cradle-to-gate Flow Data
 - Life cycle process flow diagram to provide deeper understanding of the life cycle inventory showing all inputs and outputs.
 - Life Cycle Impact Assessment (LCIA)



- Impact Assessment/Impact Categories (global warming potential, acidification, embodied energy, ozone depletion, etc.)
- Manufacturing Process Allocation and Assumptions
- Use and End-of-Life Assumptions (if applicable)
- Sensitivity analysis (as required)
- LCA Results
 - Optimization scenario analysis and identification of selected optimization pathways in baseline LCA
 - Confirmation of optimization scenarios in optimized LCA or comparative LCA
 - Manufacturing impacts
 - Manufacturing Energy and Carbon Analysis
 - Raw Material Impacts
 - Overall Environmental Impact
 - Overall Energy and Carbon Life Cycle Impacts by life cycle phase
- Overall Environmental Impacts using applicable impact methodology (TRACI, CML, ReCiPe, etc.)
- Allocation and Assumptions
 - Standardized guidance for allocation should be well documented and clearly defined.
 - Any assumptions or attributions must be consistent between the baseline and optimized LCA to ensure comparability.
 - Allocation keys must be clearly defined for any applicable input
- Detailed information on the product and/or manufacturing optimization measures implemented that are expected to reduce the life cycle environmental impacts of the product.
 - Documentation to prove that impact reduction/optimization measures have been implemented. If documentation is not provided, a site visit to visually inspect and verify these implemented optimization measures have occurred will be required.
 - If an optimization measure has been implemented within the product (i.e., recycled content was added in lieu of a virgin material), GreenCircle will need to collect the updated product recipe as well as purchasing documentation of recycled materials utilized for this product to verify the reduced impacts in association with this change.
 - If an optimization measure has been implemented within the manufacturing operation (i.e., reduced the amount of energy use resulting in scope 1 or 2 carbon emissions reduction), GreenCircle will need to collect updated utility data and documentation of the equipment changes or



conservation measures implemented to verify the reduced impacts in association with this change.

Documentation requirements may differ on a case-by-case basis*

5.0 Audit and Certification Process

5.1 Data Collection

Once the proposal and certification agreement are signed by the Client, GreenCircle will conduct an initial project meeting, via video or conference call, with contact(s) at each manufacturing facility to discuss the required data, GreenCircle's Audit Plan, and project schedule. GreenCircle will gain an understanding of the baseline LCA conducted and changes that were implemented to the product and/or manufacturing process to reduce the environmental impact. GreenCircle will provide an initial data request to be completed by the contact(s). See the Documentation Requirements for information that will be requested in the data collection stage.

5.2 LCA Optimized Review and Calculations

GreenCircle will conduct a thorough review of both the baseline and optimized (post-improvement) LCAs and create an analysis of the results between the two. This LCA Optimized analysis is valid for three (3) years from the second life cycle assessment. Following the analysis, GreenCircle will verify the implemented optimization measures to the product and/or operation demonstrating how the impact reductions were achieved. After completion of the GreenCircle Life Cycle Assessment Optimized analysis, GreenCircle will certify percentage reductions per impact category.

5.3 Audit Deliverables

Upon verification of the Life Cycle Assessment Optimization claims, GreenCircle will issue GreenCircle Certified, LLC certificate(s) and marks. The certificate(s) will document that an independent evaluation of the LCA Optimized claim has been conducted on behalf of the company for the specified product(s). The certificate(s) will include the percent reduction of environmental impacts by category. GreenCircle will prepare a written LCA Optimization audit report on the audit process and findings and provide this report to the Client.

If the product also has a GreenCircle Certified Environmental Facts (CEF) label, then embodied carbon reductions and manufacturing and operations improvements will be documented on the label. GreenCircle will list the final certificates on the GreenCircle Certified Product Database website (unless the Client prefers not to) and provide GreenCircle marks for use in marketing (upon a signed licensing agreement).





6.0 Annual Recertification Process

The LCA Optimized analysis is valid for a maximum of three (3) years from the second life-cycle assessment conducted.

All LCA Optimized Certifications will have yearly Mark Usage verifications by GreenCircle. It is important for GreenCircle to evaluate any changes within the product and operations or manufacturing processes to ensure continued compliance with the established criteria. Completion of recertification ensures continued transparency and further use of the GreenCircle mark.

7.0 Complaints, Appeals and Disputes

GreenCircle must be contacted immediately if there is a complaint, appeal, and/or dispute brought against a certification that GreenCircle has verified. GreenCircle will follow the GreenCircle Appeals, Complaints and Disputes procedure to review and resolve the issue.

8.0 Guidelines for Private Label User

The Life Cycle Assessment Optimized certification is for the exclusive use of the Client. Companies that produce private label products will require any private label customers, or downstream re-sellers of the certified product(s) who desire to utilize the GreenCircle Life Cycle Assessment Optimized certification to enter into a separate Licensing Agreement with GreenCircle regarding the use of the GreenCircle Mark on private label product and promotional materials. Please contact GreenCircle directly for more information.

9.0 Labeling Requirements

The Client agrees to promptly cease display and use of the GreenCircle Certified, LLC mark: (1) Upon expiration of the certification period; (2) If Client is no longer in compliance with one or more of the terms and conditions of the GreenCircle Certification Agreement. Please reference the **GreenCircle Certified Mark Usage Guidelines** for further details and more information on using the mark. The Client shall take caution to ensure that the GreenCircle Certification mark is not associated with products and/or operations which do not comply with the GreenCircle Certification System (GCCS). The Client will be asked to remove the GreenCircle mark immediately if it is found that they have applied the mark on a non-conforming GCCS product and/or operation. If the Client fails to remove the misused mark, an investigation will be conducted pertaining to the misuse, in which the full cost of the investigation shall be





borne by the Client. The Client shall not allow the GCCS Certification mark to remain on non-conforming products offered for sale. Such action could invite prosecution under U.S. Trademark statutes or attract other penalty provisions in other U.S. or State law.

10.0 Key Terminology

Allocation: Separation of inputs or emissions on a product level with the goal of consistently connecting emissions with their sources.

Audit Plan: Specifies how GreenCircle intends to conduct a particular audit. Our audit plan describes the activities we intend to carry out to achieve our audit objectives.

Carbon Dioxide equivalent: (CO₂ equivalent or CO₂-eq) A measure used to compare emissions from different greenhouse gases created by converting gas amounts to the equivalent amount of carbon dioxide with the same global warming potential.

Certification Period: A six month or preferably twelve-month period in the recent past in which GreenCircle identifies at the beginning of each certification. During this period, GreenCircle will collect various documentation needed to certify the specific claim.

Component: A constituent part of something (such as a system or mixture).

Critical Review: Process intended to ensure consistency between a life cycle assessment, Environmental Product Declaration, and compliance with ISO 14040 and ISO 14044 principles and requirements.¹

Data Quality: Regarding the goal and scope of the study – data must be accurate, consistent, and representative. Accurate data is judged based on the type of data (where it came from and how it was calculated), and the completeness of data.

Elementary Flow: material or energy entering the system being studied that has been drawn from the environment without previous human transformation, or material or energy leaving the system being studied that is released into the environment without subsequent human transformation.¹

Functional Unit: the unit of measure of a particular product, service, or system whose impact is being calculated by an LCA. It is essential to compare products, services, or entire systems across the same functional unit and to clearly state what functional unit or units are being used.

Impact Category: class representing environmental issues of concern to which life cycle inventory analysis results may be assigned.¹





Impact categories:

Impact Category	Unit	Definition
GWP	kg CO ₂ e	global warming potential (greenhouse gases)
ODP	kg CFC-11e	depletion of the stratospheric ozone layer
AP	moles H ⁺ or kg SO ₂ e	acidification of land and water sources
EP	kg N or kg PO ₄ -eq	eutrophication
POCP	kg NO _x , kg O ₃ eq, or kg ethene	formation of tropospheric ozone
ADP – Fossil Fuels	MJ	depletion of nonrenewable energy resources

Life Cycle Perspective: LCA considers the entire life cycle of a product, from raw material extraction and acquisition, through energy and material production and manufacturing, to use and end of life treatment and final disposal (for cradle to grave analysis). Through such a systematic overview and perspective, the shifting of a potential environmental burden between life cycle stages or individual processes can be identified and possibly avoided.¹

Life Cycle Assessment: Compilation and evaluation of the inputs, outputs, and potential environmental impacts of a product system throughout its life cycle.¹

Material Inputs: All incoming materials including original products collected, materials or components reclaimed or recycled, virgin or purchased materials.

Material Outputs: All outgoing materials or products from a manufacturing or processing facility.

Primary Data: Raw data that was collected and measured from the specific source being measured (e.g., site specific energy data or purchased raw materials data from a supplier or manufacturing plant)

Product: Refers to the specific entity that is being assessed in a product focused LCA. A product's system boundary will be clearly defined, and any actions taken within that system boundary will be assessed as part of the product LCA.

Product Category: Group of products that can fulfill equivalent functions.²

Product Category Rules: Set of specific rules, requirements, and guidelines for developing Type III product specific environmental declarations for one or more product categories.²

Raw Material: Primary or secondary material that is used to produce a product.¹





Reference Flow: Measure of the outputs from processes in a given product system required to fulfil the function expressed by the functional unit.¹

Secondary Data: Data existing on the internet or private/public databased collected previously by researchers (e.g., average data from EPA, Life cycle inventory data from Ecoinvent, or other third part sources inventory data).

1. ISO 14040:2006: Describes the principles and framework for life cycle assessment (LCA) including: definition of the goal and scope of the LCA, the life cycle inventory analysis (LCI) phase, the life cycle impact assessment (LCIA) phase, the life cycle interpretation phase, reporting and critical review of the LCA, limitations of the LCA, the relationship between the LCA phases, and conditions for use of value choices and optional elements (ANSI)

2. ISO 14025:2006: Establishes the principles and specifies the procedures for developing Type III environmental declaration programs and Type III environmental declarations. It specifically establishes the use of the ISO 14040 series of standards in the development of Type III environmental declaration programs and Type III environmental declarations. ISO 14025:2006 establishes principles for the use of environmental information, in addition to those given in ISO 14020:2000

11.0 Reference Documents

ISO 14040: *Environmental management – Life cycle assessment – Principles and framework*

ISO 14044: *Environmental management – Life cycle assessment – Requirements and guidelines*

ISO 14025: *Environmental labels and declarations – Type III environmental declarations – Principles and procedures*

ISO 17065: *Conformity assessment – Requirements for bodies certifying products, processes and services*

ISO 14071: *Environmental management – Life cycle assessment – Critical review processes and reviewer competencies*

ISO 14067: *This document specifies principles, requirements and guidelines for the quantification and reporting of the carbon footprint of a product*

PAS 2050: *Specification for the assessment of the life cycle greenhouse gas emissions of goods and services*





GHG Protocol product lifecycle accounting and reporting standard: *Framework for measuring the greenhouse gas emissions of a product*

12.0 Appendix A Data Quality

Data Quality Assessment and Sensitivity Analysis

All the data collected for the inventory model should be the most accurate, consistent, and representative data with regards to the goal and scope of the study, under practical time and operational control constraints. Primary data should be utilized whenever possible. Any secondary data should meet data quality requirements with a documented data quality assessment and sensitivity analysis. All data utilized in the LCA's will be documented in a data sources table.

Accuracy: Accuracy is judged based on the type of data that is used to model the emissions (supplier-specific, calculated, proxy, etc.). It is also judged based on the completeness of the inventory collected, as well as the completeness of the background data.

- Raw Materials – Must be representative of the ingredients and materials used in the product. All proxies that were used must be listed and any assumptions identified (use language from below)
- Manufacturing – Ideally Medium -High. For each product, utilize a complete BOM and map each component/ingredient to a representative LCA process for both primary and secondary data. Acceptable data sources include data from EcoInvent, GaBi, U.S LCI databases, other industry sources, or academic literature. Transportation – Ideally Medium -High. For inbound, utilize primary data obtained from the actual shipments of same or similar products and their average distances around the globe, as well as the actual splits of mode type for these trips. Utilize an average data factor for inbound, and primary actual average data per unit for outbound transportation.
- Product Use – Ideally Medium - High. Utilize detailed power models for each product confirmed by actual measurements. This should provide documentation on average power for each product that can be used to demonstrate a lifetime energy consumption based on the expected product lifetime.
- End-of-life (EoL) – Low/Medium. Most end-of-life impacts are based on secondary data utilizing LCA software data sets or average EPA data.
- Consistency: Consistency is based on the assumptions used in the model and data sources used for the background data. Each life cycle stage of the product is based on a parameterized model. Therefore, assumptions should be identical for each product.





- Representativeness: Representativeness is judged based on temporal correlation, geographical correlation and technological correlation and time related coverage of the data. The source of all data used in the LCA’s must be documented in a data sources table that addresses all data quality parameters.

Amendment History

Date	Issue	Summary of Amendments
04/01/2011	Rev. 0	Official issue date of document.
07/15/2013	Rev.1	Update language and definitions
06/30/2015	Rev. 2	Additional update language and definitions
05/22/2019	Rev. 3	Additional documentation requirements, definitions, and reference documents
5/20/2022	Rev. 4	Editorial updates
12/22/2022	Rev. 5	Formatting revisions
1/09/2023	Rev. 6	Split audit plan into building and non-building products

Certification Officer: Michelle Gorenne

