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SUSTAINABILITY GUIDANCE SERIES

Installment 001
Transferred Energy Claims

RAMBOLL

CONTENTS

TABLE OF TABLES

1 FOREWORD

This document is part of the Battery Council International (BCI)'s Sustainability Guidance Series, an initiative aimed at providing members with industry-specific, relevant, and practical guidance on various sustainability topics.

This document aligns with the International Organization for Standardization (ISO) 14020:2022 *Environmental statements and programmes for products – Principles and general requirements*[1] *and 14021:2016 Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)*[2]. A first-party conformity assessment per ISO 17000:2020 *Conformity assessment – Vocabulary and general principles*[3] was conducted by Rebecca Spellissy of Ramboll.

This guidance document supports non-comparative claims related to transferred energy in battery products and does not support comparative assertions of environmental superiority, improvement, or comparison of an organization's own prior product/process or another's organization's process/product. Also, this document does not apply to calculation of related metrics, e.g., greenhouse gas emissions.

In alignment with ISO, the following definitions apply:

- "shall" indicates a requirement
- "should" indicates a recommendation
- "may" is used to indicate that something is permitted
- "can" is used to indicate that something is possible, for example, that an organization or individual is able to do something

2 DEFINITIONS

- **Claimant:** "Person or organization responsible for the provision of the environmental statement"[i] (i.e., battery manufacturer)

- **Formation:** The process of initially charging and discharging battery cells in a specified manner in order to activate and stabilize the electrodes and electro-chemistry within the battery.

[1] International Organization for Standardization. 2022. ISO 14020:2022 Environmental statements and programmes for products – Principles and general requirements. Available at https://www.iso.org/standard/79479.html

[2] International Organization for Standardization. 2016. "ISO 14021:2016 Environmental Labels and Declarations -- Self-Declared Environmental Claims (Type II Environmental Labelling)." Available at https://www.iso.org/standard/66652.html

[3] International Organization for Standardization. 2020. "ISO 17000:2020 Conformity assessment – Vocabulary and general principles." Available at https://www.iso.org/standard/73029.html

- **Manufacturing Electricity:** The total amount of electrical energy consumed during the battery production process, including raw material preparation, cell assembly, formation, and initial charging.

- **Product:** A battery model or battery unit produced by a manufacturer.

- **Program Operator:** "person or organization responsible for developing and maintaining an environmental statement programme"[i] (i.e., battery manufacturer or appointed entity; see ISO 14020 §6.2)

- **Program Owner:** "legal entity [that] can be held legally responsible for its environmental statement programme"[i] (i.e., battery manufacturer; see ISO 14020 §6.2)

- **Rated Capacity:** The amount of energy a battery can store, typically measured in watt-hours (Wh) or kilowatt-hours (kWh).

- **State of Charge (SOC):** The level of charge within a battery, generally expressed as a percentage of its total capacity, to indicate how much energy is stored within the battery.

- **Stored Energy Transferred:** The amount of electro-chemical potential energy stored in batteries from the formation and initial charging processes that is ultimately transferred to customers in the form of charged batteries.

3 BACKGROUND

Battery manufacturing is an energy-intensive process, particularly through the final stages of formation and charging prior to shipping to customers. Battery manufacturing involves several key stages, beginning with the preparation of raw materials (e.g., lead, lithium compounds, graphite) for transformation into electrodes. The electrodes are combined with separators and electrolytes to form the cell assembly, which is then housed and sealed to prevent contamination and maintain integrity. Following assembly, the battery undergoes formation and may undergo additional charging (e.g., top up charging).

Formation serves to activate the battery and involves controlled electricity usage. During formation, the battery cells undergo controlled charging and discharging cycles at precise voltages and currents provided by electrical systems. This process stabilizes the electrode materials and forms a solid-electrolyte interface layer, which is important for the long-term performance of the battery to ensure it can achieve their full capacity and efficiency. The newly manufactured batteries are then taken through one or more controlled charge/discharge cycles to initialize the electro-chemistry, stabilize electrode structure, and allow for quality checks. Formation duration varies, depending on the battery type, and can consume a significant amount of energy in the process. Once formation is complete, the batteries may undergo additional top up charging to a predetermined SOC. The formation and charging energy sources can vary, e.g., grid electricity versus on-site electricity generation.

The formation and charging steps result in electro-chemical potential energy stored inside the battery. When the finished product is shipped, the stored electricity is shipped with it. In other words, part of the facility's purchased electricity is transferred to the customer in the form of charged batteries. Recognizing and quantifying this transfer is important for the manufacturer's optimization of energy use, transparent energy reporting, and for communication to customers and the public.

4 OBJECTIVE

There are two objectives of this guidance document:

1. provide guidance on the requirements for the environmental statement program, per ISO 14020, and
2. provide an "industry or trade" method of evaluation for transferred energy claims, as preferred by ISO 14021:2016.

Regarding objective 1, this document will detail the supporting information and documentation required for the environmental statement program for self-declared environmental claims of transferred energy stored in battery products.

Regarding objective 2, this guidance provides a replicable methodology for battery manufacturers to calculate and declare how much electricity is consumed during battery manufacturing and how much of that electricity is ultimately transferred to customers in the products as stored energy.

5 ENVIRONMENTAL STATEMENT PROGRAM

In general, any claims should adhere to existing green claims standards that are relevant to the claimant's operations, such as the European Union's Empowering Consumers Directive,[4] the United Kingdom Competition and Markets Authority Green Claims Code,[5] the United States Federal Trade Commission's Green Guides,[6] ISO 14020,[i] and ISO 14021.[ii] Users of this document should defer to applicable regulations or standards where there is contradiction or direction beyond this document.

5.1 Environmental statement program template

Per ISO 14020, "environmental statements shall be made based on an environmental statement programme." For self-declared environmental claims, the environmental statement program established by the claimant shall be adapted from **Table 1** below. For a full description of terms and program requirements, refer to ISO 14020.

[4] European Union. 2024. "Directive (EU) 2024/825 of the European Parliament and of the Council of 28 February 2024 amending Directives 2005/29/EC and 2011/83/EU as regards empowering consumers for the green transition through better protection against unfair practices and through better information." Available at https://eur-lex.europa.eu/eli/dir/2024/825/oj/eng

[5] United Kingdom Competition and Markets Authority. 2021. "Green claims code: making environmental claims." Available at https://www.gov.uk/government/publications/green-claims-code-making-environmental-claims

[6] Federal Trade Commission. 2012. "Guides for the Use of Environmental Marketing Claims ("Green Guides")." Available at https://www.ftc.gov/legal-library/browse/federal-register-notices/guides-use-environmental-marketing-claims-green-guides

Table 1. Environmental statement program template for self-declared transferred energy claim. Blue text indicates placeholders or suggested language, while black text indicates explanatory guidance.

Program Aspect	Description
Product	[DESCRIBE PRODUCT SCOPE]
Program name	[PROGRAM NAME] e.g., Battery Manufacturer's Transferred Energy Claims program
Program owner and operator	[PROGRAM OWNER AND OPERATOR] e.g., Battery Manufacturer's Sales and Marketing Department Address: | Email address:
Statement of purpose	[DESCRIBE THE PURPOSE OF THE CLAIM AND ITS SIGNIFICANCE.]
Program scope	Self-declared environmental claim regarding the stored energy that is transferred to customers in the products. The temporal scope is [TEMPORAL SCOPE]. The organization scope is [ORGANIZATIONAL SCOPE]. The life cycle scope is [LIFE CYCLE SCOPE].
Relevant standards	ISO 14020:2022 Environmental statements and programmes for products – Principles and general requirements ISO 14021:2016 Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)
Intended audience	[INTENDED AUDIENCE] e.g., The intended audience for the [PROGRAM NAME] is the general consumers of these products purchased through regular retail channels.
Interested parties	Interested parties have (not) been consulted. **OPTIONAL:** Claimants may choose to consult interested parties, e.g., customers requesting the information. If completed, see ISO 14020 §6.3 and add additional information as appropriate.
Parties and responsibilities	The [PROGRAM OWNER AND OPERATOR] has overall responsibility for the program, including responding to external enquiries from consumers, regulators, or other interested parties. The [DEPARTMENT(S)] is (are) responsible for obtaining the necessary information required for the calculation.

Program Aspect	Description
Production function, environmental criteria, and specified requirements	[DESCRIPTION OF PRODUCT FUNCTION] The environmental criteria are efficient energy consumption and transfer and the corresponding requirement is percentage of manufacturing energy transferred to the customer.
Calculation method	Battery Council International Sustainability Guidance Series, Installment 001 Transferred Energy Claims
Conformity assessment	A conformity assessment has (not) been conducted. **OPTIONAL:** A conformity assessment is optional under ISO 14020 and 14021. The program operator should elect to conduct a conformity assessment and if so, should follow ISO 17000. At a minimum, verification shall be possible without confidential business information, per ISO 14021 §6.5.2. See Section 5.2 for documentation requirements.
Format, reporting and information provision	**Format:** [FORMAT], e.g., in sustainability report or on claimant website **Claim:** [CLAIM] e.g., see Section 6 **Explanatory statement:** [EXPLANATORY STATEMENT] An explanatory statement shall be included with the claim if the claim itself is "likely to result in misunderstanding" and is not necessarily "valid in all foreseeable circumstances with no qualification." For example, for a claim such as "35% of manufacturing energy is transferred as stored energy in our batteries," an explanatory statement such as the following should be included with the claim: "The formation and charging steps during manufacturing result in electro-chemical potential energy stored inside the battery. When the finished product is shipped, the stored electricity is shipped with it. This transferred stored energy has been quantified according to the BCI Sustainability Guidance Series, 'Installment 001 – Transferred Energy Claims.' This metric covers all batteries manufactured by our facilities in the US in 2025." **Supporting documentation:** Copies of supporting documentation are retained by the [DEPARTMENT] for recordkeeping, with a retention period of [X] years. See Section 5.2 for list of supporting documentation that shall be prepared and retained.
Change management	Describe process for implementing changes to the program

5.2 Documentation

Manufacturers may communicate the results publicly and shall prepare clear documentation that includes the environmental statement program, data, calculation steps, and assumptions used in the calculations.

Per ISO 14020 and 14021 §6.5.3, the following documentation shall be prepared to support any claims. ISO 14021 §6.5.3(c)-(g) are not applicable.

1. Environmental Statement Program (see Section 5.1)

2. Data

- **Energy Consumption Records:**
  - Total annual electricity consumption for in-scope facilities (metered data from utility invoices/accounts or energy use logs).
  - Documentation of allocation methodology (in cases where only a subset of batteries is included in the scope of the claim).
- **Production Records:**
  - Total number of batteries shipped for in scope facilities.
  - Breakdown of the total number of each battery model produced, including product codes and rated capacity in watt-hours (Wh) or kilowatt-hours (kWh).
- **State-of-Charge (SOC) Records:**
  - SOC values for the batteries in scope, including documentation of how the SOC values were obtained.

3. Calculation Steps & Assumptions

This can be provided in a live Excel workbook or similar.

- **Calculation Methodology:**
  - Clear steps to calculate total annual electricity consumption.
  - Steps to quantify stored energy transferred to customers.
  - Sample calculations demonstrating methodology (e.g., Table 1 and Table 2 examples).
- **Assumptions:**
  - Detailed explanation and documentation of any assumptions and secondary or proxy data used in the calculations.

4. Limitations & Transparency

- **Explicit Limitations:**
  - Clearly state any limitations in claims due to assumptions, exclusions, or estimates.

5. (If applicable) Conformity assessment

- Name and credentials of assessor
- Dates of validity for conformity assessment
- Conformity assessment letter

5.3 A Note on Greenhouse Gas (GHG) Emissions Claims

It is important to note that a GHG emissions claim analogous to the transferred stored energy claim cannot be made. A claim such as "our manufacturing facilities generate 1,000 MT CO2e annually from grid electricity, and 35% of those GHG emissions are transferred to the customer as stored energy" shall not be made as the emissions still occur within the manufacturer's GHG reporting boundary and are not transferred. Per the GHG Protocol's Corporate Accounting and Reporting Standard,[7] the emissions shall be reported for both the battery manufacturer and the customer in different scopes. For example, the emissions from grid electricity consumption for battery manufacturing would be reported under the battery manufacturer's scope 2 emissions (purchased electricity) and the customer's scope 3 emissions (category 1 – purchased goods and services).

6 EVALUATION METHOD

This document lays out clear calculation steps so that users (i.e., battery manufacturers) can develop claims regarding the stored energy that is transferred to the customers in the products and regulators, investors, and customers can rely on and verify the claim. An example of a typical statement that the methodology supports is:

"During financial year 2025, our manufacturing facilities drew 2,000 MWh of electricity from the grid, of which 35% (700 MWh) was transferred to customers at point-of-sale as stored energy in batteries."

To support such a claim, the methodology specifies how to calculate and quantify two key values: (a) total annual electricity consumption and (b) the amount of stored energy sold.

6.1 Scope of the Analysis

6.1.1 TEMPORAL SCOPE

The temporal scope, or time span, of the claim shall be clearly documented and should align with other reporting requirements. For example, if the organization discloses GHG inventories or other environmental, social and governance (ESG) indicators on a basis of one fiscal year, the same fiscal year should be used for the energy transfer accounting.

6.1.2 ORGANIZATIONAL SCOPE

The organizational boundaries of the claim shall be clearly defined, as the scope of inclusion can vary significantly from individual battery products, to single manufacturing facilities, to business units, and to the entire organization. The organizational boundaries may also be based on a specified geographical scope, such as a country, region, etc.

6.1.3 PRODUCT SCOPE

The products within the scope of the claim shall be included in the analysis and shall align with the intended use of the claim. The scope may encompass all products sold or be narrowed down to a specific battery chemistry, product line/family, end use application, or other criteria. Regardless of the selected scope, the products included within the scope shall be clearly defined and transparently documented.

6.1.4 LIFE CYCLE SCOPE

The life cycle stages included in the claim shall be the manufacturing stage through the point-of-sale (i.e., when ownership of the products is transferred to the customer). Therefore, any stored energy losses that occur during storage, transport, or handling activities conducted by the manufacturer (claimant) shall be included.

[7] GHG Protocol. "GHG Protocol Corporate Standard Revised." Available at https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

6.2 Data

6.2.1 DATA REQUIREMENTS

Reliable quantification of transferred stored energy requires three key pieces of data:

1. Total annual electricity consumption for in scope facilities. Metered data from utility invoices/accounts or energy use logs are preferred but other analyses such a GHG inventories or ESG reports can be used. These data shall be expressed in kilowatt-hours (kWh) or megawatt-hours (MWh).

2. Production records listing the total number of batteries shipped for in scope facilities. Additionally, a breakdown of the total number of each battery model produced, including product code and rated capacity in watt-hours (Wh) or kilowatt-hours (kWh). If the product scope is limited to certain battery models, only the production numbers for those specific models are required, along with the overall total number of batteries shipped.

3. State-of-charge at the point-of-sale records for the batteries shipped, with a detailed breakdown by each battery shipped (e.g., if the same battery model is shipped with a different SOC for various shipments, the SOC of the battery model for each shipment should be provided). All data sources shall be thoroughly documented, and any simplifying or generalizing assumptions shall be clearly noted. For additional guidance on data sources for SOC, please refer to the following section.

See Section 6.2.2.2 for guidance if any of these data points are missing or incomplete.

6.2.2 DATA CONSIDERATIONS

6.2.2.1 STATE-OF-CHARGE VALUES

Obtaining accurate SOC values can be a challenging aspect of the calculation. To promote consistency, to the claimant shall follow the below hierarchy of data sources for obtaining SOC values:

1. Results from continuous quality control testing: The most reliable data comes from continuous quality control testing conducted on individual batteries at the point of production or sale. These test results provide precise and real-time SOC values for each battery, reflecting the exact condition of the battery at the time of testing.

2. Batch average results from benchtop testing: Batch average results from benchtop testing involve testing a representative sample of batteries from each production batch to determine average SOC values. Although less precise than individual continuous testing, this method still offers a reasonably accurate reflection of the SOC for a given batch of batteries.

3. Documented technical specification or customer requirement: Documented technical specifications or customer requirements that outline the expected SOC, providing an assumed value that aligns with production standards. Technical specifications that are published and publicly available (or upon request) and customer contractual requirements are preferred.

4. Default values derived from published literature/industry standards: In cases where none of the above methods are accessible, default SOC values should be adopted based on published literature and widely accepted industry standards. These values should be used cautiously, as they represent generalized assumptions that may not align with specific production scenarios.

When modeling SOC values, the claimant shall conservatively assume lower values where relevant (e.g., multiple SOC values available from different sources) to avoid overestimation of transferred energy. Factors such as charge loss during the manufacturer's storage, transportation, and handling activities should be accounted for, as these can significantly affect the battery's SOC at the time of sale. The claimant shall document and provide a rationale for any assumptions made regarding charge loss.

6.2.2.2 USE OF SECONDARY OR PROXY DATA FOR CASES OF INSUFFICIENT DATA

In situations where primary data for electricity consumption, battery shipments and specifications, and/or SOC information is insufficient or unavailable across certain temporal or organizational scopes, secondary or proxy data may be utilized to fill the gaps. Alternatively, the scope may be adjusted to avoid missing data (e.g., exclusion of facilities and related sales due to lack of manufacturing electricity data).

Secondary data includes information from external sources, such as industry reports, literature, or government databases. Proxy data includes information extrapolated from similar products or analogous production processes within the organization. When employing secondary or proxy data:

- Clearly explain the rationale for using the data and how the data correlates with the specific battery models or production conditions being studied.
- Provide justification that the secondary or proxy data is representative of the actual data it replaces.
- Document all sources of secondary or proxy data and the methodologies used for extrapolation.
- If relevant and feasible, temporally and geographically align proxy data with the specified scope by adjusting for any known differences in production and sales conditions, for example by scaling production volumes and accounting for seasonal sales variations.

6.3 Calculation Method

There are three key calculation steps required for determining the total stored energy transferred:

1. Calculation of total manufacturing electricity: Summation of electricity use across all manufacturing facilities within the temporal and organizational scope.

2. Calculation of total transferred energy: For each in scope battery sold, the rated capacity is multiplied by the SOC to determine the stored energy. The stored energy amounts of each in-scope battery are then summed to calculate total stored energy being transferred to customers.

3. Percentage of total manufacturing energy transferred to customers as stored energy: Divide total stored energy transferred by total manufacturing energy and multiply by 100%.

Note that if only a subset of products manufactured at a facility is included in the scope, then allocation of total facility electricity consumption to those products is required. In such cases, refer to *the Rules for the calculation of the carbon footprint of industrial batteries without external storage (CFB-IND)*[8], specifically Section 6.2.2 "Allocation of energy and auxiliary inputs of production lines."

A sample calculation for one facility (Facility 1) that manufactures three different battery models in one calendar year is shown below, beginning with obtaining monthly electricity use at the facility from utility bills as shown in **Table 2**:

Table 2: Example Monthly Electricity Use at Facility 1

Utility Bill Month	Electricity Usage for Facility 1 (MWh)
January	200
February	150
March	150
April	200
May	150
June	150
July	200
August	150
September	150
October	200
November	150
December	150
Total	**2,000**

Summing the electricity used in each month *m* at each facility *f* gives the total manufacturing energy used within the calendar year:

$$total\ manufacturing\ electricity = \sum_{f} \sum_{m} electricity\ usage_{f,m}\ (MWh) \quad = 2{,}000\ MWh$$

Table 3 provides an example of the ideal final format of battery model data for use in calculating the total stored energy transferred:

[8] Andreasi Bassi S., Ardente F., Candelaresi D., Eynard U., Ferronato N., Peters J.. Rules for the calculation of the carbon footprint of industrial batteries without external storage (CFB-IND). Publications Office of the European Union; 2025. Available from: doi/10.2760/6346639

Table 3: Battery Model Data

Facility f	Battery Model b	Number of Units Sold in 2024	Rated Capacity (kWh)	State of Charge at Shipment (%)	Total Transferred Energy (kWh)
Facility 1	1	4,700	70	85	279,650
Facility 1	2	3,600	35	80	100,800
Facility 1	3	7,100	50	90	319,500

Using the data from Table 3, the total transferred energy can be calculated as follows:

$$total\ transferred\ energy = \sum_{f} \sum_{b} annual\ units\ sold_{f,b}\ [unit] * battery\ capactiy_{b}\ \left[\frac{kWh}{unit}\right] * SOC_{f,b}\ [\%]$$

$$\begin{aligned} total\ transferred\ energy\ &= (4{,}700\ units\ of\ battery\ model\ 1\ from\ facility\ 1\ x\ 70\ kWh\ x\ 85\%) \\ &+ (3{,}600\ units\ of\ battery\ model\ 2\ from\ facility\ 1\ x\ 35\ kWh\ x\ 80\%) \\ &+ (7{,}100\ units\ of\ battery\ model\ 3\ from\ facility\ 1\ x\ 50\ kWh\ x\ 90\%) \end{aligned}$$

$$total\ transferred\ energy = 699{,}950\ kWh = 700\ MWh$$

Dividing the total transferred energy by the total manufacturing electricity gives the percentage of energy transferred to the customer:

$$\%\ of\ energy\ transferred\ to\ customer = \frac{total\ transferred\ energy\ [MWh]}{total\ manufacturing\ electrcity\ [MWh]}\ x\ 100\%$$

$$\%\ of\ energy\ transferred\ to\ customer = \frac{700\ MWh}{2000\ MWh}\ x\ 100\% = 35\%$$

7 CONCLUSION

This document provides guidance on how to make transferred energy claims. The first step is to establish an environmental statement program as outlined in Section 5. Then, calculate the information needed for the claim according to Section 6. The claim can then be made as laid out in the environmental program, e.g., in the annual sustainability report, as described in Section 5.