Statement SG24/00000078

The input data related to GHG Emission footprint of IT or technology devices in year 2023 used in

GHG Emission Footprint Calculation Tool:
Carbon Loop Calculator (Software Platform)

Developed by:

TES- AMM Singapore Pte Ltd

has been verified in accordance with ISO 14064-3:2019 as meeting the requirements of

For the following Carbon footprint calculation:

- GHG Emission footprint from processing activities
- Avoided GHG Emission footprint from TES-AMM circular service

Authorized by

Susan Law
SEAP Regional Manager
Date: 02 October 2024

Version 1

SGS International Certification Services Singapore Pte Ltd
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SGS has been contracted by TES-AMM Singapore Pte Ltd (hereinafter referred to as “TES-AMM”), 9 Benoi Sector Singapore 629844, for the verification of input data related to GHG emission footprint of IT or technology devices in accordance with

ISO 14064-3:2019

as provided by TES-AMM Singapore Pte Ltd (hereinafter referred to as “TES-AMM”), 9 Benoi Sector Singapore 629844, in the input data related to Greenhouse Gas emission footprint used in Carbon Loop Calculator (Software Platform) for the period 01 01 2023 to 31 12 2023.

Roles and responsibilities

The management of TES-AMM is responsible for the organization’s GHG information system, the development and maintenance of records and reporting procedures in accordance with that system, including the calculation and determination of GHG emissions information and the reported GHG emission footprint.

It is SGS’s responsibility to express an independent GHG verification opinion on the input data related to Greenhouse Gas emission footprint used in Carbon Loop Calculator (Software Platform) for the period 01 01 2023 to 31 12 2023.

SGS conducted a third-party verification of the provided GHG assertion against the principles of WRI/WBCSD Greenhouse Gas (GHG) Protocol – Corporate Accounting and Reporting Standard, ISO 14040:2006, ISO 14044:2006, ISO 14067:2018, and ISO 14064-3: 2019 in the period 12 08 2024 to 26 09 2024. The verification was based on the verification scope, objectives and criteria as agreed between TES-AMM and SGS on 18 04 2024.

Level of Assurance

The level of assurance agreed is that of reasonable assurance.

Scope

SGS has independently validated the calculation methodology of Carbon Loop Calculator (Software Platform). This calculation tool was developed by TES-AMM to calculate GHG emissions from IT or technology devices’ reuse and recycling, as well as the avoided emissions resulting from these activities. Based on the validation statement SG24/00000052 issued on 09 07 2024, SGS concluded that the presented GHG Emission Footprint Methodology of Carbon Loop Calculator (Software

Platform) version 1.0 has been found to comply in all material respects with the applicable requirements and standards.

In this engagement, TES-AMM has commissioned SGS to independently verify the reported input data related to GHG emission footprint used in the Carbon Loop Calculator (Software Platform). The verification aims to ensure compliance with various standards mentioned in the criteria.

The scope of the verification as outlined below.

This engagement covers verification of input data related to GHG emission footprint from anthropogenic sources of greenhouse gases used in the Carbon Loop Calculator (Software Platform) and is based on ISO 14064-3:2019.

- In relation to GHG site-specific emission footprint, the organizational boundary was established following operational control approach.
- Title or description activities: Input data related to Greenhouse Gas emissions used in Carbon Loop Calculator (Software Platform) for the period 01 01 2023 to 31 12 2023.
- Location/boundary of the of sites included in the verification:

SN	Site	Boundary
1	Sydney, Australia	No: 1 Marple Avenue, Villawood NSW 2163, Chester Hill NSW 2162
2	Melbourne, Australia	23 Fillo drive, Somerton VIC 3062
3	Pioneer Place, Singapore	6 Pioneer Place 627705
4	Benoi, Singapore	9 Benoi Sector 629844
5	Tokyo, Japan	6F East-Tower, GLP-ALFALINK, Sagamihara-1, 3700-1 Tana-Akasaka, Chuo-ku Sagamihara-shi 252-5212
6	Shanghai, China	No. 358, Xing shun Rd, Jiading District, Shanghai, P.R.C 201815
7	Recklinghausen, Germany	Blitzkuhlenstraße 169, 45659 Recklinghausen
8	Herten, Germany	Hohewardstrasse 327, 45699 Herten

SN	Site	Boundary
9	Seattle, USA	1208 Andover Park East, Tukwila, WA 98188
10	Virginia, USA	9601 Cosner Dr, Fredericksburg VA 22408
11	Cannock, UK	Blakeney Way, Kingswood Lakeside, Cannock, Staffordshire, WS11 8JB
12	Irvine, UK (Scotland)	10, Crompton Way, North Newmoor, Irvine, North Ayrshire, KA11 4HU

- Physical infrastructure, activities, technologies and processes of the organization: GHG emission footprint in the life cycle of processes involving a combination of IT or technology devices' reuse and recycling activities, e.g., IT Asset Disposition and e-waste recycling activities.
- GHG sources, sinks and/or reservoirs included: Sources as presented in the GHG inventory/assertion provided by TES-AMM on 26 09 2024
- Types of GHGs included: CO_2, CH_4, N_2O, SF_6, HFCs, PFCs, NF_3
- The IPCC 2014 AR5 GWP values are applied in this inventory, unless stated otherwise.
- Emission factor:
  - Direct emission: UK DEFRA 2023 (BEIS)
  - Indirect emission:
    - Electricity emission factor:
      - Sydney, Australia – Average of 0.776 $kgCO_2e/kWh$ (Source from supplier-specific data published in monthly invoices in 2023)
      - Melbourne, Australia – Average of 0.905 $kgCO_2e/kWh$ (Source from supplier-specific data published in monthly invoices in 2023)
      - Pioneer Place, Singapore & Benoi, Singapore – 0.4168 $kgCO_2e/kWh$ (Source from Energy Market Authority (EMA) published in 2023)
      - Tokyo, Japan – 0.4568 $kgCO_2e/kWh$ (Source from International Energy Agency (IEA) published in 2023)
      - Shanghai, China – 0.5703 $kgCO_2e/kWh$ (Source from Ministry of Ecology and Environment of the People's Republic of China in 2023)
      - Recklinghausen, Germany – 0.6840 $kgCO_2e/kWh$ (Source from Association of Issuing Bodies (AIB)'s European Residual Mix published in 2023)

- Herten, Germany – 0.001 kgCO_2e/kWh (Source from supplier-specific data published on supplier's website in 2023)
- Seattle, USA – 605.872 lbCO_2e/MWh (Source from Environmental Protection Agency (EPA) published in 2023)
- Virginia, USA – 0 lbCO_2e/MWh (Source from renewable energy supplier-specific data published in monthly invoices in 2023)
- Cannock, UK – 0.2530 kgCO_2e/kWh (Source from supplier-specific data published on supplier's website in 2023)
- Irvine, UK (Scotland) – 0.2530 kgCO_2e/kWh (Source from supplier-specific data published on supplier's website in 2023)

- Purchased heating emission factor: Herten, Germany – 0.1567 kgCO2e/kWh (Source from supplier-specific data published on supplier's website in 2023)

- The secondary database: UK DEFRA 2023 (BEIS), Supply Chain Greenhouse Gas Emission Factors v1.2, CleanCargo 2022, EcoInvent v3.10 and v3.9.1 using IPCC 2021 AR6 GWP values
- Directed actions: NA
- GHG information for the following period was verified: 01 01 2023 to 31 12 2023.
- The version of inventory sheet: TES 2023 Environmental Data 25.09 SGS.xlsx and MASTERDATA Carbon saving tool 30.08.xlsx
- The version of GHG assertion: N/A
- Intended user of the verification statement: For TES-AMM internal use and external publication as required.

Objective

The purposes of this verification exercise are, by review of objective evidence, to independently review:

- Whether the GHG emission footprint are as declared by the organisation's GHG assertion
- The input data reported are accurate, complete, consistent, transparent and free of material error or omission.

Criteria

Criteria against which the verification assessment is undertaken are the principles of

- WRI/WBCSD Greenhouse Gas (GHG) Protocol – Corporate Accounting and Reporting Standard, GHG Protocol – Corporate Value Chain (Scope 3) Accounting and Reporting

Standard, applicable to the GHG emission footprint from processing activities at TES-AMM site-specific facilities, and

- ISO 14040:2006, ISO 14044:2006, and ISO 14067:2018, applicable to the avoided GHG emission footprint from TES-AMM circular service

Materiality

The materiality required of the verification was considered by SGS to 5%, based on the needs of the intended user of the GHG Assertion.

Considerations and Limitations

The following considerations and limitations have been applied to the verification engagement:

- All interviews were conducted remotely with no physical site visits included in the assurance process.
- Financial data drawn directly from independently audited financial accounts or general ledgers has not been checked back to source such as invoices. SGS relied on the supporting manual calculation sheets provided by the client to conduct the verification engagement.
- Weight data such as the number of IT assets processed in a job, or the total volume of waste processed in a site has not been checked back to source as well. SGS noted that such data is derived from asset management systems, such as Circle or Epicor, with in-built controls to ensure weight of all incoming assets are traceable.
- Distance and weight of freighting goods has not been checked back to source such as invoices or bill of lading. SGS relied on the supporting manual calculation sheets provided by the client to conduct the verification engagement.
- TES-AMM has included emissions due to the transport of waste meant for recycling and incineration with energy recovery in Scope 3 Category 9 Downstream Transport and Distribution and Scope 1 Mobile instead of Scope 3 Category 5 Waste as the organisation is unable to disaggregate emissions due to transport of waste vis a vis other goods. Instances where waste meant for recycling and incineration with energy recovery is collected by waste management vendors is considered to be infrequent, thus associated emissions are considered to be immaterial.
- Due to the scarcity of internationally recognised datasets, TES-AMM has relied on a combination of publicly available Litreature and internal expertise to develop estimated recycling rates of common raw materials in IT assets.

- The quantitative materiality threshold of 5% is applied to the individual parameters, such as site-specific Scope 1, 2, and 3 emissions, manufacturing emissions of each IT asset, and not on the intensity ratios, e.g. division of Scope 1 emissions divided by Total Assets Processed
- In relation to metric “Emissions from site processing”, TES-AMM uses site-specific data to calculate emissions from processing across 37 sites. In this engagement, SGS conducted a focused verification of the 12 key sites to ensure the accuracy of GHG emissions data from these sites across 8 countries, i.e., 4 recycling facilities (SG-Benoi, DE-Herten, AU-NSW Sydney, CN-SH) and 8 ITAD facilities (AU-VIC Melbourne, US-SEA, US-Virginia, DE-Recklinghausen, SG-Pioneer, JP-Tokyo, UK-Cannock, UK-Irvine). The basis of the engagement is to focus on the appropriateness and completeness of the GHG-related emissions where practical.

  The 12 key sites were considered due to the following.

  - The selected sites account for more than half of the total volume of IT/ technology devices processed by TES-AMM annually.
  - The selected sites represent typical TES-AMM’s processing facilities, with data collection methodology matches with the other remaining recycling and ITAD sites.

Conclusion

TES-AMM provided the GHG assertion and emission data used in the Carbon Loop Calculator (Software Platform) based on the based on the principles of relevance, completeness, consistency, accuracy, and transparency.

The input data related to GHG emissions footprint used to calculate metric “Avoided GHG emission footprint associated with TES-AMM circular service from Recycling and reuse” for the period 01 01 2023 to 31 12 2023 are verified by SGS to a reasonable level of assurance, consistent with the agreed verification scope, objectives, and criteria.

The input data related to GHG emission footprint used to calculate metric “Emissions from site processing”, for the period 01 01 2023 to 31 12 2023, disclosing Scope 1, Scope 2, and Scope 3 Emissions are verified by SGS to a reasonable level of assurance, consistent with the agreed verification scope, objectives, and criteria.

The emission of each key site is described as below:

Unit: tonnes of CO_2e

Site[1]	Scope 1[2]	Scope 2[3]	Scope 3[4]	Scope 1, 2 and 3 Emissions	Scope 1 (Mobile)	Scope 3 Cat 4	Emissions from Transport
Sydney, Australia		171.00	567.98	738.98	15.72	1,553.23	1,568.96
Melbourne, Australia	-	112.00	277.78	389.78	21.49	278.56	300.05
Pioneer Place, Singapore	-	97.12	135.66	232.79	-	0.31	0.31
Benoi, Singapore	40.40	462.79	1,455.99	1,959.19	37.23	24.19	61.42
Tokyo, Japan	-	149.64	629.37	779.01	63.18	9.21	72.39
Shanghai, China	-	1,568.81	2,043.83	3,612.64	92.85	678.53	771.38
Recklinghausen, Germany	60.28	157.87	653.89	872.03	232.27	149.46	381.73
Herten, Germany	4.96	0.28	150.26	155.50	-	264.01	264.01
Seattle, USA	46.14	34.49	919.00	999.64	252.17	268.47	520.64
Virginia, USA	35.95	-	747.18	783.13	-	580.79	580.79
Cannock, UK	46.66	111.66	4,878.59	5,036.91	33.83	83.12	116.95
Irvine, UK (Scotland)	8.60	38.87	685.29	732.76	40.49	89.48	129.97

SGS's approach is risk-based, drawing on an understanding of the risks associated with reporting GHG emissions information and the controls in place to mitigate these. Our examination includes assessment, on a test basis, of evidence relevant to the amounts and disclosures in relation to the organization's reported GHG emissions.

[1] Focused verification of the site that represents TES processing facilities with high volume of IT or technology devices processed and cover large percentage of TES AMM's target intended user

[2] Stationary Combustion and Fugitive emissions (annual numbers)

[3] Purchased electricity/ energy (annual numbers)

[4] Includes only 1, 2, 3, 5, 6, 7, 9, and 15 emissions (annual numbers)

We planned and performed our work to obtain the information, explanations, and evidence that we considered necessary to provide a reasonable level of assurance that the input data and GHG emission footprint for the period 01 01 2023 to 31 12 2023 are fairly stated.

We conducted our verification with regard to the GHG assertion of TES-AMM which included assessment of GHG information system, monitoring and reporting plan/protocol. This assessment included the collection of evidence supporting the reported data, and checking whether the provisions of the protocol reference, were consistently and appropriately applied.

In SGS's opinion the presented GHG assertion and input data:

- is materially correct and is a fair representation of the GHG data and information, and
- is prepared in accordance with WRI/WBCSD Greenhouse Gas (GHG) Protocol – Corporate Accounting and Reporting Standard, ISO 14040:2006, ISO 14044:2006, ISO 14067:2018.

Confidentiality

The reports and attachments may contain relevant confidential information of the clients. In addition to being submitted as governmental application or certification documents, the reports and attachments are not allowed to be edited, duplicated, or published without the clients' agreement in written form.

Avoidance of Conflict of Interest

The reports and attachments are completely complied with the standards and procedures that related-authorities established. The reports and attachments of auditing process are conduct with fairness and honesty. If not, the auditing institution not only has to bear the relevant compensation duties, but also to receive legal charge and punishment.

This statement shall be interpreted with the GHG assertion of TES-AMM as a whole.

Verifier Group

Above statements coincide with verification process with fairness and impartiality, and aim at the emission of year 2023 of client.

Lead Verifier: 

(Valerie Koh)

Verifier: 

(Adrian Lamano) (Priyanka Mehta)

Note: This Statement is issued, on behalf of Client, by SGS International Certification Services Pte Ltd. ("SGS") under its General Conditions for Green Gas Verification Services available at http://www.sgs.com/terms_and_conditions.htm. The findings recorded hereon are based upon an audit performed by SGS. A full copy of this statement, the findings and the supporting GHG Assertion may be consulted at TES-AMM Singapore Pte Ltd, 9 Benoi Sector Singapore 629844. This Statement does not relieve Client from compliance with any bylaws, federal, national or regional acts and regulations or with any guidelines issued pursuant to such regulations. Stipulations to the contrary are not binding on SGS and SGS shall have no responsibility vis-à-vis parties other than its Client..

ANNEX – Metric and Parameters Included in Verification of Carbon Loop Tool

S/N	Metric	Formula
1.1	Avoided GHG emission footprint associated with TES-AMM circular service: Recycling	$$\textbf{Raw Material Extraction Emission} = (\textbf{Quantity of Raw materials} \times \textbf{Virgin material extraction EF} \times \textbf{Recycling rate}) + (\textbf{Asset weight} \times \textbf{Emissions from landfill EF})$$
		$$\textbf{Avoided GHG Emission} = [(\textbf{Quantity of Raw materials} \times \textbf{Virgin material extraction EF} \times \textbf{Recycling rate}) + (\textbf{Asset weight} \times \textbf{Emissions from landfill EF})] - (\textbf{Emissions from site processing} + \textbf{Emissions from downstream processing})$$
1.2	Avoided GHG emission footprint associated with TES-AMM circular service: Reuse	$$\textbf{Avoided GHG Emission} = \left(\frac{\textbf{Manufacturing Emissions}}{(\textbf{Years of 1st life})} \times \textbf{Years of 2nd life}\right) - \textbf{Emissions from site processing}$$
2	Direct and indirect emissions associated with processing activities: - Scope 1[5] - Scope 2[6] - Scope 3[7] - Transportation emissions	$$\textbf{Emissions from processing (site specific)} = \frac{\textbf{Scope 1} + \textbf{Scope 2} + \textbf{Scope 3}}{(\textbf{Sum of volume processed at facility})}$$
		$$\textbf{Emissions from Transport (site specific)} = \frac{\textbf{Scope 1 Mobile} + \textbf{Scope 3 Category 4}}{\textbf{Sum of km travelled}}$$

Metric	Input Parameters	Input data	Unit of Analysis
1.1 & 1.2	Quantity of raw materials	Average Bill of Materials with details on weight of each raw material sourced from company data, secondary literature, and OpenAI	Per asset type
1.1 & 1.2	Virgin material extraction EF	Average emissions factors sourced from EEIO/ LCA data base	Per raw material

[5] Stationary Combustion and Fugitive emissions (annual numbers)

[6] Purchased electricity/ energy (annual numbers)

[7] Includes only Categories 1, 2, 3, 5, 6, 7, 9, and 15 emissions (annual numbers)

Metric	Input Parameters	Input data	Unit of Analysis
1.1 & 1.2	Recycling rate	Average emissions factors sourced from EEIO/ LCA data base	Per raw material
1.1 & 1.2	Asset weight	Average total weight sourced from company data, secondary literature, and OpenAI	Per asset type
1.1 & 1.2	Emissions from landfill EF	Emission factor for landfilling of WEEE sourced from UK DEFRA	N/A
1.2	Emissions from site processing	Scope 1[8], 2[9] and 3[10] Emissions intensity based on volume of waste sourced from most representative TES site[11]	Per site
1.1	Emissions from downstream processing	Average emissions factors sourced from EEIO/ LCA data base	Per raw material
2	Emissions from processing (Scope 1[8], 2[9] and 3[10])	Scope 1[8], 2[9] and 3[10] emissions intensity based on volume of waste sourced from each TES site[12]	Per site
2	Emissions from Transport	Scope 1 Mobile and Scope 3 Category 4 emissions intensity based on km travelled sourced from each TES site	Per site

[8] Stationary Combustion and Fugitive emissions (annual numbers)

[9] Purchased electricity/ energy (annual numbers)

[10] Includes only Categories 1, 2, 3, 5, 6, 7, 9, and 15 emissions (annual numbers)

[11] DE-Herten site-specific Scope 1,2,3: EF applied for EU and US region, SG-Benoi site-specific Scope 1,2,3: EF applied for Asia region (excluding China), CN-Shanghai site-specific Scope 1,2,3: EF applied for China region and AU-NSW site-specific Scope 1,2,3: EF applied for Australia region

[12] Emissions data at site-level has been verified for 12 key sites: DE-Herten, SG-Benoi, CN-Shanghai, AU-NSW, AU-VIC Melbourne, US-SEA, US-Virginia, DE-Recklinghausen, SG-Pioneer, JP-Tokyo, UK-Cannock, UK-Irvine