Lenovo's Product Carbon Footprint Strategy

Our Commitment to Address Climate Change

As stated in Lenovo's Climate and Energy Policy,[1] the company "recognizes that climate change is a serious threat and believes that we should all do our part to reduce harmful greenhouse gas (GHG) emissions" that are contributing to global warming. To guide Lenovo's GHG emissions management activities, we have established a comprehensive climate change strategy[2] that focuses on five strategic areas of influence, including:

- Lenovo's supply chain operations - delivery of goods and services to Lenovo (cradle to gate)
- Lenovo's internal operations and the direct emissions from all facilities (gate to gate)
- Energy suppliers' and their operational emissions which are attributable to Lenovo's activities
- Lenovo's customers activities and the emissions associated with their procurement, use and disposal of Lenovo's products (gate to grave)
- Actions of the government, non-profits, and public in the development and implementation of public policy in support of transition to a low carbon economy

Lenovo identifies and works with partners in each area to drive GHG emissions reductions.

In each of these strategic areas, Lenovo is taking actions that support quantifying and reducing the life cycle impacts of our products. A product generates environmental impacts in each phase of its life cycle. This includes impacts that occur across the supply chain, manufacturing and distribution operations, and the procurement, use and disposal of the product. For each of these life cycle phases, some portion of the GHG emissions, ranging from a small fraction to 100%, can be allocated to the carbon footprint of the product. A compilation of the allocated emissions from all of the life cycle phases represents the product's carbon footprint (PCF).

Why Calculate a Product Carbon Footprint?

PCF is a means for measuring, managing and communicating GHG emissions related to products. As a significant portion of the carbon emissions associated with our own, our suppliers' and our customers' activities and operations are embodied in the PCF of Lenovo's products, we recognize the value in measuring and analyzing it. This work allows us to:

- Achieve a detailed understanding of the GHG inventory of our products
- Identify PCF trends in terms of increase or decrease of GHG emissions
- Identify GHG risks/hot spots (e.g., energy intensive operations in the life cycle)
- Take targeted actions that reduce the carbon footprint of our own and our customers' operations over time
- Provide clear communication to customers, investors and other stakeholders regarding the GHG impacts of our products

- Track the development of and prepare for product carbon labeling and carbon offset requirements

The Challenges of Calculating a Product Carbon Footprint

There are numerous and substantial challenges to calculating an accurate carbon footprint for Information and Communications Technology (ICT) products, especially if the intent is to use the data for product-to-product comparisons. A few of the significant challenges are:

- Collecting and compiling dependable emissions data across a long and complicated supply chain
- Accurately allocating emissions from facilities across different geographies providing numerous products and services to multiple customers
- Maintaining current data with a continuously evolving and rapidly changing ICT product portfolio
- Ensuring consistency of results in an environment where multiple and varying calculation methodologies are available

While there are voluntary standards available to guide practitioners in compiling PCF, these standards are not designed to establish comparative values between products. The degree of flexibility written into the standards can produce variations in results for the same products when the same standard is applied by different practitioners. Compiling PCF using these standards is also a very lengthy and resource intensive process. Commonly used standards include British Standards Institute's *PAS 2050*[3], WRI/WBCSD's GHG Protocol *Product Lifecycle Accounting and Reporting Standard*[4] and International Standards Organization's *ISO 14040 & ISO 14044 – Life Cycle Assessment*[5] and *ISO 14067 – Carbon Footprint of Products*[6].

Addressing These Challenges

Lenovo believes the application of a common PCF framework across the ICT industry best supports the calculation, monitoring and reduction of ICT-related emissions globally. To that end we have participated in the development and testing of PCF methodologies around the world. Our near-term goal in supporting this work is assuring the development of a reliable and repeatable methodology that supports the identification of product lifecycle carbon emissions reduction opportunities. Lenovo's past and present work in this area includes:

- The company participated as a member of the Stakeholder Advisory Group for the World Business Council for Sustainable Development's (WBCSD) & World Resources Institute's (WRI) development of the Product Accounting & Reporting Standard. Our Beijing Desktop Development group participated in the road test of this Standard.
- Lenovo participated in the Project: *Catalyzing corporate supply chain carbon footprint reporting in China's export industries*. The project was initiated by China National Institute of Standardization, Carbon Trust and Carbon Disclosure Project and it proposed

to develop, pilot and disseminate methodologies and practices for corporate supply chain carbon emission measurement and reporting by Chinese exporting companies.

- Lenovo was engaged as a member in the IEC TC100 Technical Report (TR) , IEC TR 62921 *"Quantification methodology for greenhouse gas emissions for computers and monitors."* IEC TR 62921 provides specific guidance on how to quantify the carbon footprint of computer devices using a methodology consistent with existing guidance documents. And it was adopted by EPEAT criteria, IEEE 1680.
- Lenovo provided product carbon footprint training to more than 200 of its component suppliers.
- Lenovo has been actively involved in the PCF China Standard Project in cooperation with the Ministry of Industry and Information Technology of the People's Republic of China. Lenovo has been supporting the project in the following four areas: Product Category Rule, Desktop PCF, Notebook PCF and PCF Certification.
- Lenovo has been also involved in the following carbon footprint projects: China ICT Product Life-Cycle Assessment Data Service Platform, China ICT Supporting Low Carbon Economy and EICC Product Carbon Footprint Data Allocation Algorithm Development.
- Lenovo is engaged with other members of the information and communication technology (ICT) industry and academia in the development of a tool to simplify and expedite determination of the PCF for ICT products through the Product Attribute to Impact Algorithm (PAIA) project. It is hoped that this work will move the industry towards a standard method for establishing PCF. Lenovo's product development groups are currently using PAIA notebook, desktop, monitor, all-in-one, tablet, thin clients, servers, network switch and storage products PCF calculation tools, and are transited to the online platform since 2021 August.
- As a PAIA project member, Lenovo was also a participant in the EU ICT footprint pilot tests. This EU project is assessing the compatibility of methodologies for the measurement of the energy consumption and carbon emissions arising from the lifecycle of ICT products and services. More information is available at www.ict-footprint.com.

Lenovo is also working internally on quantifying the lifetime impact of its products. To guide this work we developed product carbon footprint calculation guidance to support quantifying the product life cycle GHG emissions of Lenovo's products. This document is written in accordance with the ISO PCF standards, PAS 2050 and the GHG Protocol requirements. Each business unit shall follow this guide in assessing the life cycle emissions of its products.

To date, with the support of our suppliers, Lenovo has compiled the PCF for select PC, visuals, mobile phone and accessory products. Although this work was done in accordance with established PCF methodologies and verified by third parties, we have not made the results publicly available. The data is provided to customers upon request. We have refrained from general publication of the results because of the significant challenges in compiling reliable data and the latitude current methods allow practitioners in compiling PCF can result in significant,

un-quantified variability in compiled results. Under these circumstances we wish to avoid PCF being inappropriately used for product-to-product comparison.

Delivering PCF through PAIA

In hopes of addressing the shortcomings associated with existing PCF methodologies, Lenovo has supported and is committed to the PAIA project. The project developed a streamlined PCF methodology which greatly reduces the time and resources needed to compile a PCF and establishes a measure of uncertainty which allows for evaluation of the accuracy of the compiled result. The methodology also identifies those stages of the product lifecycle and the product components that most significantly contribute to the PCF, supporting the identification and implementation of targeted improvement actions. Lenovo uses the PAIA tools to calculate and deliver PCF for our products until an equally efficient and more accurate methodology is developed.

The PAIA project has been driven by the Materials Systems Laboratories at the Massachusetts Institute of Technology (MIT). Participants in the PAIA project include members of the ICT industry, academia, NGOs and government. Working within the frame of the PAIA methodology, to date the project has produced tools for streamlined calculation of PCF for notebook, desktop, monitor, all-in-one, tablet, thin clients, servers, network switch and storage products. And it also developed an online platform.

We externally published Lenovo Product Carbon Footprint Information sheets for some of our existing products and all new products (including notebook, desktop, monitor, all-in-one, tablet, thin clients, servers and storage) released after July 2015. These sheets provide the carbon footprint of Lenovo's products generated using the streamlined PAIA life cycle analysis, which includes manufacturing, transportation, use and end of life. A PCF Information sheet is available alongside an ECO Declaration sheet for each of our products.

Our customers and stakeholders can understand the limitations associated with the calculated values by reviewing the PAIA intended use document. The intended use document states that the PAIA method and tools are not intended to be used to address the following items:

1. The results from the PAIA method and tools should be represented as a streamlined LCA. PAIA may not be compliant with the primary data requirements of some LCA standards depending on the definitions and interpretations of those requirements.

2. At this time, the results of the PAIA tools are not designed to differentiate between products at the SKU level. The tools can offer a high level estimate of impact along with the associated uncertainty of the results for product classes, but not for specific products.

3. At this time, the results of the PAIA tools should not be used for a regulated carbon footprint disclosure program without further discussion with the research team.

4. In the case of a major shift in technology or improvement in manufacturing, the PAIA tools may need to be reconfigured (as would any study based on extant data).

5. As is typically found in any LCA, data within the tools are of varying quality (age, source, sample size, etc.). The quality of data should be examined in the context of the requirements of each tool use.

6. The results of the PAIA tools are not intended to be applied to cradle-to-gate or component-level assessments as the triage was applied at the cradle-to-grave level and the level of detail made in each tool was made accordingly.

7. The results from the PAIA tools are liable to change over time as the methodology is improved and data is updated."

Continuing to Improve PCF Calculation Methodologies

Lenovo will continue to support the development of more accurate and efficient resources for carrying out PCF calculations.

In the near term, this means a continued commitment to the PAIA project. This will include:

- Supporting the development of PAIA tools for other ICT product categories
- Working to ensure the PAIA methodology supports calculations that meet new and developing compliance requirements and standards
- Improving and maintaining the accuracy and quality of data used in the PAIA tools
- Working with partners on a process which ensures the PAIA tools remain current and accessible

Lenovo will continue to pursue opportunities to participate with governments, industry organizations, academia and NGOs in the development of standards, methodologies and other requirements which support the reduction of carbon emissions associated with the manufacture, procurement, use and disposal of ICT products.

On a longer horizon, Lenovo hopes that the PCF of ICT products will be calculated compiling the published PCF of all individual ICT components and parts. To this end we will continue to work with our supply chain to encourage the development of tools, resources and expertise that support their ability to provide us with component- and parts-level PCF.

About the Authors:

Gong Xun, research areas including carbon standards, Product Lifecycle Assessment, Product Eco-design & Recycling. She is responsible for Lenovo Product LCA & Carbon Footprint tech, Standard & Regulation formulation and climate-related work. She is recruited as the IEC expert, deeply involved in the IEC TC100, TC297, and WRI Greenhouse Gas Protocol Product Standard formulation work. And she participates and supports the research and development of MIT PAIA tool for the streamlined carbon emission calculation methodology. As the technology lead, she is the drafter of micro-computer section of Carbon Emission and Low Carbon Certification Technique Research and Demonstration Project for the National Development and Reform Commission (NDRC) and Certification and Accreditation Administration (CNCA) jointly released plan "Interim Management Methods for Low-carbon Products Certification". And she is the tech lead and project manager of China ICT Product Life-Cycle Assessment Data Service Platform project and China Eco-design Enterprise Pilot project of Lenovo.
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About Lenovo:

Lenovo (HKSE: 992) (ADR: LNVGY) is a US$45 billion global Fortune 500 company and a leader in providing innovative consumer, commercial, and enterprise technology. Our portfolio of high-quality, secure products and services covers PCs (including the legendary Think and multimode YOGA brands), workstations, servers, storage, smart TVs and a family of mobile products like smartphones (including Motorola), tablets and apps. Join us on LinkedIn, follow us on Facebook or Twitter (@Lenovo) or visit us at www.lenovo.com.

References:

[1] Click here to view Lenovo's Climate and Energy Policy

[2] Click here to view Lenovo's climate change strategy

[3] PAS 2050:2011 *Specification for the assessment of the life cycle greenhouse gas emissions of goods and services*, British Standards Institute, 2011

[4] *Product Life Cycle Accounting and Reporting Standard,* World Business Council for Sustainable Development (WBCSD), World Resources Institute (WRI), 2011

[5] *International Standard ISO 14040:2006 Environmental Management – Life Cycle Assessment – Principle and Framework and International Standard ISO 14044:2006 Environmental Management – Life Cycle Assessment – Requirements and guidelines.*

[6] International Standard ISO/TS 14067:2013 Greenhouse gases -- *Carbon footprint of products – Requirements and guidelines for quantification and communication*