Delta Product Life Cycle Assessment Management

台達產品生命週期評估管理

Delta Product Life Cycle Assessment and Product Carbon Footprint Management

In order to reduce the impact of products on the environment, Delta has conducted full-scale LCA and Screening LCA on the environmental impact of respective products according to the international standards ISO 14040 and ISO 14044 in each phase, and has introduced green design. By summarizing the results of several products' LCA, it shows that the environmental impact from the "use phase" of Delta's core products is currently most significant during their life cycle, while "acquisition of raw materials" comes in second.

Since 2010, Delta has selected several representative products to perform product carbon footprint research based on the Life Cycle Assessment methodology in accordance with PAS 2050 and ISO 14067 standards. They included the carbon footprint inventory of notebook external power supply units (adapters), DC fans, PV inverters, high efficiency rectifier modules, switching power supplies, and DC / DC modules for EV powertrains, for which third-party verification statements were obtained.

In 2022, the Supply Chain ESG Committee worked with all business groups to launch a comprehensive set of product carbon footprint projects. Each business group has established a working group to regularly report on their progress, including the parallel deployment of product carbon footprint calculations, examination of reduction practices for product life cycles, and case studies of green product design.

Delta has a large variety of products, and for this reason, we calculate our carbon footprint in separate stages. We expanded the product categories included in the inventory to adapters, power chokes, stators, DC fans, LED high bay, wireless APs, electric vehicle charger IC-CPDs, digital projectors, and integrated low-voltage DC brushless vehicle motors in accordance with ISO 14067 Product Carbon Footprint Standards. We also obtained third-party verification statements. We organized in-person training programs and online

courses in 2023 to help employees understand product carbon footprints as well as build up their ability to respond to customer requirements. We also compiled lessons learned from the carbon footprint inventory and shared inventory tools and resources through internal announcements to accelerate the internal product carbon footprint inventory.

Delta released the "Delta Group's Product Carbon Footprint Strategies" in 2022. In the mid-term, the program will independently improve product carbon footprint promotion capabilities, launch a quantitative plan, and establish a response mechanism for customer product carbon footprint requirements. In the long-term, all important products will be included in Delta's product carbon footprint calculation platform to help develop low-carbon products. Delta will also continue to negotiate, communicate and encourage value chain partners to accelerate product carbon footprint reduction actions in compliance with international trends, customer demand, and relevant regulations.

The key measures implemented for product carbon footprint reduction are as follows:

1. Pay attention to developments in international carbon border taxes, complete inventories and calculation of the carbon footprint of products based on international standards, and ensure that the methodology and data quality comply with the regulations.
2. Establish a product carbon footprint implementation team in Business Units to strengthen product carbon footprint awareness and knowledge in all functional groups and facilitate the long-term development of low-carbon products.
3. Incorporate data from international carbon emission factor databases and set requirements for material suppliers to provide data on carbon emissions for continuous updates of Delta's carbon emissions database for materials.
4. Analyze product carbon footprint hot spots and opportunities for carbon reduction. Consider the use of circular business models, green product design, partnerships with low-carbon raw material suppliers, energy conservation and renewable power operation in plants, setup of green

logistics, waste management, and others, to plan carbon footprint reduction actions.

LCA to Green Design

Delta has upheld the mission statement "To provide innovative, clean and energy-efficient solutions for a better tomorrow" and has incorporated the spirit of green product design and circular design into the life cycle of products in the development process. We continue to develop and innovate energy-efficient products and solutions to provide efficient and reliable integration solutions and services for energy conservation. Our strategy includes allocating R&D resources to minimize waste. We continue to provide training related to circular design, including principles such as changing from the source, using waste as a resource, maintaining high value utilization and thinking about circular pathways. We also introduce strategies such as circular designs, the selection of low-carbon materials, the provision of product usage rights, the extension of product life cycles, and the creation of residual product value.

For example, we use post consumer recycled (PCR) PBT (Polybutylene Terephthalate) on fan blades and fan frames, use recycled copper in metal components, add recycled aluminum and PC recycled materials for products' outer casings, use eco-friendly product packaging made entirely of paper, use lighting equipment that's 90% recyclable, and more. The aim is to raise our resource utilization from the perspective of the product life cycle and reduce the environmental impacts when designing products and services, while also satisfying customer expectations.

Product Life Cycle Stage	Strategies for Reducing Environmental Impact of Products
Product Design	• Consider the full life cycle (raw materials / energy / water / waste) • Modular design
Raw Materials	• Lightweight product design • Adoption of green packaging materials • Use of renewable / recycled / recyclable materials • Green supply chain • Local procurement of materials • Chemicals and hazardous substance management
Manufacturing and Assembly	• Green building plants • Adoption of energy conservation / water conservation / waste reduction solutions • Resource recycling • Use of renewable electricity
Transportation & Distribution	• Reduce packaging volume design • Lightweight product design • Improved transportation efficiency
Usage	• Enhance energy efficiency of products
Final Disposal	• Use of recyclable materials • Design for ease of recycling and dismantling • Meet requirements of local environmental protection regulations (e.g., EU WEEE Directive)

台達產品生命週期評估及產品碳足跡管理

台達為了降低產品對環境之衝擊，參照國際標準 ISO 14040 及 ISO 14044 要求，評估產品各階段的環境衝擊，並導入綠色設計。歸納數項產品生命週期分析結果，「使用」階段是目前台達核心產品產生環境衝擊的最主要階段，其次是「原物料取得」階段。

台達自 2010 年開始，陸續依據 PAS 2050 及 ISO 14067 標準，挑選代表性產品以生命週期評估（Life Cycle Assessment）方法學執行產品碳足跡（product carbon footprint）研究，包括筆記型電腦外接電源供應器（adapter）、直流風扇（DC fan）、太陽能變流器（PV inverter）、高效整流模組（high efficiency rectifier module）、交換式電源供應器（switching power supply）及電動車車載充電機（DC/DC module for EV powertrain）等產品碳足跡盤查，並取得第三方查證聲明書。

2022 年由供應鏈 ESG 委員會偕同各事業單位全面展開產品碳足跡專案，各事業單位成立工作小組定期報告推動進度，包括平行展開產品碳足跡計算、考量產品生命週期的減量作法、產品綠色設計案例等主題。

由於台達產品種類眾多，將分階段完成各類產品的碳足跡計算。依照 ISO 14067 產品碳足跡標準計算，擴大盤查的產品類型，包含開關電源（adapter）、電感（power choke）、定子組件（stator）、直流無刷馬達散熱風扇（DC fan）、天井燈（LED high bay）、無線基地台（wireless AP）、電動汽車充電控制器（charger IC-CPD）、數位投影機（projector）、整合式低壓直流無刷馬達（vehicle motor）等，並通過第三方查證。2023 年為擴大同仁們對產品碳足跡的認識及建立回應客戶需求能力，除辦理實體教育訓練及線上課程，亦將產品碳足跡盤查經驗整理後，藉由內部公告分享盤查工具及資源，協助加速內部產品碳足跡盤查作業。

台達於 2022 年發布「台達集團產品碳足跡策略」，中期將自主提升其產品碳足跡推動能力與展開量化計畫，並建立客戶產品碳足跡要求因應機制，長期則將所有重要產品納入台達產品碳足跡計算平台，幫助低碳產品研發並且持續議合、溝通及鼓勵價值鏈夥伴加速產品碳足跡減量行動，以符合國際趨勢、客戶要求及相關法規。

產品碳足跡減量推動之關鍵作法如下：

1. 關注國際碳邊境稅趨勢，依據國際標準盤查及計算產品碳足跡，確保方法學及數據品質符合規範。
2. 導入國際碳係數資料庫及同步要求材料供應商提供碳排數據，以持續更新台達材料碳排數據庫。
3. 建立事業單位產品碳足跡推動小組，由各事業單位深化產品碳足跡概念及知識至生命週期各功能群，以長期發展低碳產品。
4. 分析產品碳足跡熱點及減碳機會，考量循環商業模式、產品綠色設計、低碳原材料供應商合作、廠內節能及再生電力營運、綠色物流建立、廢棄物管理等方式規劃碳足跡減量行動。

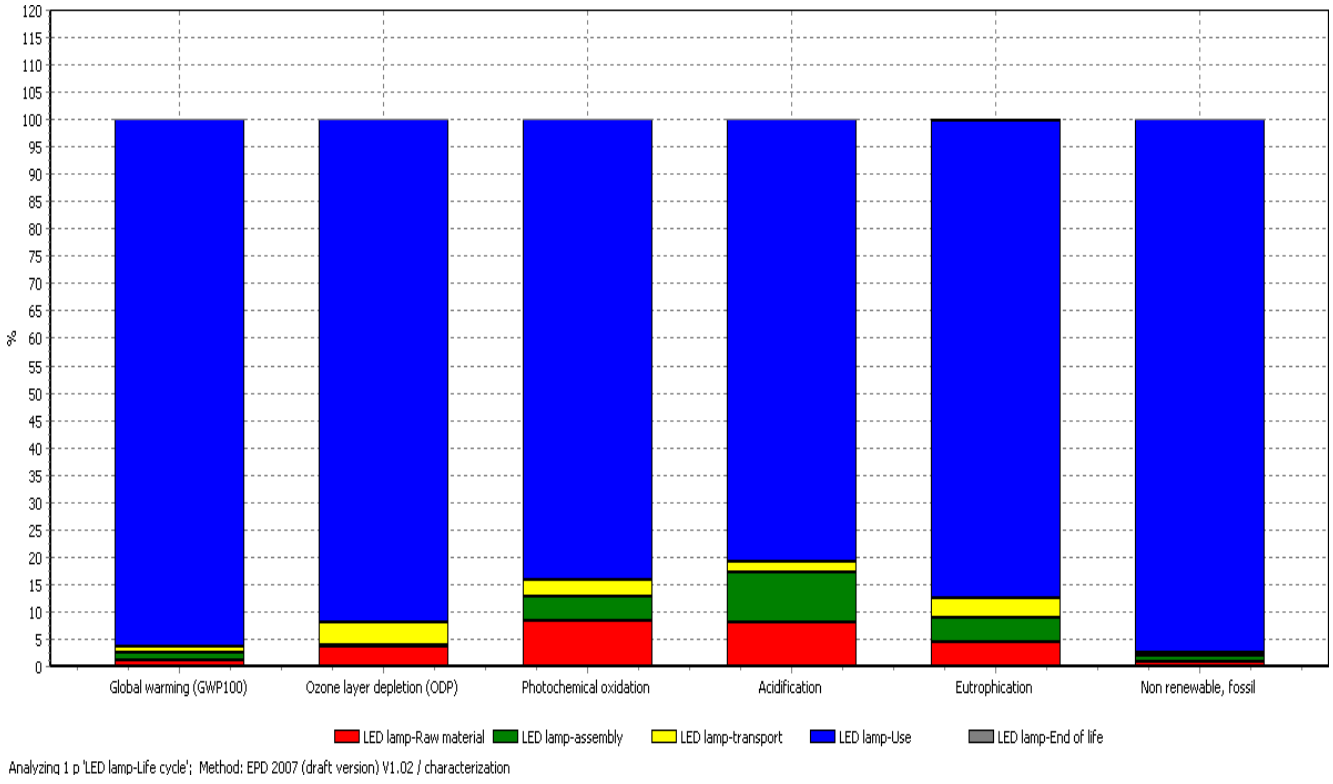
生命週期評估及綠色設計

台達秉持「環保 節能 愛地球」的經營使命，開發產品過程將綠色設計及循環設計之精神納入到生命週期中，持續開發創新節能產品及解決方案，提供高效率且可靠的節能整合方案與服務，從設計源頭減少廢棄物產生。我們持續提供循環設計相關教育訓練，包括從源頭改變、廢棄物即資源、維持高價值利用與思考循環路徑等原則，及導入循環設計、選擇低碳材料、提供產品使用權、延長產品生命、創造產品剩餘價值等策略，如在扇葉扇框使用消費後回收（Post Consumer Recycle，簡稱 PCR）的 PBT、金屬零組件使用回收銅、機構外殼添加回收鋁與 PC 回收料、產品使用全紙環保包裝、90%可回收再使用的燈具等，以期能在設計產品或服務時，從產品生命週期的角度考量提升資源利用、降低環境衝擊，並滿足客戶期待。

產品生命週期階段	降低環境衝擊做法
產品設計	• 思考全生命週期（原物料／能源／水／廢棄物） • 模組化設計
原物料	• 產品輕量化設計 • 採用綠色包裝材料 • 選用可再生／回收／可回收材料 • 綠色供應鏈 • 原料在地化 • 化學品及有害物質管理
生產製造	• 綠建築廠房 • 導入節能／節水／減廢方案 • 致力資源循環 • 採用再生電力
運輸配送	• 降低包裝材積設計 • 產品輕量化設計 • 提升運輸效率
使用	• 提升產品能源效率
最終廢棄	• 採用可回收原料 • 易回收與易拆解設計 • 符合當地環保法規要求（如歐盟 WEEE 指令）

LED Life Cycle Analysis - Environmental Impacts

Impact category	Unit	Total	Raw material	Assembly	Transport	Use	End of life
Global warming (GWP100)	kg CO_2 eq	2.10E+02	2.28E+00	3.17E+00	1.87E+00	2.02E+02	6.80E-02
Ozone layer depletion (ODP)	kg CFC-11 eq	5.88E-06	2.18E-07	1.82E-08	2.43E-07	5.40E-06	1.54E-10
Photochemical oxidation	kg C_2H_4	2.90E-02	2.44E-03	1.26E-03	8.61E-04	2.44E-02	2.46E-06
Acidification	kg SO_2 eq	3.56E-01	2.87E-02	3.21E-02	7.20E-03	2.88E-01	1.72E-05
Eutrophication	kg PO_4^{3-} eq	3.29E-02	1.47E-03	1.41E-03	1.23E-03	2.87E-02	3.10E-05
Non renewable, fossil	MJ eq	4.38E+03	3.87E+01	4.28E+01	2.67E+01	4.27E+03	2.17E-02



Analyzing 1 p 'LED lamp-Life cycle'; Method: EPD 2007 (draft version) V1.02 / characterization

Impacts from Parts/Components in Assembly Stage

Impact category	Global warming (GWP100)	Ozone layer depletion (ODP)	Photochemical oxidation	Acidification	Eutrophication	Non renewable
Unit	kg CO_2 eq	kg CFC-11 eq	kg C_2H_4	kg SO_2 eq	kg PO_4^{3-} eq	MJ eq
Total	**5.44E+00**	**2.36E-07**	**3.70E-03**	**6.08E-02**	**2.88E-03**	**8.15E+01**
Chip Resistor(Supplier1)	0.30%	1.08%	0.21%	0.22%	0.50%	0.33%
PCB(Supplier2)	0.41%	0.89%	0.52%	0.50%	0.64%	0.43%
Fuse(Supplier3)	0.10%	0.17%	0.20%	0.24%	0.18%	0.11%
Mylars(Supplier4)	0.07%	0.10%	0.06%	0.04%	0.10%	0.11%
Lamp Cover(Supplier5)	10.11%	1.20%	6.31%	8.53%	8.83%	9.70%
Heat Sink(Supplier6)	8.70%	16.72%	7.37%	4.67%	7.98%	9.29%
Solder(Supplier7)	0.91%	1.36%	2.07%	2.25%	2.32%	1.04%
Voltage Dependent Resistor (Supplier8)	0.06%	0.08%	0.13%	0.14%	0.14%	0.07%
LED lamp assembly	58.16%	7.72%	33.98%	52.72%	48.82%	52.55%
Diode	3.43%	4.85%	1.82%	1.66%	3.63%	4.27%
Capacitor	7.52%	42.55%	32.74%	22.51%	9.82%	8.72%
Transistor	2.13%	2.10%	5.60%	1.61%	1.78%	2.58%
Connector	0.04%	0.07%	0.05%	0.03%	0.10%	0.05%
Adhesives	0.99%	2.78%	0.69%	0.46%	2.41%	1.00%
Inductor	0.70%	0.79%	3.17%	0.35%	0.68%	0.87%
Transformer	0.43%	0.72%	0.55%	0.41%	0.64%	0.52%
Wires	0.00%	0.00%	0.01%	0.01%	0.01%	0.00%
Gift box	-0.24%	2.06%	0.73%	0.44%	2.25%	1.05%
PCB(Supplier9)	3.81%	11.1%	2.50%	2.02%	6.18%	4.50%
Lamp holder	0.16%	0.28%	0.10%	0.12%	0.19%	0.13%
IC	0.27%	0.64%	0.16%	0.13%	0.83%	0.26%
LED	1.94%	2.74%	1.02%	0.94%	1.98%	2.42%
Label	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

TPS conduct life cycle analysis (ReCiPe Methodology)

Life cycle stage	Item	Climate change Human Health	Ozone depletion	Human toxicity	Photochemical oxidant formation	Particulate matter formation	Ionising radiation	Climate change Ecosystems	Terrestrial acidification	Freshwater eutrophication	Terrestrial ecotoxicity	Freshwater ecotoxicity	Marine ecotoxicity	Agricultural land occupation	Urban land occupation	Natural land transformation	Metal depletion	Fossil depletion
		DALY	DALY	DALY	DALY	DALY	DALY	species.yr	species.yr	species.yr	species.yr	species.yr	species.yr	species.yr	species.yr	species.yr	$	$
Raw Material	直接材料使用	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	6.2501	2.3190
	輔助材料使用	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	0.0206	0.0000
Manufacture	能資源使用	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0029	0.1276
	廢氣	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	廢水	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	廢棄物處理	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	廢棄物運輸	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
	公用設備溫室氣體排放	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Distribution	能資源使用	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0003
	產品配銷	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0018	0.2163
總計		0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	6.2754	2.6633

Life cycle stage	Climate change Hum	Ozone depletion	Human toxicity	Photochemical oxidant formation	Particulate matter formation	Ionising radiation	Climate change Ecosystems	Terrestrial acidification	Freshwater eutrophication	Terrestrial ecotoxicity	Freshwater ecotoxicity	Marine ecotoxicity	Agricultural land occupation	Urban land occupation	Natural land transformation	Metal depletion	Fossil depletion
Raw Material	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	6.2707	2.3190
Manufacture	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0029	0.1277
Distribution	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0018	0.2166
SUM	0.0001	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0009	6.2754	2.6633

LED EcoProfile

1. LED 節能燈泡原物料使用量

材質（大類）	材質（細項）	重量（g）	比例（%）
複合材料	PCB	6.300	3.59%
電子零件	Electronics	21.196	12.09%
金屬	Brass（鍍 Ni）、Al	62.883	35.86%
塑膠	PC	12.978	7.40%
	PET	1.662	0.95%
Adhesives	Silicone	41.050	23.41%
紙		29.267	16.69%
合計	產品總重量	175.336	100.00%

表 1、原物料使用量

2. 製造過程能資源耗用

2.1 製造廠地：廣東省東莞市石碣鎮鶴田廈高科技園區振園路台達工業區。

2.2 製造流程

產品製造從材料輸入到半成品組裝最後包裝出貨，製造流程如圖 4.1 所示：

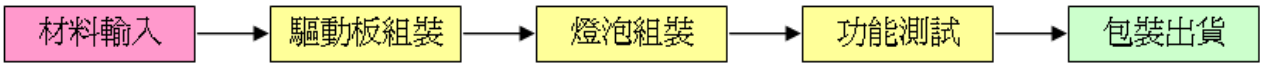


圖 1、產品製造流程

2.3 能資源耗用:

從零組件製造到產品組裝完成，每 1Pcs.功能單位統計所用的總用電量：16.9KWH，總用水量：0.7Kg。

3. 運輸資訊

從中國(陸運)->香港(空運)->德國(法蘭克福國際機場)，運輸的距離共 9449 公里。

4. 產品使用階段能耗

產品預估使用壽命 15 年，實際使用模式每小時消耗 7WH，預估產品每日使用 7 小時，產品壽命期間之總使用電力為 268.3KWH，每日停止使用 17 小時，停止使用模式每小時消耗 0WH。

5. 產品回收資訊

5.1 產品爆炸圖：

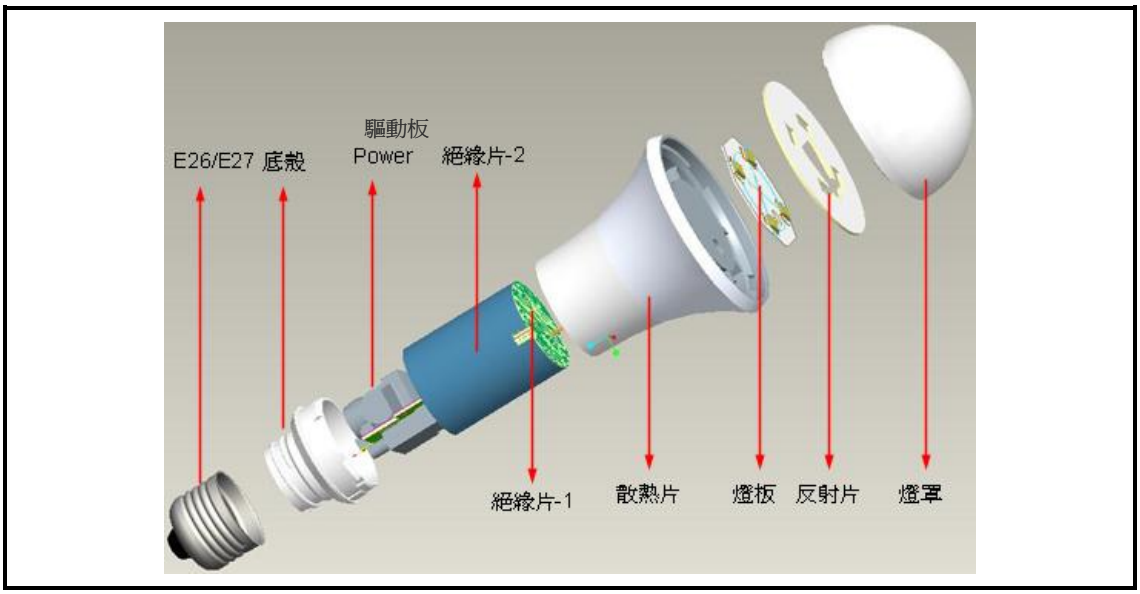


圖 2、LED 節能燈泡爆炸圖

5.2 產品中 WEEE Directive 2002/96/EC Annex II 項目-優先移除含有環境危害物質部位如表 2(對應位置，如圖 2 所示)。

部件/物品名稱	可能含有之危害物質
LED 燈板	PCB
驅動板	PCB

表 2、WEEE Annex II 優先移除含有環境危害物質部位

5.3 產品回收率評估

5.3.1 產品 3R 比率計算方式

本產品回收組成計算 3R 比率，說明如表 3。

項目	重量(單位)
整機產品總重	175.3 g
再使用 Reuse	0.0 g
再循環 Recycle	106.8 g
能源回收 Energy Recovery	41.1 g
WEEE Annex II item	24.7 g
棄置 Disposal	2.7 g

表 3、LED 節能燈泡 3R 比率

5.3.2 產品 3R 比率與歐盟 WEEE 指令的回收政策與目標之比較

本產品之 3R 回收率評估結果，預期可有助於歐盟會員國達到 WEEE 指令規範的回收政策與目標。

3R 項目	WEEE Directive Article 7 - Recovery	GLDY-07USFWB (LED 節能燈泡)
Reuse and Recycling	50.0%	**75.0%**
Recovery	70.0%	**98.4%**

表 4、3R 回收率評估結果

5.4 產品回收方式、回收點及相關參考網址

LED 燈泡的回收方式，可送至清潔隊資源回收車、民間回收業者、照明光源販賣店家(含販賣點逆向回收如：大型賣場、超商、)或環保機關核可之回收商統一回收。

參考網址:環保署廢照明光源回收宣導網

http://recycle.epa.gov.tw/newRecycle/Upload/yo-2/index.htm

6.環境衝擊資訊

評估範疇:產品原物料、製造、運輸、使用、廢棄/回收階段。

功能單位: 1 顆 LED 燈泡(GLDY-07USFWB)。

評估軟體:VHK Eco Report 軟體。

本產品經生命週期評估後，環境衝擊評估結果如下表所示：

環境衝擊項目	當量指標	當量值
全球暖化 Greenhouse Gases in GWP100	Kg CO2 eq.	264784
酸雨 Acidification, emissions	g SO2 eq.	1562378
優養化 Eutrophication	g PO4	187
能源消耗 Total Energy(GER)	MJ	6067473
水資源消耗 Water(process)	ltr	404500
一般事業廢棄物(Non-hazardous waste)	g	7034969
有害事業廢棄物(Hazardous waste)	g	139846

表 5、VHK Eco Report 軟體之環境衝擊評估結果

產品材質在非鐵金屬及工程塑膠所佔比例較高，約各佔 31.9%及 28.7%（如圖 4.3 所示）。

Materials	unit	Total
Bulk Plastics	g	14
TecPlastics	g	51
Ferro	g	0
Non-ferro	g	57
Coating	g	0
Electronics	g	26
Misc.	g	30

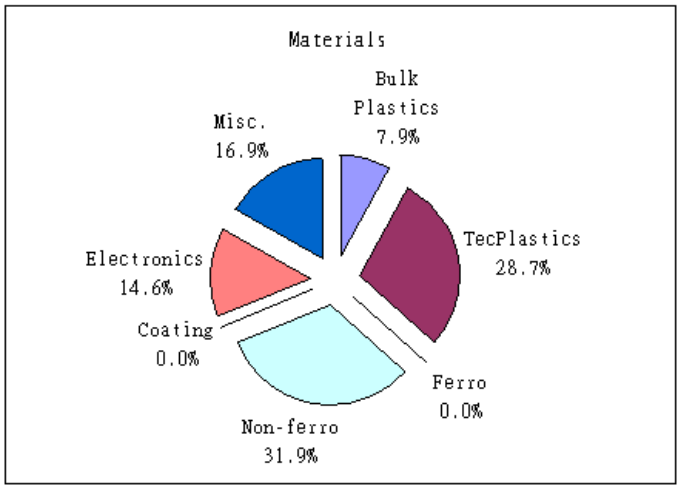


圖 3、產品各材質比例

產品的電力能耗在使用階段佔最大用量，消耗電力為 2817MJ（如圖 4 所示）。

	Life Cycle phases -->	PRODUCTION				
	Resources Use and Emissions	Material	Manuf.	DISTRIBUTION	USE	END-OF-LIFE*
Total Energy (GER) MJ		26	6	52	2817	-2

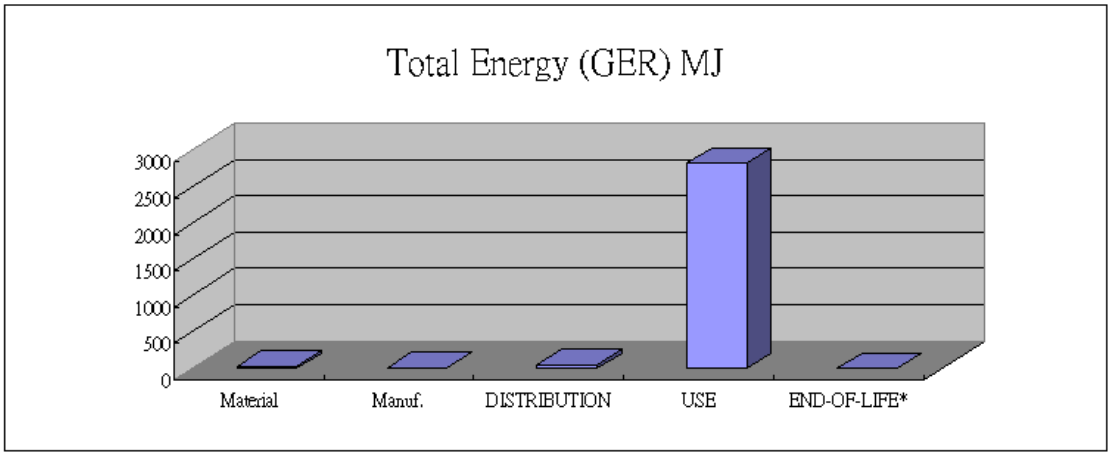


圖 4、產品各階段消耗電力狀況

產品的酸雨排放在使用階段佔最大量，酸雨排放為 725g SO2 eq（如圖 7 所示）。

	Life Cycle phases -->	PRODUCTION				
	Resources Use and Emissions	Material	Manuf.	DISTRIBUTION	USE	END-OF-LIFE*
Acidification, emissions g SO2 eq.		11	2	12	725	0

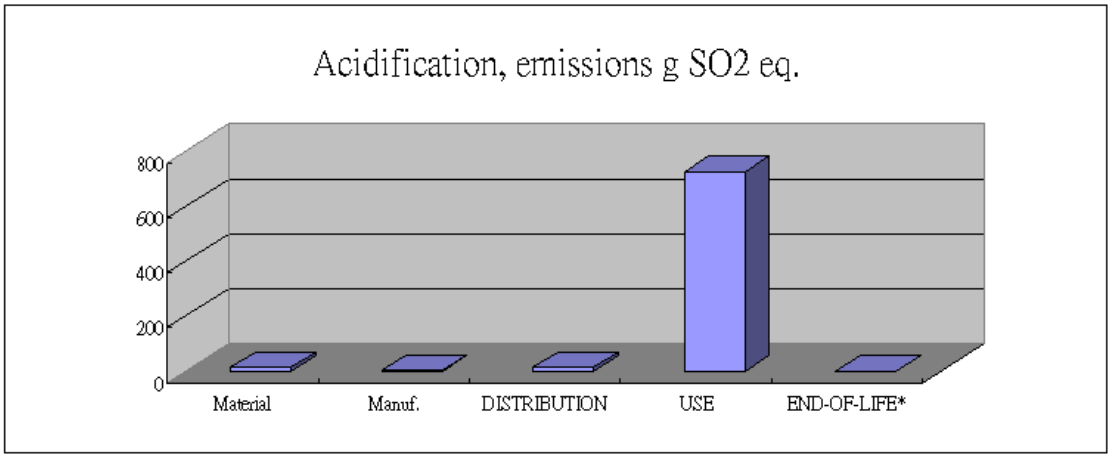


圖 7、產品各階段酸雨排放狀況

產品棄置佔 20.6%，循環再利用佔 79.4%（如圖 8 所示）。

END-OF-LIFE*		
	Disposal	Recycl.
WEEE要求	25.0%	65.0%
實際	20.6%	79.4%

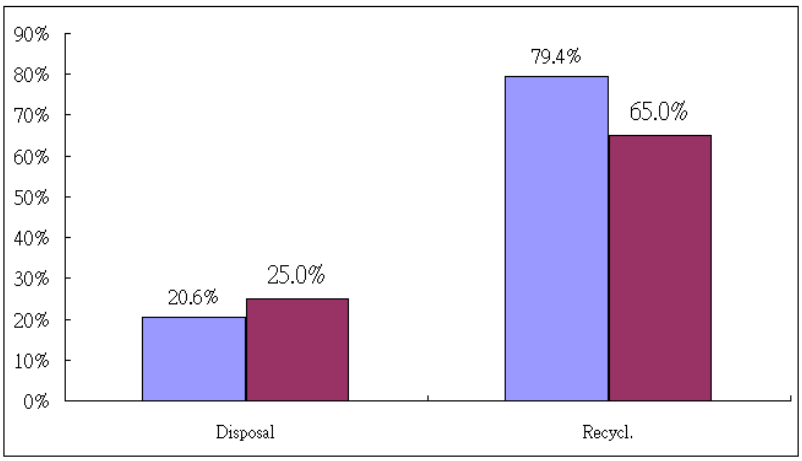
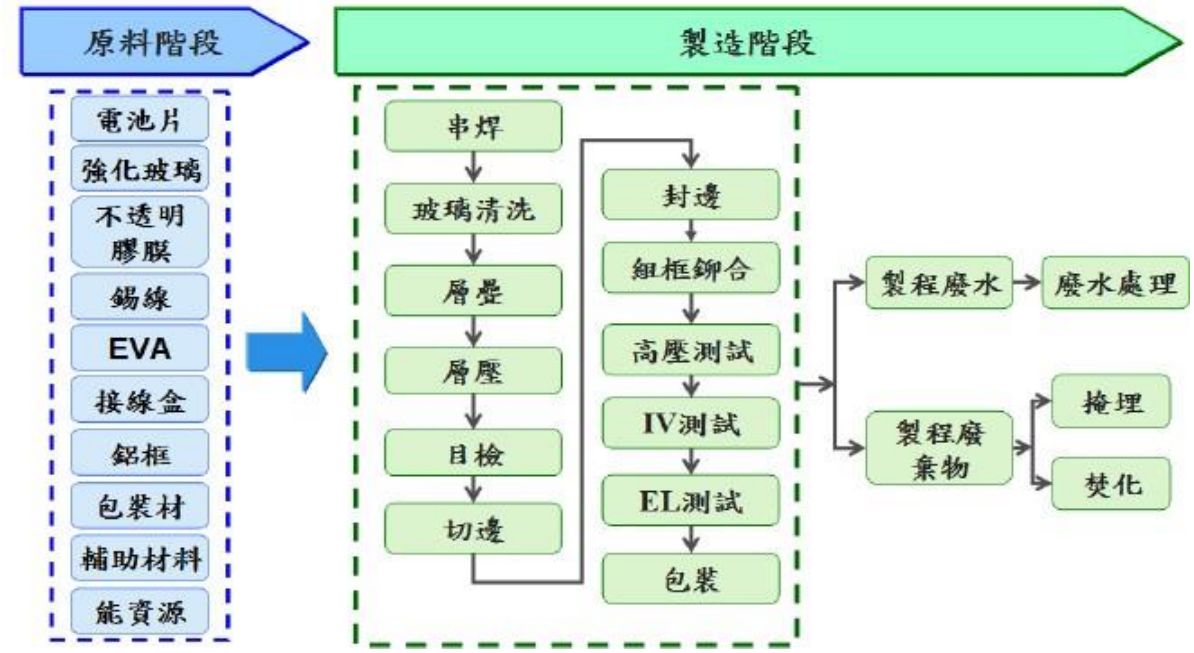


圖 8、WEEE 指令的回收率要求與產品實際回收率

Solar Module Life Cycle Assessment
(Product Carbon Footprint)

Solar module:

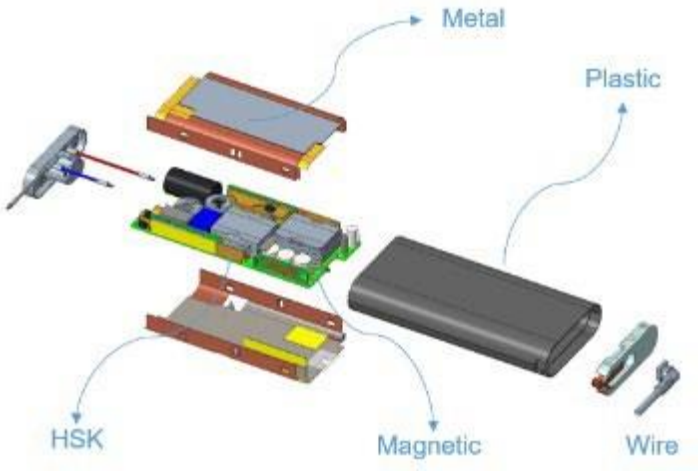


Solar module:

生命週期階段		產品碳足跡(kg CO_2e/片) Product Carbon Footprint		排放比例(%)
原物料階段 Raw material	原物料階段排放	2.08E+02	2.09E+02	90.69%
	供應商運輸排放	1.28E+00		0.56%
	間接材料排放	9.01E-02		0.04%
製造階段 Manufacturing	製造階段(能資源使用)	1.93E+01	2.00E+01	8.41%
	製造階段(公用設施排放)	6.47E-02		0.03%
	廢棄物運輸	1.84E-03		0.00%
	廢棄物處置	6.19E-01		0.27%
合計		2.29E+02		100%

Power Supply Module Life Cycle Assessment
(Product Carbon Footprint)

Model	Emission	Raw materials	Manufacturing	Total
A	$kgCO_2e$ / PCE	23.746	0.059	23.805
	%	99.75%	0.25%	100%
B	$kgCO_2e$ / PCE	170.499	11.393	181.892
	%	93.74%	6.26%	100%
C	$kgCO_2e$ / PCE	128.954	0.649	129.603
	%	99.50%	0.50%	100%



Fan Module Life Cycle Assessment
(Product Carbon Footprint)

機種資訊	
產品名稱 Product name	Fan
產品重量 Product weight	0.1715g

階段名稱	原物取得(Raw materials)			製造(Manufacture)		
碳排放量($KgCO_2e$/pcs)	能資源使用	運輸	廢棄	能資源使用	運輸	廢棄
	1.307	0.098	0.000	0.015	0.191	0.000
	1.405			0.206		
各階段貢獻比例	87.19%			12.81%		
總碳排放量($KgCO_2e$/pcs)	**1.612**					

碳排熱點Hotspot			比重
1	扇框 Plastic Frame		**24.69%**
2	包裝 Tray Pet		**20.68%**
3	印刷電路板 PWB		**14.24%**
4	鐵殼 SECC (電鍍鋅鋼板)		**11.4%**
5	扇葉 Plastic Impeller		**7.18%**
Total			**78.19%**

2023 Material Flow Accounting

Main materials
422,787 metric ton

Metal materials	73.4%
Packaging materials	16.8%
Plastics materials	8.9%
Chemicals	0.8%
Other materials	0.1%

Energy
806,653 MWh

Purchased electricity and self-generated solar power	92.5%
Natural gas	5.8%
Diesel	0.9%
Gasoline	0.4%
Liquid petroleum gas	0.1%
Purchased heat	0.3%

Water
4,293.6 megaliters

Tap water	94.8%
Groundwater	2.9%
Rainwater	2.3%

Packaging materials Reuse/Reutilization
14,966 metric ton

Reclaimed Water
421.3 megaliters

Products
161,770,629k pcs

Power Electronics	99.9%
Automation	~0%
Infrastructure	~0%
Others	~0%

Waste
49,304 metric ton

Recycle	86.8%
Waste to energy recovery	11.8%
Incineration without energy recovery	0.3%
Landfill	1.1%

Water discharge
2,751 megaliters

Domestic sewage	89.9%
Process wastewater	10.1%

2024 Material Flow Accounting

Main materials

402.6 thousand metric ton

Metal materials	41.70%
Packaging materials	17.71%
Plastics materials	14.84%
Chemicals	0.13%
Other materials	25.62%

Energy

892,407 MWh

Purchased electricity and self-generated solar power	91.9%
Natural gas	6.4%
Diesel	0.6%
Gasoline	0.4%
Liquid petroleum gas	0.1%
Purchased heat	0.5%

Water

4,192.7 megaliters

Tap water	96.6%
Groundwater	0.4%
Rainwater	3.0%

Input

Output

Waste Reduction in Production Processes
161,824 metric ton

Packaging materials Reuse/Reutilization
12,692 metric ton

Reclaimed Water
505.1 megaliters

Products

Power Electronics	99.9%
Automation	~0%
Infrastructure	~0%
Others	~0%

Waste

57,969 metric ton

Recycle	88.3%
Waste to energy recovery	10.0%
Incineration without energy recovery	0.1%
Landfill	1.6%

Water discharge

3,181.9 megaliters

Domestic sewage	91.1%
Process wastewater	8.9%