4

Commitment to Green Operations

4.1 Climate Change Strategies

As part of guiding people to be Earth citizens and being a corporation that leads people to live happy lives, Advantech strives to improve the environment and maintain labor safety. In 1996, we introduced the ISO 14001 Environmental Management System standard, followed by the OHSAS 18001 (changed to ISO 45001 in 2020) Occupational Safety and Health Management System standard in 2005. Through complying with governmental regulations on environmental protection, labor, safety and health, we focus on reducing the impact of our operations on overall environment, safety and health, by engaging in activities such as greenhouse gas management and product design, use, and disposal. It is through the participation and commitment of all members that Advantech is able to achieve the goal of environmental protection and corporate sustainability.

Material topic management policy / management framework

Material topic	Climate change strategy and energy management
Criticalness to operations	Global climate change is a critical topic currently faced by humans. Advantech considers itself a protector of the global environment, and we endeavor to reduce greenhouse gas emissions and energy waste. We are strict in conducting greenhouse gas inventory and implementing air and water pollution prevention measures. We strive to protect the global environment and construct a sustainable green industry.
Management policy	• Meet all environmental regulations. Our goal is zero pollution and zero violations of relevant regulations. • Identify risks caused by climate change and respond to them. • Establish short-, mid-, and long-term goals for saving energy and reducing carbon emissions, and develop practical processes and promote them.
Goals and effectiveness	To improve management, based on the set management policy goal, we will annually evaluate whether KPIs have improved from the previous year.

Item	Results in 2020	Goals for 2021	Goals for 2025
Energy management	• Compared to 2019, our overall GHG emission density per unit revenue in 2020 was reduced by 2.1% • Compared to 2019, the energy consumption output value at Kunshan (manufacturing plant) was reduced by 3.2% • Compared to 2019, the energy consumption per capita at Kunshan (R&D park) was reduced by 14.2%	• Introduce a BEMS to Linkou and Kunshan • Obtain the green factory certification for the Kunshan plant	• Compared to 2019, Advantech's overall GHG emission density per unit revenue is reduced by 30% • Reach 20% on the proportion of green power use in China and Taiwan
Develop renewable energy	Collected regulations and conducted internal studies. We have evaluated that in the future, we will purchase renewable energy (Currently, we are preliminarily evaluating solar power.)	Linkou solar panel power generation accounts for 4.5% of the total electricity use	Linkou solar panel power generation accounts for 6.5% of the total electricity use

Project highlight and performance

B List ranking

Ranked in the B List in the 2020 Climate Disclosure Project (CDP) climate change questionnaire evaluation.

Zero violations

We use our environmental management system to regularly inspect our performance. In 2020, we did not violate any environmental protection policy.

-2.1%

Compared to 2019, Advantech's overall GHG emission density per unit revenue reduced by 2.1%

4.1.1 Climate risk identification and response

The impact of global climate change has become a critical topic that cannot be overlooked. In 2015, the United Nations passed the Paris Agreement and proposed a reduction goal for global carbon emissions. The Greenhouse Gas Reduction and Management Act has been read third times and passed in Taiwan. Clearly, both Taiwan and other countries have growing concerns about climate change topics. As a global citizen facing the risks caused by global warming, Advantech is extremely concerned global climate change. As such, we continuously strive to minimize our greenhouse gas emissions and save energy. We also focus on climate disaster risk management and are devoted to taking clear and concrete action.

Climate risk identification and response

To protect corporate assets and the rights of critical stakeholders and to meet corporate governance principles, Advantech implements risk management procedures to reduce and eliminate potential risks while offering suitable compensation measures and timely recovery mechanisms. For natural disaster risk management, we review risks in the realms of climate regulations, climate disasters, and other climate-related topics on operation management, and we take effective measures to reduce or eliminate any risks.

Risk type:Transition Risks			
item	Impact assessment	Climate opportunities	Actions in response
Policy and regulation risks	Greenhouse gas inventory and disclosure	Improve energy efficiency to reduce operation costs	Promote data inventory to understand the current situation on greenhouse gas emissions and energy use. Carbon reduction goals are set based on the inventory results (2020 KPI: to reduce 2.5% CO2e/revenue).
	Regulations on reducing and managing greenhouse gas emissions	Improve energy efficiency to reduce operation costs	Upgrade old equipment to improve energy use efficiency. In 2020, all chillers were replaced at Advantech Headquarters. In 2021, we plan to replace plant equipment.
	GHG total quantity control and emission trading system	Participate in the carbon emission trading market	Plan to purchase renewable energy and obtain licenses and carbon credit. In 2020, we conducted assessments for purchasing renewable energy licenses.
	Regulation fees increase operation costs	Establish policies that go above and beyond legal requirements to increase corporate competitiveness	Consolidate legal compliance and corporate sustainability. Respond to the government's usage policies on renewable energy.
Technology risks	Stakeholders pay more attention to low-carbon products and services	Develop or expand energy-saving products and services to gain stakeholder trust	To ensure service quality, we provide green and low-carbon products and services. For further details, please refer to Chapter 4.4.
Market risks	Fluctuations in global fuel prices affecting production and operation costs	Develop renewable energy plans to promote the diversification of corporate energy	Promote renewable energy development plans and use clean energy. Solar power generators have been established at Linkou and Kunshan. In 2021, we plan to continue installing solar power at new factories.

Risk type:Physical Risks			
item	Impact assessment	Climate opportunities	Actions in response
Immediate risk; long-term risk	Climate change can exacerbate natural disasters, which can damage our plants, resulting in unstable product quality and a higher risk of goods being returned	Strengthen organizational operations to enhance production line resistance against natural disasters.	Establish crisis management procedures and disaster-prevention and response capacity. We have established crisis management procedures for our overseas plants.
	Climate change can exacerbate natural disasters, resulting in the unstable supply of energy and resources	Identify high-risk supply chain components and actively enhance the stability of suppliers	Consolidate supplier assessment mechanisms. Strengthen supplier quality and environmental management ability. Increase the number of approved backup suppliers. Each year, we regularly audit our suppliers.
	Climate change can exacerbate natural disasters, resulting in higher raw material costs and reduced or interrupted production capacity	Identify high-risk supply chain components and actively enhance the stability of suppliers	Consolidate supplier assessment mechanisms. Strengthen supplier quality and environmental management ability. Increase the number of approved backup suppliers. Each year, we regularly audit our suppliers.

4.1.2 Greenhous gas inventory and management

Based on Taiwan's Greenhouse Gas Reduction and Management Act and ISO 14064-1, which states the quantification, supervision, report, and verification process for greenhouse gas inventories, Advantech established the Greenhouse Gas Inventory Promotion Committee to ensure low carbon emission operations through the promotion of various tasks on greenhouse gas inventory and reduction. Each year, we have been gradually reducing our direct and indirect emission of CO_2, CH_4, N_2O, and HFCs. Since 2011, we have participated in the international organization Carbon Disclosure Project (CDP). Accordingly, we disclose our carbon emission reduction plans and results each year.

Greenhouse gas inventory

Advantech's plants in Taiwan adhere to ISO 14064-1 and the GHG Protocol. In addition to conducting a self-inventory, starting 2019, SGS Taiwan has been conducting third-party onsite inspections. Organizational boundaries refer to requirements and suggestions in the ISO 14064-1:2006 standard, with operational control employed to establish organizational boundaries. Domestic and foreign subsidiaries are not included. Our greenhouse gas inventory management procedures and inventory reports are used to reidentify emission sources. Our organizational boundary includes Ruiguang Headquarters, Sunny Building, Donghu Plant, and Linkou Park. The scope of the inventory consists of the qualitative and quantitative inventory of Scope 1 (direct greenhouse gas emissions), Scope 2 (indirect greenhouse gas emissions from energy), and the inventory on items in part of Scope 3 (other indirect greenhouse gas emissions).

For Advantech plants in Taiwan, Scope 1 's total emissions were 636.13 tons CO2e. Table 4.1.1 lists the emission levels for each region. In 2015, Advantech Kunshan first adopted the 2014 ISO14064-1 Greenhouse Gas Emission Inventory. The China Quality Certification Centre also conducted third-party on-site inspections. The inspection results for 2020 revealed that in Advantech Kunshan, major emission sources under Scope 1 generated 1,520 tons CO_2e.

Table 4.1.1 Advantech Scope 1 greenhouse gas emissions amount in 2020

Region \ Greenhouse gas		CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3	Total tons CO_2e
Taiwan	Ruiguang Headquarters	0.2137	-	-	113.3860	-	-	-	113.5997
	Sunny Building	0.3422	-	-	116.3520	-	-	-	116.6942
	Donghu Plant	0.1345	-	-	-	-	-	-	0.1345
	Linkou Park	30.7420	0.0140	0.0265	374.9201	-	-	-	405.7026
China	Kunshan Plant	697.9509	16.8450	2.4526	803.9600	-	-	-	1,521.2086
Total		**729.3833**	**16.859**	**2.4791**	**1,408.6181**	**-**	**-**	**-**	**2,157.3396**

*Note: 1.The Donghu Plant had no direct combustion source, and its facilities that used refrigerant mostly used R22 refrigerant, which is regulated by the Montreal Protocol on Substances that Deplete the Ozone Layer (not in this inventory). As such, emissions for this year were zero.
2.The Kunshan Plant was expanded.

Scope 2 for Advantech Taiwan only involved the use of purchased electricity. Carbon emissions are calculated using the emission factor for grid electricity, 0.509 kg CO_2e, as announced by Taiwan's Bureau of Energy of the Ministry of Economic Affairs in 2019, totaling 9,819.0357 tons CO_2e. Scope 2 for Advantech Kunshan, including the use of purchased electricity and purchased steam, totaled 18,555.362 tons CO_2e. Electricity carbon emissions were calculated to be 0.8046 kg CO_2e., which is based on the IV Emission factor value, 2012 East China Regional Power Supply Network. Carbon emissions from steam were 110 kg CO_2/GJ, which was based on Guidelines for Accounting Methods and Report of Corporate Greenhouse Gas Emissions in Other Industrial Industries. Table 4.1.2 shows the emission levels for each region.

Table 4.1.3 shows the emission levels for Scopes 1 and 2, which was 30,568.9404 tons CO_2e in 2020.

Table 4.1.2 Advantech Scope 2 greenhouse gas emissions amount in 2020

Region		Source of greenhouse gas	Emission equivalent (tons CO_2e)
Taiwan	Ruiguang Headquarter	Electricity	1,252.4921
	Sunny building	Electricity	1,511.5186
	Donghu Plant	Electricity	846.6502
	Linkou Park	Electricity	6,208.3748
China	Kunshan Plant(Note*)	Electricity	17,553.9261
		Steam	1,038.6387
Total			**28,411.6005**

Note: China Kunshan Plant was expanded, so its emission amount increased compared to in 2019.

Table 4.1.3 shows the emission levels for Scopes 1 and 2, which was 30,568.9404 tons CO_2e in 2020.

Region		Scope 1 Direct greenhouse gas emissions	Scope 2 Indirect greenhouse gas emissions from energy	Total CO_2e (tons)
Taiwan	Ruiguang Headquarters	113.5997	1,252.4921	1,366.092
	Sunny Building	116.6942	1,511.5186	1,628.213
	Donghu Plant	0.1345	846.6502	846.785
	Linkou Park	405.7026	6,208.3748	6,614.077
China	Kunshan Plant	1,521.2086	18,592.5648	20,113.7734
Total		**2,157.3396**	**28,411.6005**	**30,568.9404**

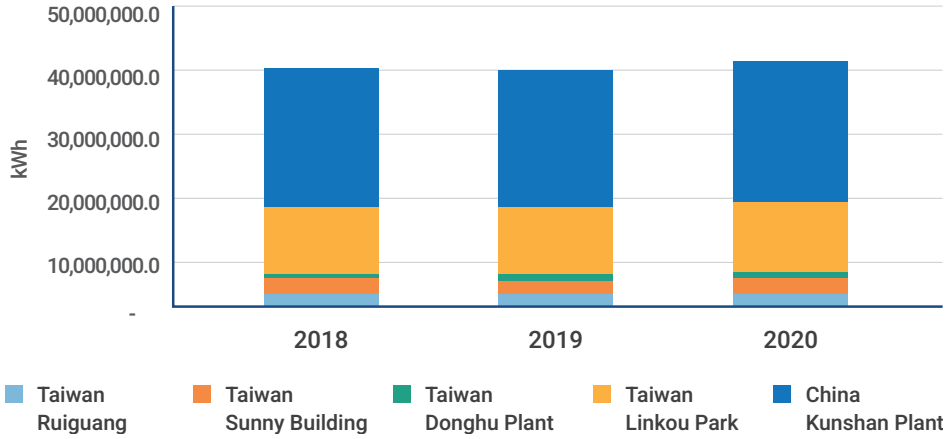
*Note: Greenhouse gas emissions from Advantech Taiwan were calculated using the latest version of the Greenhouse Gas Parameter Management Table released by Taiwan's Environmental Protection Administration (Version 6.0.4 was released in June 2019), and using also the global warming potential parameter of each greenhouse gas announced by the IPCC in 2013.

Advantech Taiwan's greenhouse gas emissions were primarily CO_2 generated during the power generation of purchased electricity. This source of emissions accounted for at least 93% of Advantech Taiwan's total annual emissions for 2020. In 2020, the average greenhouse gas emission (Scopes 1 and 2) turnover per unit was 0.058 tons CO_2e/US$1000, which was down 0.059 tons CO_2e/US$1000 compared to 2019. The main reason was that Advantech integrated the manufacturing systems in the Linkou and Donghu plants. By improving manufacturing efficiency and by utilizing the Linkou energy-saving system, we were able to reduce our overall electricity use. In 2019, Advantech Kunshan initiated various energy-saving special projects, including mechanisms for comparing the energy-saving efficiency of each unit, assessing and verifying the energy-saving performance of electrical equipment, and reducing the cost of general electricity use. In future, we will continue to set goals for reducing electricity consumption per unit of turnover per year. We will embed the concept of energy saving in the hearts of our employees, making it a critical part of our company culture.

To identify key factors to slow down climate change, Advantech Taiwan seeks to identify not only greenhouse gas emissions from its own operations, but also other emission sources. Starting from 2019, we have adopted the GHG Protocol Evaluator Tool to conduct emissions identification for Scope 3. We have also established relevant inventory methods to identify emission hot points, set goals for reducing emissions, and implement reduction measures incrementally. Table 4.1.4 lists the identification and emissions of Advantech Taiwan for Scope 3 in 2020. Because the emission sources of Kunshan plant are difficult to identify, we have not conducted an inventory for that plant. However, we will include it in the future.

Fig. 4.1.1 2018–2020 annual electricity use among Advantech plants

Statistics of the electricity use of Advantech pants



*Note: In 2020, China Kunshan Plant was expanded, causing an increase in electricity use.

Fig. 4.1.2 2018–2020 electricity use trend of turnover per unit

Advantech's electricity use per unit revenue in recent years

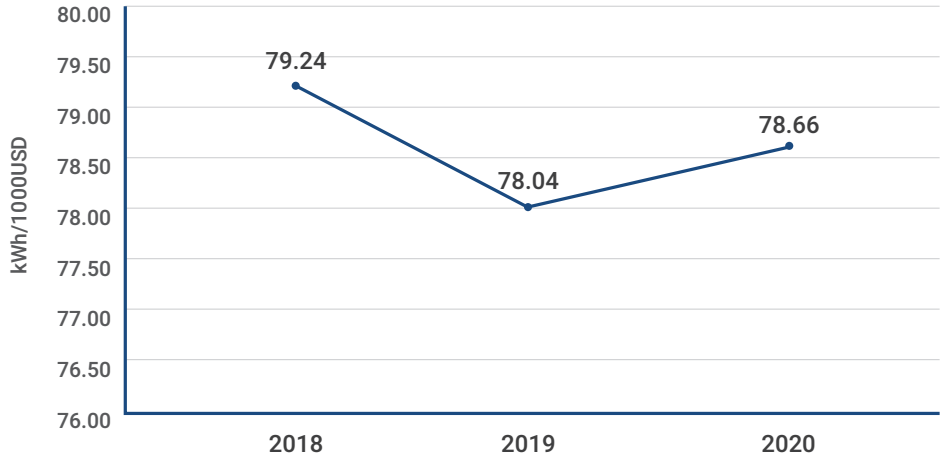


Table 4.1.4 Advantech Taiwan greenhouse gas Scope 3 identification and emissions

Category	Verification category description	Emissions (tons CO_2e)
03 Activities related to fuel or energy that are not under Scopes 1 or 2	Upstream fuel and energy of Taiwan Power Company	2,102.4332
05 Waste generated during operations	Waste declared according to the Department of Environmental Protection via the Industrial Waste Declaration and Mana gement Information System	0.8158
06 Business travel	(does not include general waste)	67.4089
07 Employee commute	Employee travel by air	446.0176
Total		**2,616.6755**

Participate in the international CDP assessment

Since 2015, under the wishes of our clients, Advantech has been participating in the CDP, which is the world's largest existing database related to climate change. Each year, the CDP issues a questionnaire to survey corporations' responses to climate change and their efforts toward reducing greenhouse gas emissions. This is aimed at evaluating the risks and opportunities that corporations will be exposed to in the face of climate change. Through annually disclosing emissions information through the CDP, we review the risks that climate regulations, climate disasters, and other climate-related topics have on our operations. We then implement effective measures to reduce or eliminate risks in order to meet international clients' demands on greenhouse gas management. In 2020, Advantech was categorized as a B-list company.

Future directions

In 2020, the COVID-19 pandemic affected the world, and corporations have had to adjust their operation models in response. Therefore, determining how to bolster corporate operations under the impact of the pandemic is a critical topic. The transformation to low-carbon emissions is a key factor. As of July 2020, countries that have promised to reduce carbon emissions by 2050 have a combined GNP exceeding 53% of global GDP. We hope that through the science-based target (SBT) method, we can calculate and achieve our carbon emission reduction goals. Also, according to the Task Force on Climate-Related Financial Disclosure (TCFD), we are able to identify climate risks for inclusion in our corporate operation management goals, thereby reducing any potential loss from climate disasters.

*Note:

1.The SBT method defines the limit of total carbon emissions required to control the global warming trend within 2°C. Using scientific methods and weight calculation, it calculates the credit for reasonable reductions in carbon emissions for specific industries and companies under a global carbon credit.

2.The TCFD is a guideline issued by the international Financial Stability Board. Its content is meant to assist investors and decision-makers to understand the major risks an organization faces, helping them more precisely assess risks and opportunities related to the climate. Specifically, it focuses on the risks and opportunities an organization faces when transforming into low-carbon economy.

4.2 Energy Management Actions

Linkou Park

Smart energy-saving strategies implemented at Linkou can be divided into two major systems: the office system and the manufacturing system. The office system consists of smart parking, human-sensing energy-saving offices, and smart meeting rooms. It is through the smart management of these facilities that we minimize energy waste at the site.

Table 4.2.1 Energy-saving facilities in Linkou office area

Smart parking	This system includes parking space reservation, license plate recognition, eTag, guest welcome message, parking lot control and management, vehicle tracking, and air quality control. The smart parking lot also has automatic lighting to minimize energy waste.
Human-sensing energy-saving offices	The air conditioning system automatically detects and controls the air quality. The office is divided into several areas. The system is integrated with the access control system, and it schedules lighting and air conditioning according to working hours, off hours, and break times. When the system detects that people are absent for a certain time, it will automatically turn off the lighting and air conditioning in that area. The system can be accessed and adjusted via a webpage or the touchscreens at entrances.
Smart meeting rooms	People can use the one-key touch control to switch meeting room settings. The system has automatic air quality control that can introduce fresh air into the room. Once a room has been empty for 15 minutes, the system will automatically shut down all electricity use and air conditioning to save energy.

The manufacturing system is connected to and monitored from the Advantech Situation Room. In recent years, the Advantech Manufacturing Center has been proactively undergoing digital transformation. With sensors installed at our operation sites, we are able to collect real-time information and upload it to the cloud for analysis. All information from factories is presented in the situation room in real time, informing managers on the current situation with our production lines. The situation room allows us to monitor manufacturing, measure equipment yield, conduct preventive maintenance, and keep track of environmental factors such as temperature and humidity. It also includes an energy management system.

Advantech Headquarters (Neihu)

In 2020, Advantech Headquarters replaced the chillers and traditional luminaries with LED luminaries, which reduced energy use from lighting by 65%. These two replacements together have saved 166,960 kWh of electricity. In 2021, we have scheduled to continue replacing inefficient and outdated equipment in order to increase energy use efficiency.

Advantech Kunshan

Tables 4.2.2 outlines Advantech Kunshan's energy-saving facilities.

Table 4.2.2 Energy-saving at Advantech Kunshan

Continue to optimize energy management and system optimization	We have established rules for comparing the energy-saving efficiency of each unit (energy consumption/output value, energy consumption/working hours, and peak–middle–valley ratio), providing real-time energy-consumption data that assists factories with analyzing their energy-saving effectiveness and formulating improvement plans.
Transform air-conditioning into automatic systems	We are in the process of connecting all air-conditioning systems in all rooms to a monitoring system in order to optimize electricity usage. The system monitors the environment (temperature and humidity) to maintain optimal conditions. This project is being implemented incrementally.
Upgrade air compressors	We are connecting the air compressor pipeline system in parallel and upgrading it to a two-stage compression permanent magnet frequency conversion air compressor to save energy.
Install human-sensing systems	We have integrated LED lighting in public areas with human-sensing switches to reduce energy consumption.

Overall energy management strategies and actions

In addition to the aforementioned energy-saving facilities, Advantech's overall energy management strategies consists of the following: daily energy-saving, developing a building energy management system (BEMS), and clean energy strategy.

1.Daily energy-saving

- Holding video conferences over on-site meetings when possible
- Prioritizing office equipment and electronic product procurement with energy-saving labels
- Setting the indoor air conditioning temperature
- Reminding employees to switch off any lights when they leave a room

2.Develop a BEMS

Advantech is striving to further develop BEMSs in the workplace. From management to operations and maintenance, our energy-saving management strategy is two-fold. It depends first on obtaining energy-consumption information and then uploading the data to the cloud for analysis with AI. In addition to this allowing us to visualize the energy consumption data for real-time monitoring and alert notifications, it also facilitates adjusting scheduling, performing equipment cleaning and maintenance, and replacing high-energy-consumption equipment. We upgraded our BEMS in mid-2020 and transferred the platform to the Advantech WISE-Stack private cloud. It is expected to be officially launched in 2021 Q1 in our Linkou branch. The first couple of functions include energy-saving performance overview for the top decision-makers as well as real-time energy-use monitoring and abnormal energy-use analysis for managers. We plan to launch a cellphone version and will gradually expand this to Kunshan Park and other manufacturing systems.

Moreover, since 2020 Q4, we have been uploading monthly electricity and water use to our internal eManager system for our Linkou, Neihu, Kunshan, Shanghai, Xi'an, and Beijing branches. This allows different business units in each factory to monitor changes in their monthly electricity and water use. Comparing this information against historical data allows us to determine whether we are achieving energy conservation goals. By making energy consumption data internally transparent, we can generate a top-down management effect on energy-saving within the company.

3.Clean energy strategy

- Solar power: Solar panels have been installed at the Linkou Park site since June 2019. Each month in 2020, they generate approximately 46,682 kWh of electricity, which is connected in parallel to the power grid. In addition, the new building in Linkou Phase 3 is planned to be equipped with solar panels, and they are estimated to generate 8,000 kWh of electricity per month.
- Electricity purchase: We are planning to purchase green energy, with plans to incrementally purchase more green electricity starting from 2022.

Looking to the future, we plan to centralize production by integrating operations at the Linkou Phase 2 smart factory. Through energy management and production line optimization, our goal is to reduce energy waste and electricity consumption in order to consolidate energy efficiency. In pursuit of protecting human life and ensuring a green environment long into the future, we are dedicated to reducing the impact of our operations on the environment, from product design and use to waste. In addition to complying with relevant regulations, Advantech achieves environmental protection and sustainable corporate development through the participation and commitment of all employees.

Energy-saving and carbon governance directions

In 5 years, green energy will account for 20% or more of the total electricity use

Strategy 1

Energy-saving

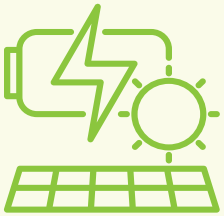
- Introduce a BEMS to Linkou and Kunshan; Implement carbon-reduction plans.
- The energy-saving and technology improvement team is responsible for replacing equipment that is high energy-consuming.

Goals

Reduce electricity use by 30% for lighting, 10% for air-conditioning, and 10% for electricity consumption per capita in 2021.

Strategy 2

Energy generation



- Total electricity generated by solar panels in Taiwan: 560,000 kWh. In Phase 3, we will expand the area of solar panels.
- Total electricity generated by solar panels in Kunshan: 352,000 kWh. A 20-kW solar power generator has been set up on the roof top and there are 13 solar-powered street lamps in our factory.

Goals

- Electricity generated by solar panels in Linkou Plant to account for 4.5% of total electricity use in 2021 and 6.5% of total electricity use in 2025.
- Electricity generated by solar panels in Kunshan Plant to account for 1.7% of total electricity use in 2021 and 3.33% of total electricity use in 2023.

Strategy 3

Energy purchase

- Purchase renewable energy licenses.
- Invest in renewable energy companies.

Goals

Green energy to account for at least 20% of total electricity consumption in 2025.

4.3 Environmental Management

Presentation of project highlights or performance numbers

-37%	Kunshan Plant waste management technology improved, with total waste reduced by 37%.
70%	Kunshan Plant adopted a water recycling and renewal system, achieving a reclaimed water recycle rate of 70%.

4.3.1 Environmental responsibility

As a part of our environmental management strategy, we comply with relevant regulations on environmental protection for waste water and industrial waste management. In addition, we have established the Environmental, Health and Safety Management System Manual as a guideline for our management system, which we regularly inspect and consolidate. Our waste water management meets emission standards and we report to the government in line with relevant regulations. Industrial waste is handled by qualified companies. Advantech's environmental declaration and environmental policies are as follows:

1. Reduce environmental impact: We will adopt adequate technology for production or pollution prevention. We will also introduce designs for product energy conservation and waste reduction so as to prevent pollution from product use, to make more efficient use of resources, and to reduce the environmental impact of product use and service delivery.
2. Take environmental protection responsibility: We will continue to satisfy consumer demands for green products by abolishing and/or reducing environmentally restricted substances in raw materials, parts, adjuvants, and packaging materials. This is achieved by adopting the principles of prohibition or restriction in order to protect the environment and reduce the impact of our products on natural ecosystems.
3. Conduct recycling: We will conduct energy and resource recycling and educate all employees to raise their awareness on energy conservation as well as environmental health and safety.
4. Promote waste reduction in the industry: We will seek to introduce environmental protection design concepts to use energy more efficiently and reduce the environmental impact of product use or service delivery so that we can continue to satisfy consumer demands regarding the provision of environmentally friendly products.
5. Comply with environmental protection regulations: We will comply with all environmental protection laws, regulations, and other demands from the government. We will also respond to international environmental protection trends by researching and developing green products that continue to satisfy consumer demands with regard to green and environmentally friendly products.
6. Consolidate environmental management: We will seek to popularize environmental protection education by having all Advantech employees participate in promoting environmental management systems. We will also conduct continuous auditing activities and environmental management inspections to discover our shortcomings and continue to improve our processes in order to establish a lawful and effective environmental management system.

Environment promotion procedures and actions

Promotion procedure	Management action
Operation guidelines related to environmental protection management, environmental management systems (ISO 14001), greenhouse gas inventory (ISO 14064)	• Pollution prevention and control • Environmental education training • Environmental management system maintenance • Greenhouse gas management

To fulfill the promises of green management and sustainable development, since 1996, Advantech has been implementing an environmental management system to consolidate the planning of environmental protection topics and to achieve efficient resource use. Through the Environment, Safety and Health Committee, we have established the framework for environment, health and safety concepts, promoted energy-saving, improved our energy use efficiency, and included energy cost reduction as an annual key auditing item. Moreover, we follow our environmental management system and greenhouse gas inventory to regularly inspect our effectiveness. In 2020, there were no issues with environmental protection that required any amendment. In 2020 per unit revenue for greenhouse gas emissions density was reduced by 2.1% compared to the previous year.

Environmental certification items	HQ Ruiguang/Sunny	ATMU Donghu	ATMU Linkou	AKMC Kunshan
ISO 14001:2015	✓	✓	✓	✓
ISO 14064:2018	✓	✓	✓	✓

Advantech input and output in environmental resources

Input

Output

Natural gas
294,971.0 m^3

Greenhouse gases (Scope1&2)
30,530.6 ton CO_2e

Greenhouse gases (Scope 3)
2,616.7 ton CO_2e

Electricity
41,452,086.4 kWh

Tap water
242,543.0 m^3

Sewage
169,780.10 m^3

Industrial waste
1,550.6 ton

4.3.2 Energy and resource use and waste management

Water use and management

Each Advantech plant is equipped with water-saving faucets and toilets and implements water-saving measures to reduce water use per capita. All factories and offices are located in developed industrial zones or parks in metropolitan areas with access to tap water. None of them draw water from underground sources or wells.

Figures 4.3.1 and 4.3.2 respectively show the total water use and water use per unit revenue at all plants for the past 3 years. Water consumption per unit revenue for 2020 was reduced by 8% compared to 2018. In Taiwan, we primarily reduce our overall water consumption by recycling rain water for daily use and by adopting a smart watering system, smart air conditioning cooling water system with smart control, and water chiller system with regular control for monitoring and management. At the Kunshan plant in 2019, we launched the energy-saving management and control special project. Water meters were installed in each production unit at each factory building to help manage water use. Water use is divided into Phase 1, Phase 2, Phases 3–4, dormitories, kitchen, and facility use when we evaluate whether our water usage is reasonable. The Kunshan plant implements a water recycling and regeneration system to recycle water resources, achieving a reclaimed water recycle rate of 70%. Each year, this system reduces water use by up to 53%.

Fig. 4.3.1 Advantech Taiwan 2018–2020 annual total water use (cubic meters)

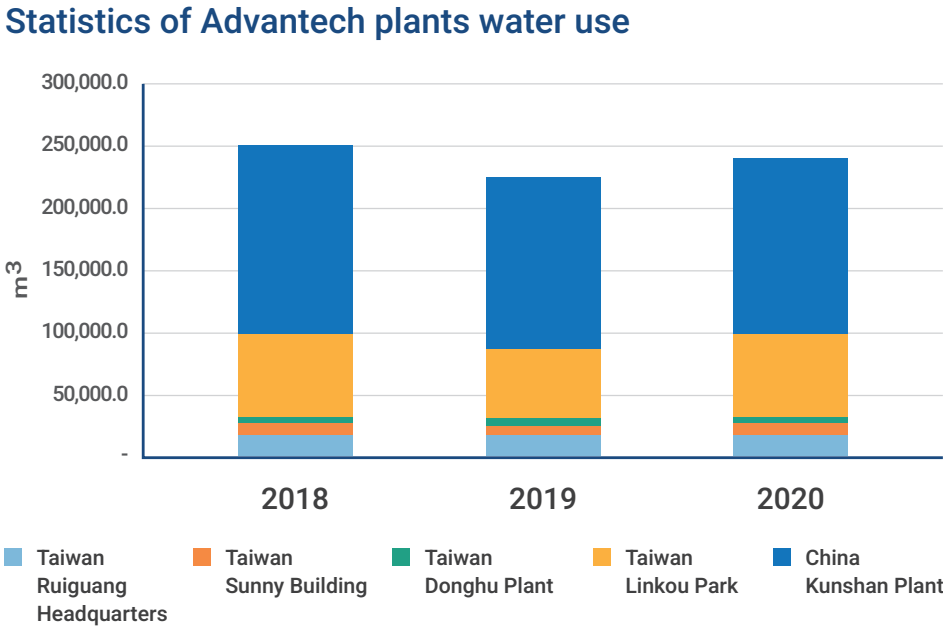
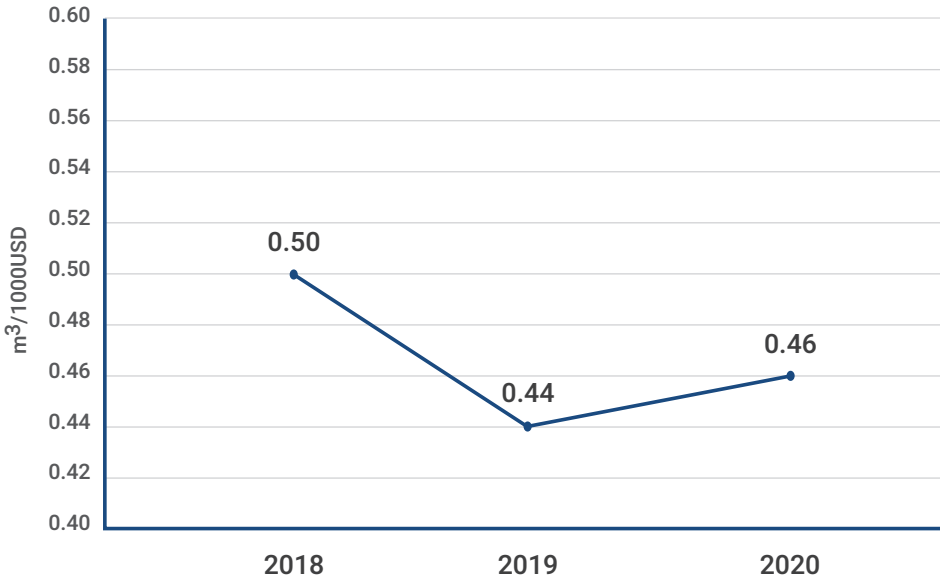


Fig. 4.3.2 Water use trend at Advantech plants per unit revenue in the past 3 years



*Note:In 2020, the Kunshan plant expanded Phase 5, which increased the amount of water consumption.

Waste management and resource recycling management

Advantech's ultimate waste management goal is to achieve zero waste. Therefore, we have adopted strategies for reducing total waste and turning waste into resources. In addition to our resource management strategies (e.g., raw material reduction to minimize waste), we proactively promote turning waste into resources (e.g., reuse of packaging). By adopting recycling and reuse to replace the original end-of-pipe treatment model, we are able to transform waste materials into useful resources. This achieves resource recycling and reduces both energy consumption and handling costs. Each year, Advantech assesses its waste contractors. Should they violate their contract or any government regulation, Advantech will adopt appropriate measures to either provide coaching or cease cooperation. In 2020, there were no major violations or illegal activities by any of our waste contractors. Table 4.6 shows the company's waste management model.

For Advantech Taiwan and Kunshan, we estimate the weight of general waste undergoing final treatment based on our waste collection and disposal contract. As such, weight information under further treatment categories cannot be obtained. Thus, we only disclose treatment information pertaining to industrial waste (Table 4.6).

Table 4.3.1 Advantech Taiwan and Kunshan waste management model

Waste type		Content description	Treatment method	Final treatment method
General waste	Bottles and cans	PET bottles, Styrofoam, iron, and aluminum cans	Recycled by designated persons	Reuse
	Paper	Newspapers, magazines, photocopy paper, printing paper, cartons, paper boxes	Recycled by designated persons	Reuse
	General glass	Drink bottles	Recycled by designated persons	Recycle
	General plastic	Drink bottles, waste containers	Recycled by designated persons	Recycle
	Other recyclables	Batteries, toner cartridges, fluorescent tubes	Headquarters/ photocopier vendor	Recycle
	Food waste	Compost food waste, food waste for pig feed	Recycled by the building management committee	Fertilizer
	General waste	General office waste	Recycled by the building management committee	Incineration (Taiwan) Sanitary landfill (Kunshan)
Industrial waste	General industrial waste	PCB scrap, electronic component waste. waste sponge, tape waste	Recycled by designated persons	Incineration (Taiwan) Sanitary landfill (Kunshan)
	Hazardous industrial waste	Tin dross waste, liquid chemical waste	Outsourced to qualified treatment companies	Cement solidification and landfill/ incineration /reuse

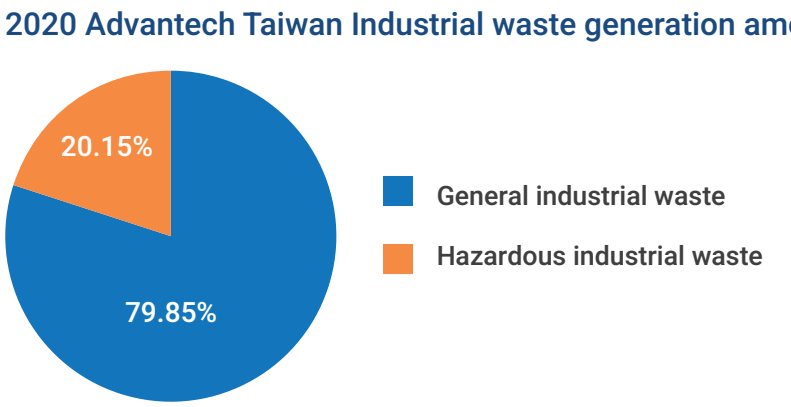
Table 4.3.2 Statistics of the weight of Advantech Taiwan and Kunshan industrial waste

Region	No.	Waste type	Waste name	2020 production (metric tons/year)
Taiwan	1	General industrial	Mixed metal waste (PCB scrap)	45.50
	2	General industrial	Electronic component waste, trimmings, and defectives	0.13
	3	General industrial	PCB waste containing metal and dust from the board	12.52
	4	General industrial	Waste wood	8.43
	5	Hazardous industrial	Waste liquid	16.80
			subtotal	83.38
China Kunshan	1	General industrial	General waste	83.66
	2	General industrial	Sludge	12.53
	3	General industrial	Waste water-based cleaning agents, waste cutting fluid	6.13
	4	General industrial	Lubricating oil	5.10
	5	General industrial	Waste tape	29.76
	6	General industrial	Waste organic solvent	2.42
	7	General industrial	Paint residue	128.19
	8	General industrial	Waste material from stamping	1,199.00
	9	Hazardous industrial	Waste fluorescent tubes containing mercury	0.49
			subtotal	1,467.28
Total				**1,550.66**

*Note : Weight data for Taiwan and Kunshan Plant are data that each plant has declared to the relevant competent authority.

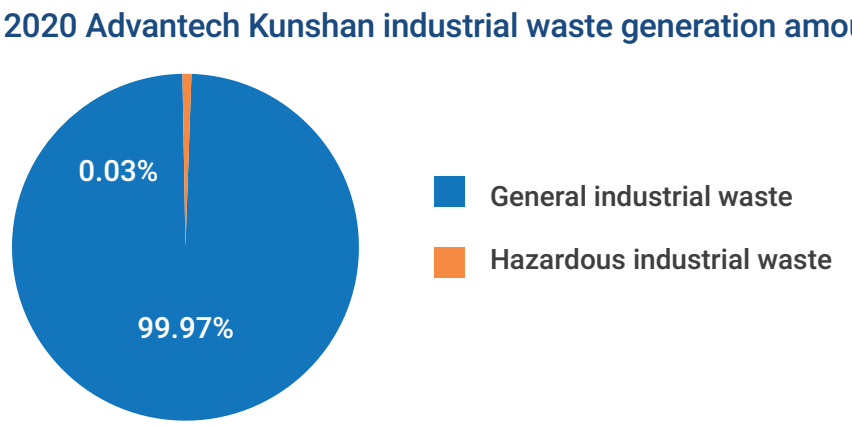
In 2020, the total amount of industrial waste generated by Advantech Taiwan was approximately 83.38 tons (Fig. 4.6). Because our operations are primarily based around assembly, the total hazardous industrial waste was only approximately 16.80 tons, accounting for 20.15% of all industrial waste, while total general industrial waste was 66.58 tons, accounting for 79.85% of all industrial waste. PCB waste accounted for the largest component of industrial waste produced by Advantech in Taiwan. To minimize our industrial waste, we will continue to improve our production yield to reduce electronic waste or trimmings.

Fig. 4.3.3 Overall waste generated by Advantech Taiwan in 2020



In 2020, the total industrial waste generated by Advantech Kunshan was 1,467.28 tons, including general waste, organic solvents, and waste material from stamping from mechanical factories. Figure 4.7 shows the percentage of each type of industrial waste. Advantech Kunshan's industrial waste reduction plans include establishing a designated storage area for paint-stripped waste, handing dried paint-stripped waste over to a qualified recycling company for treatment, and exchanging tin dross waste for tin wire from the original supplier, who then recycles and reuses the tin dross waste.

Fig. 4.3.4 Overall waste generated by Advantech Kunshan in 2020

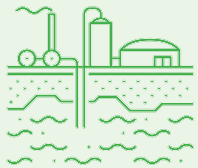


Pollutant emission reduction in the Kunshan plant (the result of 2020 compared to 2019)

Waste gas

Technology improvement

-41%



Waste water

Technology improvement

-53%

Waste

Technology improvement

-37%

Introduction to an emissions reduction special project: treatment technology improvement within the factory

Liquid spray factory

Waste gas

RCO waste gas treatment was adopted together with VOCS online monitoring. The waste gas treatment effectiveness was increased to 92%, and VOCS annual emissions were reduced by 50%.

Waste water

A spray paint water curtain circulation system was adopted. Annual water use was reduced by 73%.

Waste

The annual amount of paint-stripped waste generated was reduced by 50%.

Waste gas treatment equipment

Paint-stripped waste treatment equipment

Spray paint water curtain circulation system

Powder spray factory

Waste gas

Surface treatment technology was improved. Spraying liquid was altered to spraying powder. Because no solvent was involved, VOCS emissions were reduced by 83%.

Waste water

Dry spray room. No spray water was generated.

Waste

Dust collection equipment. The powder can be recycled, and the usage rate was ≥ 85% . Suspended particles are 100% purified and will not be emitted into the air.

Environmentally friendly automatic spray paint

Dry powder paint

Dust collection equipment

4.4 Eco Design and Product Liability

Vision and promise

In response to UNDP's SDG 9 (industry, innovation, and infrastructure) and SDG 12 (responsible consumption and production), Advantech has established various eco design goals pertaining to raw materials, product design, manufacturing, and environmental management. We have introduced various standards aimed at improving the environment, minimizing environmental impacts from operations.

4.4.1 Eco design

Setting goals for eco product

In late 2020, Advantech established the Eco Product Innovative Design Special Project, promoting higher-standard eco design guidelines to R&D units and encouraging them to adopt innovative eco design procedures. Product departments were invited to propose projects for internal assessment and selection.

We aim to incorporate eco product innovative design procedures incrementally and have set short-, mid-, and long-term goals accordingly. For example, in 2021, 10% of standard products in new projects must meet the four major aspects outlined in the eco design guidelines. This requirement will be expanded to 50% by 2023 and 80% by 2025.

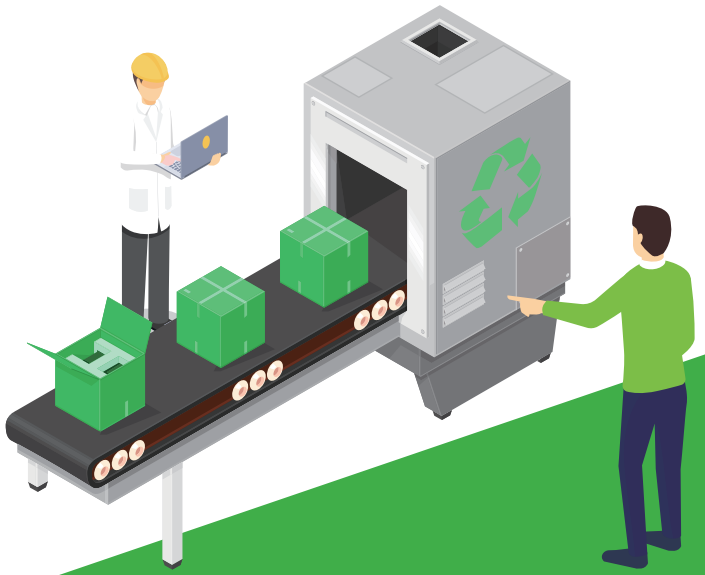


Fig. 4.4.1 Eco Product Innovative Design Special Project

STEP 01

TRIAL RUN

Green Design guideline
Trial implement

2020/11~2021/1

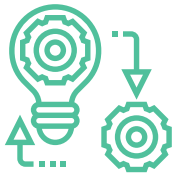
Goals

- Establish design guidelines and publish the Standardized Eco Guidelines for business groups to follow.

Action

- PMO to sync up the guidelines with the Eco Committee.
- Establish two classes for eco criteria (Gold/Silver)
- Arrange a trial run for implementing the new design in each BG (6 products)

STEP 02



CHANGE RULES

Apply to Every SBU
NPI Projects

2021/2~2021/6

Goals

- Corporate level to perform top-down execution for standard products (progressive)

Action

- 2021/1~2021/3
  New product DCP to announce the new criteria.
- 2021/4~2021/6
  Execute the eco design standard.

STEP 03

GOAL & GO

Focus on the most important goal

2021/7~2021/12

Goals

- Long-term establishment of an eco-product management system to enhance ESG with more environmentally friendly designs.
- Standardize the process flow for eco products.

Action

- Adjust the criteria based on the practical conditions of each BG.
- Implement into A/A+ standard products.
- 10% of new products to achieve silver level (basic) standard.

Eco product design management mechanism

Standards have been established based on the following four major aspects: green materials, green package materials, product recycling, and product energy-saving. We assess the environmental impact of products from production, manufacturing, and shipping through to consumer use, recycle and reuse, to waste processing. We meet ensure that we meet international regulations and our clients' needs when designing our innovative eco products.

Fig. 4.4.2 Eco product design management mechanism

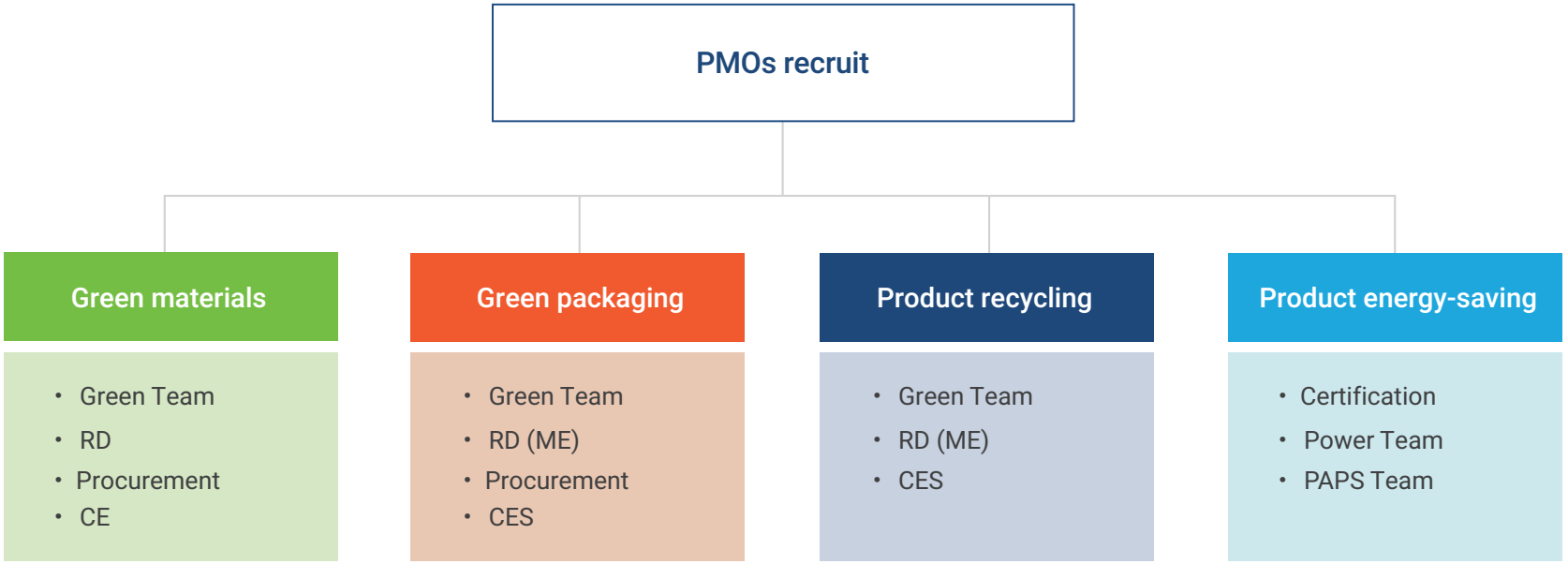
Eco Product **Engineering**	• Eco product committee • Eco Design-in • NPI Process Reform
Eco Product **Awarding**	Eco product Award

Fig. 4.4.3 The four major aspects of Advantech Eco Design

Cross-department committee

We established an Eco Design Management Committee. Advantech's project management officers (PMOs) recruit relevant departments and work with them to design, implement, manage, and review standards.

Fig. 4.4.4 Eco Product Committee



Establishing standards

Based on international environmental protection regulations, international assessment tools (e.g., EPEAT), and our experience with our customers, we have established Guidelines of Eco Design Standards for improving energy efficiency and reducing environmental hazards in eco design. We also provide tools to review standards. If a product passes the review, then we provide certification for it.

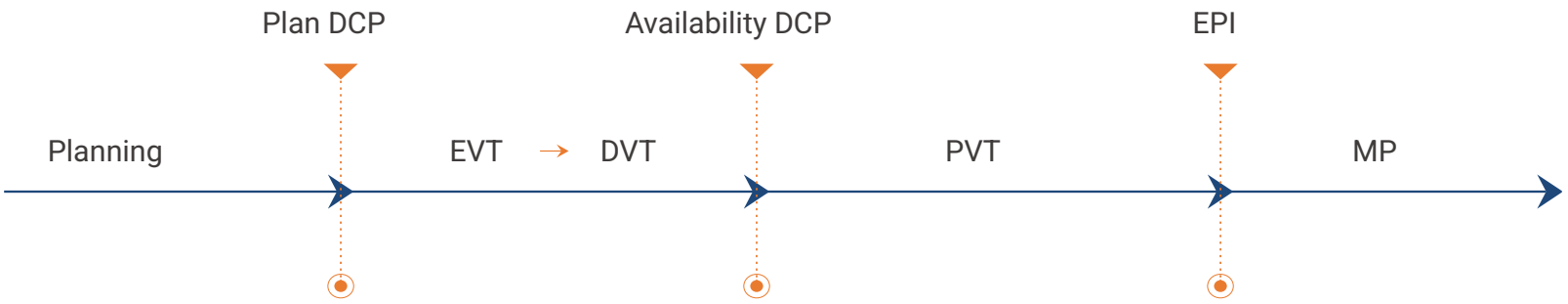
Table 4.4.1 Example of eco product design planning

Product type	Key points in environmental design	Design content	
Industrial panel PCs, servers, IPCs, and motherboards	Improve energy efficiency. Eco design. Reduce hazardous waste.	Conform with the European Union RoHS Directive, China RoHS, Taiwan BSMI RoHS, and IEC62474	Use recycled fiber in corrugated packaging
		Conform with substance restriction requirements of the EU Battery Directive	Design for repair, reuse, and recycle
		Reduce bromine and chlorine content in plastic parts (>25 g)	Design for recycling plastic materials (applies to plastic parts >100 g in weight)
		Conform with the supply chain communication regulations of the EU REACH regulation	Calculate product recyclability a 90% rate (IEC TR62635)
		Eliminate heavy metals in packaging	Prepare messages and reports on reuse and recycle
		Restrict the use of elemental chlorine as a bleaching agent in paper-based packaging	Ensure useability of replacement components
		Enhance the recyclability of packaging	Ensure energy efficiency

Inspection during product development

Eeco product management begins at the design stage. At each inspection point, relevant departments are assigned to inspect for quality and ensure that eco design goals are met.

Fig. 4.4.5 Eco Product Innovative Design Special Project



Eco design reward system

We offer awards to inspire employees to design and produce environmentally friendly eco products in line with Advantech's green benchmarks.

Fig. 4.4.6 Eco-Excellence Product Award

Eco-Excellence Product Award

Qualifications Product is used as a unit. Products that meet the Eco Design Guidelines are eligible for this award.

Golden Medal The overall design meets Advantech's Golden level definition of Eco Design Guidelines and passes the Energy Star standard.

Silver Medal The overall design meets Advantech's Silver level definition of Eco Design Guidelines.

Review key points Green material; Green packaging material; Product is recyclable; Product is energy-saving

Current eco design outcomes and future goals

Item	2020 results	2021 goals	2025 goals
International environmental protection regulations (hazardous substances, recycling)	Apply mandatory international regulations and Advantech's standards for substance monitoring	Continue to ensure that raw materials are 100% in alignment with mandatory international regulations and Advantech's standards for monitoring substances	Continue to ensure that raw materials are 100% in alignment with mandatory international regulations and Advantech's standards for monitoring substances
International energy-saving environmental protection labels: Energy Star/ErP	Focus on specific models	Focus on specific models	Focus on specific models
Eco Design Guideline	Incorporate innovate eco design procedures	10% of Advantech's standard items for new development projects meet the four major aspects in the Eco Design Guidelines	80% of Advantech's standard items for new development projects meet the four major aspects in the Eco Design Guidelines

International energy-saving environmental protection labeling

The Energy Star label is a government plan co-promoted by the United States Department of Energy and Environmental Protection Agency, and it has been adopted by numerous countries, including Canada, Japan, Taiwan, Australia, New Zealand, and those in the EU. The Energy Star is an international standard for the energy efficiency of electrical equipment. Qualified computer equipment must meet the regulations of Energy Star, and its power supply must meet the Energy Start EPS 2.0 specification.
Since 2009, Advantech has launched various models that meet this standard. For a list of the models that have been introduced in the past 3 years, see 4.5 Appendix

International environmental protection regulations (see 4.5 Appendix)

4.4.2 Product liability

Advantech seeks to reduce impacts on the environment and ecology, fulfill corporate responsibilities for a more sustainable environment, meet stakeholder expectations, and continue to follow international regulations. In accordance with these considerations, we review the management status of hazardous substances each year and regularly update relevant company regulations as necessary. Our goal is to consistently implement our green product management system.

Fig. 4.4.7 Green Product Management System (GPMS)

Information docking

- Green Mark (On going)

Material or component risk assessment

- Asses the usage of substancesat Advantech
- Ensure components comply with new regulations (E.g., RoHS Exemption)

Generate product reports for clients

- Assess announcements of Advantech meeting RoHS & REACH
- Assess other regulations

Green data survey operation

- Establish internal regulations
- Release, review, and confirm Kunshan green data
- Upload supply chain green data

Information delivery to the supply chain

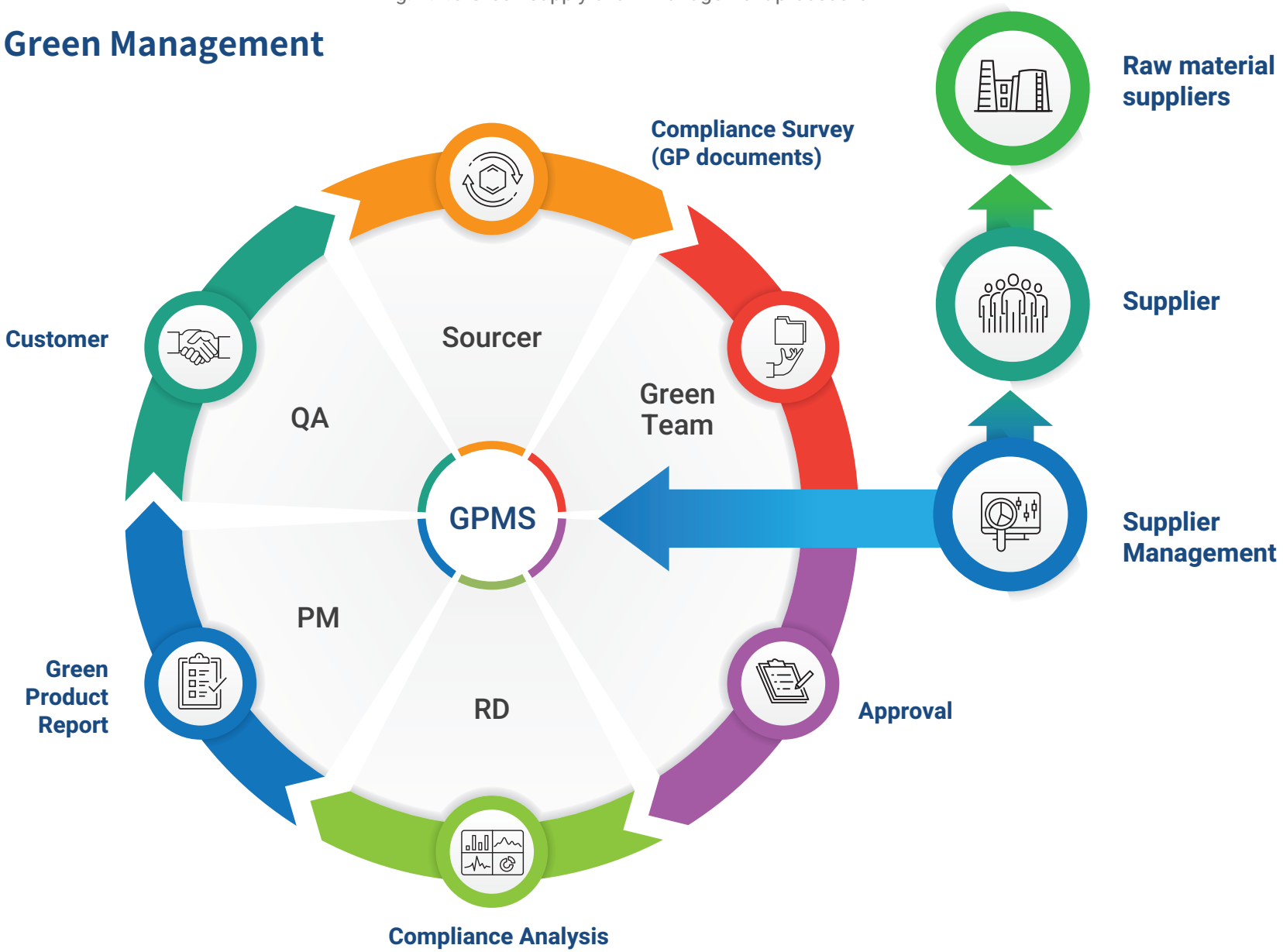
- Announce relevant information
- Update critical regulations or announcements regarding client regulations

Conflict minerals survey (expansion)

- Report conflict minerals in line with Responsible Business Alliance
- Update the list of smelters and perform surveys and product

In 2010, Advantech established its Green Product Management System. This supply chain platform requires suppliers to guarantee that their products do not contain certain hazardous substances and to provide relevant certifications for review. Each year, we optimize this system to ensure an effective green supply chain.

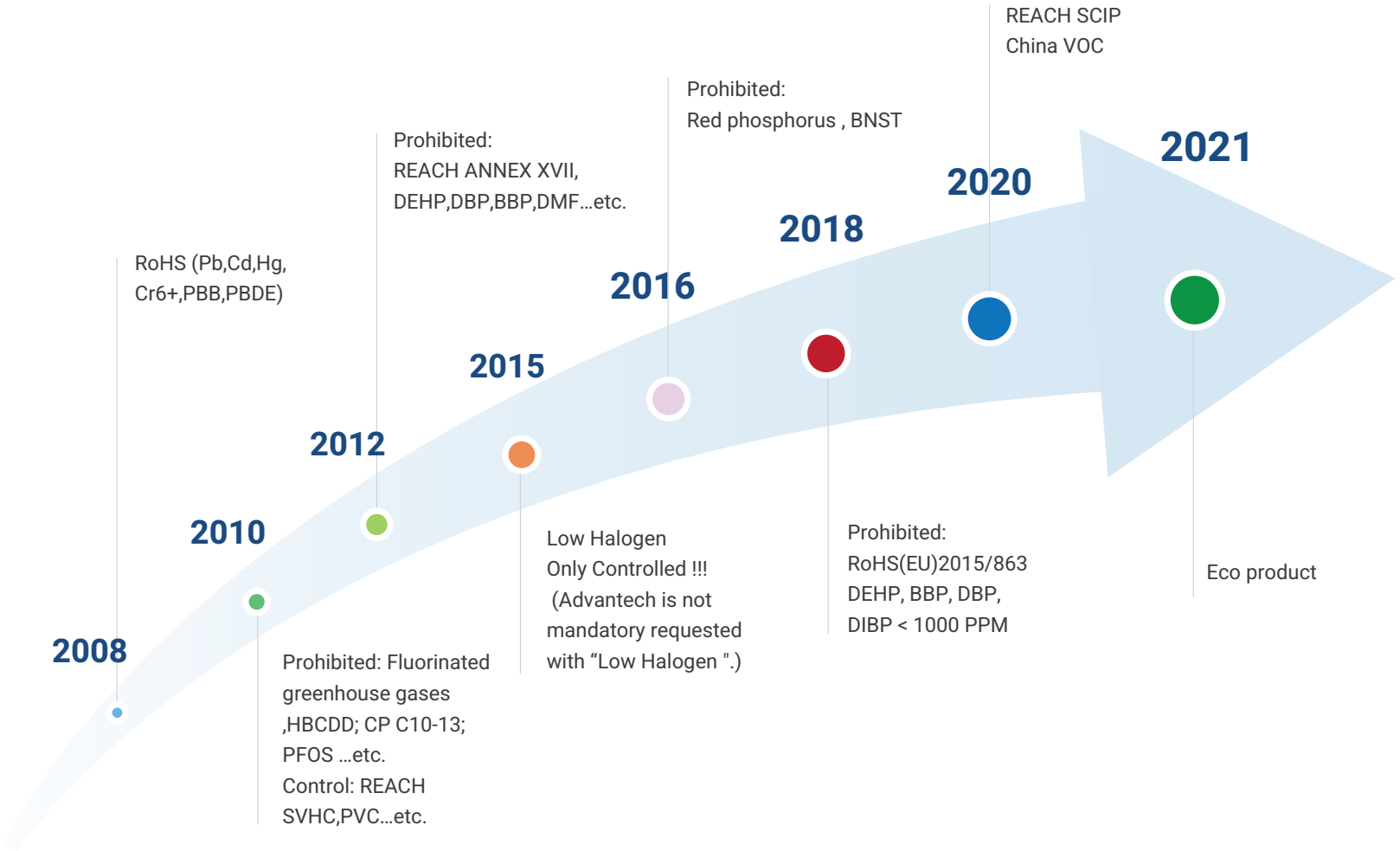
Fig. 4.4.8 Green supply chain management procedure



Focused case: Sony Green Partner

Advantech has been a Sony Green Partner since 2012. From components to OEM cooperation, we have overcome many challenges. In recent years, we have only had to pass a document review for our certification to be extended. Becoming a Sony Green Partner demonstrates that our green management outcomes have been affirmed by our clients.

Fig. 4.4.9 Advantech Green Policy - Hazardous Substance Reduction Plan



4.5 Appendix : Conformation Status of Product and Environmental Regulations

Advantech amends its internal management standards in accordance with various environmental protection policies on environment-related substances management, such as EU RoHS (including EU 2015/863), REACH, and POPs. In 2009, we adopted the IECQ HSPM QC080000 hazardous substance management system. We conduct risk assessment based on our supplier management and green supply chain management systems. When selecting materials for products, we ensure that all of our products are 100% in alignment with RoHS green environmental protection regulations in addition to environmental regulations in each country where our products are sold. These regulations are listed below:

1. China Administrative Measure on the Control of Pollution Caused by Electronic Information Products (China RoHS) and Taiwan BSMI RoHS
2. EU's RoHS and REACH for SVHC
3. Regulations for product recycling
   - 3.1 EU's Waste Electrical and Electronic Equipment (WEEE) Directive
   - 3.2 International standard: ISO 11469 (marking of products fabricated from plastics materials)
4. Regulations for battery recycling
   - 4.1 The EU's Battery Directive
   - 4.2 China's regulations for battery energy consumption
   - 4.3 US/Canada's battery regulations
   - 4.4 Japan's battery regulations
   - 4.5 Taiwan's battery regulations
5. South Korea's e-Standby program and requirements for minimum energy consumption of display products
6. Regulations on waste packaging materials
   - 6.1 EU's Directive on Packaging and Packaging Waste
   - 6.2 China's RoHS- SJ/T 11364-2006 (marks for packaging recycling)
   - 6.3 Taiwan's regulations on waste management
   - 6.4 Japan's regulations on containers and packaging recycling
   - 6.5 South Korea's regulations on packaging
7. Other regulations on energy conservation
   - 7.1 EU's 1275/2008/EC (energy consumption requirements for standby and off modes)
   - 7.2 Mexico's new energy law
   - 7.3 EU's 278/2009/EC (requirements for efficiency of external power supplies)
   - 7.4 California Energy Commission (CEC)
   - 7.5 South Korea's Minimum Efficiency Performance Standards (MEPS)
   - 7.6 Australia's MEPS

At the design and development stages, our products are verified in accordance with relevant safety regulations to ensure that they meet CE/FCC/CCC requirements on safety labeling. Advantech adheres to environmental protection and green product regulations in countries worldwide. This includes the effective use of natural resources, banning of hazardous substances, life cycle assessment, and comprehensive waste management practices. We promote products based on safety, energy-conservation, and environmental friendliness. Relevant information is announced on our official website (http://www.advantech.tw/) under the product catalog description, as shown below:

Fig. 4.5.1 Environmental protection declaration from the Advantech website

In 2020, Advantech did not breach any regulations. We are rigorous in conducting quality management, paying attention to every detail.

Table 4.5.1 Advantech products with Energy Star certification in the past 3 years

Product model	Product type
ESY152,ESY15i5,ESY22i2,EY22i5	Industrial panel PCs
ESY20X2;ESY20X3;ESY20X5;ESY20X7	
ESY15X2;ESY15X3;ESY15X7;ESY17X2;ESY17X3;ESY17X7;ESY15X5	
ESY15i2,ESY15i5,ESY22i2,ESY22i5	
AIM-37AC, AIM8IAC, AIM8I, AIM 10W	
DSDM-055FD-45NE-V, DSDM-155FD-45NE-V	
DSDW-049FD-45NE-V	
GSC-7152W, GSC-7152W-C3AE	