04

Environmental Sustainability

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SDG 6.3: Improve water quality, wastewater treatment, and safe reuse
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SDG 7.3: Double the rate of improvement in energy efficiency
SDG 12.2: Achieve sustainable management and efficient use of natural resources
SDG 13.1: Strengthen resilience and adaptive capacity to climate-related hazards
SDG 13.2: Integrate climate change measures into policies and planning

2025 Performance Highlights

- **SBTi Approved** Greenhouse gas reduction targets validated under the SBTi
- **CDP A List** recognition for Climate Change and Water Security, plus an A (Leadership) rating in Supplier Engagement Assessment (SEA)
- **UL 2799 Platinum** All manufacturing sites certified to Zero Waste to Landfill at the highest Platinum level
- **100%** Group-wide manufacturing sites certified to ISO 50001 Energy Management Systems
- **100%** All manufacturing sites awarded the Ministry of Environment “Green Dining Table” label, with the Kaohsiung plant recognized as the city’ s first employee cafeteria to receive the designation

Targets and Progress of Material Topics

Issue	2025 Target	2025 Progress	2026 Targets	2030 Targets
Energy and Greenhouse Gas Management Technology innovation and efficiency improvements controlled energy consumption. Greenhouse gas emissions monitoring and reduction were strengthened to improve energy-use efficiency. Note: The base year for greenhouse gas emissions reductions is 2023.	• Scope 1 and Scope 2 GHG emissions reduced by 2.5%	✔ Scope 1 and Scope 2 GHG emissions reduced by 15%	• Scope 1 and Scope 2 GHG emissions reduced by 7.5%	• Scope 1 and Scope 2 GHG emissions reduced by 42% • Scope 3 GHG emissions reduced by 25%
	• GHG emissions intensity: 12.6 kg CO_2e/layer	✔ GHG emissions intensity: 11.6 kg CO_2e/layer	• GHG emissions intensity: 11.1 kg CO_2e/layer	-
	• PFCs emissions intensity: 0.471 kg CO_2e/layer	✔ PFCs emissions intensity: 0.357 kg CO_2e/layer	• PFCs emissions intensity: 0.462 kg CO_2e/layer	-
	• Electricity intensity: 24.90 kWh/layer	✔ Electricity intensity: 23.31 kWh/layer	• Electricity intensity: 23.08 kWh/layer	-
	• Annual electricity savings: 2–3%	✔ Annual electricity savings: 3.4%	• Annual electricity savings: 2–3%	• Cumulative electricity savings ≥ 15% (since 2021)
	-	✔ Winbond (Taiwan) used 8.7% renewable energy	-	• Winbond (Taiwan) used 50% renewable energy
Water Resource Management* Water-saving measures and circular water recycling and reuse protected and optimized water resources to support sustainability.	• Site-wide water recycling rate ≥ 80%	✔ Site-wide water recycling rate: 82.7%	• Site-wide water recycling rate ≥ 80%	• Site-wide water recycling rate ≥ 80% annually
	• Water consumption intensity: 161 L/layer	✔ Water consumption intensity: 143 L/layer	• Water consumption intensity: 158 L/layer	-
	• Ultrapure water intensity: 0.286 m^3/layer	✔ Ultrapure water intensity: 0.141 m^3/layer	• Ultrapure water intensity: 0.295 m^3/layer	-
	• Water pollution composite index reduction rate: 78%	✔ Water pollution composite index reduction rate: 86.3%	• Water pollution composite index reduction rate: 78%	• Water pollution composite index reduction rate ≥ 78%
Waste Management* Waste reduction, segregation, and circular reuse reduced adverse environmental impacts.	• Site-wide waste recycling rate ≥ 90%	✔ Site-wide waste recycling rate: 93.7%	• Site-wide waste recycling rate ≥ 90%	• Site-wide waste recycling rate ≥ 90% annually
	• Waste generation intensity: 0.588 kg/layer	✔ Waste generation intensity: 0.565 kg/layer	• Waste generation intensity: 0.599 kg/layer	-
Air Pollution Prevention* Emissions were controlled and process technologies were enhanced to minimize impacts on the atmospheric environment.	• Average VOC removal efficiency: 90%	✔ Average VOC removal efficiency: 99%	• Average VOC removal efficiency: 93%	• Average VOC removal efficiency ≥ 93% annually
	• VOCs emissions intensity: 0.204 g/layer	✔ VOCs emissions intensity: 0.179 g/layer	• VOCs emissions intensity: 0.2 g/layer	-

Note 1. Scope: Scope 1, Scope 2, and Scope 3 GHG emissions targets apply to the Winbond Group; all other indicators apply to Winbond (Taiwan) manufacturing operations.
Note 2. Unit: "Layer" refers to energy/resource consumption or GHG emissions per mask layer for 12-inch wafer production.
Note 3. Items marked with * were non-material topics.

Section Overview

To align with global efforts on environmental sustainability, Winbond continued to reduce the environmental impacts of its operations and recorded no material violations of environmental regulations. Guided by its commitment to "Environmental Sustainability and Value Creation," Winbond invested in innovative technologies and resources and advanced initiatives including energy and carbon reduction, improved resource-use efficiency, and strengthened waste and emissions management to deliver its sustainable development roadmap.

In 2025, Winbond received the highest recognition on the CDP A List for both Climate Change and Water Security. Winbond also achieved Leadership Level A under the CDP SEA, demonstrating strong performance in environmental sustainability, disclosure, and climate risk management.

On January 8, 2026, Winbond formally passed the review of its greenhouse gas reduction targets under the Science Based Targets initiative (SBTi). Using 2023 as the base year, the Winbond Group established value chain-wide greenhouse gas reduction targets and defined a long-term roadmap to achieve net zero emissions by 2050. The decarbonization pathway aligned closely with the Paris Agreement goal of limiting the global average temperature increase to 1.5° C, demonstrating strong integration between operating strategy and international climate action.

Risk also creates opportunities. Adequate resources support a resilient supply chain. Ongoing reviews of business models create customer value, and product and process innovation strengthens long-term, sustainable, mutually beneficial partnerships with customers.

Convener
Vice President, Manufacturing Business Group

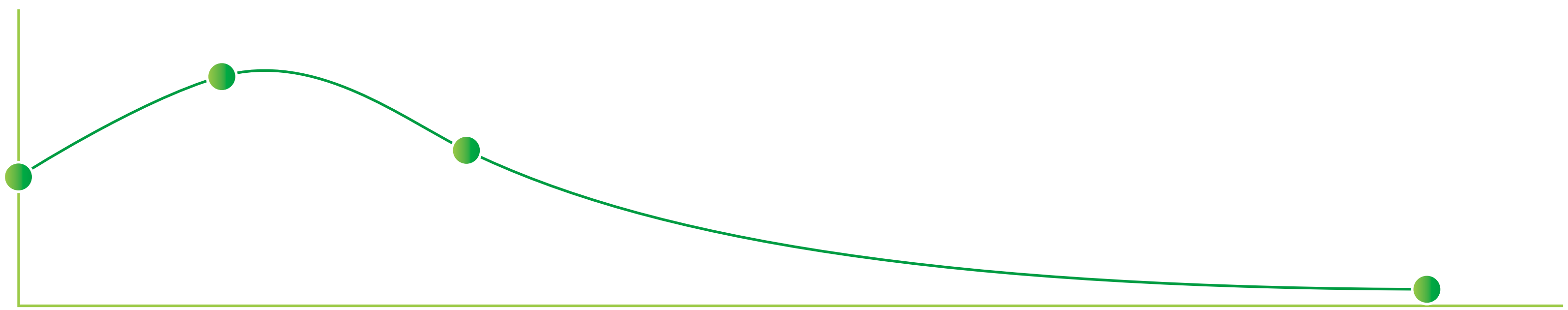
Wen-Hua Lu

4.1 2050 Net zero Commitment

In response to the severe challenges posed by global climate change, sustainability progressed from commitment to action. Science-based methodologies and a long-term perspective supported effective planning for the low-carbon transition.

On January 8, 2026, the Winbond Group formally passed the review of its greenhouse gas reduction targets under the SBTi, demonstrating a strong commitment to science-based governance and systematic climate action. Using 2023 as the base year, the Group established greenhouse gas reduction targets covering the entire value chain and defined a long-term roadmap to achieve net zero emissions by 2050. The decarbonization pathway aligned closely with the Paris Agreement goal of limiting the average global temperature increase to 1.5° C, demonstrating strong integration between operating strategy and international climate action.

Short-Term Targets (2030)	Long-Term Targets (2050)
• Reduce absolute greenhouse gas emissions from process direct emissions (Scope 1) and energy indirect emissions (Scope 2) by 42% compared with the base year • Reduce emissions from purchased products and services and from the use phase of sold products (Scope 3) by 25% compared with the base year	• Reduce absolute greenhouse gas emissions from Scope 1 and Scope 2 by 90% compared with the base year • Achieve a 90% reduction for Scope 3 emissions within the same scope as the short-term target, progressively advancing net-zero transformation across the value chain



2021
- Committ\ed to 2050 net-zero emissions

2023
- Set SBT targets with 2023 as the base year

2030
- Reduce GHG Scope 1 + 2 emissions by 42%
- Reduce GHG Scope 3 emissions by 25%
- Winbond Taiwan manufacturing sites to reach RE 50

2050
- Moving toward net zero

Winbond Group passed the SBT target review

SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

THE NET ZERO STANDARD
APPROVED NET-ZERO TARGETS

2050 Net-Zero Action Plan

Systematic implementation	• carbon emissions management (GHG inventory, product carbon footprint), water resource management system, energy management system, circular economy
Reducing process gases	• process gas reduction (higher utilization), fluorinated gas substitution technologies
Improving energy efficiency	• replacement of energy-consuming equipment, usage management, AI-enabled intelligent energy monitoring
Using renewable energy	• renewable energy (wind and solar PV)
Driving a low-carbon value chain	• low-carbon transportation, low-carbon raw materials, carbon-neutral natural gas
Carbon removal	• research and practice of nature-based solutions; research of technology-based solutions

Driving transformation through substantive investment

To deliver its net zero commitment, the Winbond Group upheld green manufacturing principles and prioritized carbon reduction. Starting at the R&D stage, process optimization and the introduction of zero-carbon-emission gases reinforced the ambition to advocate green products and scale green impact through core capabilities.

Annual environmental protection expenditure supported investment in, and maintenance of, environmental software and hardware. Investment items included improvements and upgrades for air pollution prevention, water pollution prevention, and waste treatment. In 2025, the Winbond Group invested NT$896 million in environmental protection measures and optimization, representing approximately 1.0% of annual revenue. Economic benefits generated from environmental investment reached approximately NT$137 million. [Historical data is available in Appendix VII: Environmental Investment]

4.2 Greenhouse Gas and Energy Management

Winbond strengthened data governance to digitize the management of greenhouse gas emissions and energy and resource use. Data consolidation and inventory work began in 2020, enabling systematic management. In 2023, the scope expanded to subsidiaries, progressively improving data completeness and control. Reduction actions were implemented based on inventory outcomes, and performance data were tracked regularly. In 2025, Winbond revised the Climate Change and Energy Management Policy and established a climate-transition green manufacturing and supply chain management model to support social responsibility and sustainable operations.

Greenhouse Gas Management

In 2025, Winbond expanded the scope of greenhouse gas management. All global sites were included in the ISO 14064-1 greenhouse gas emissions inventory and verification. Annual inventories were conducted across sites to improve visibility into emissions and verify the effectiveness of reduction actions. [Historical data is available in Appendix VII: Environmental Sustainability Information]

| Greenhouse Gas Emissions |

Unit: Metric Tonnes CO_2e

Boundary	Winbond (Taiwan)		Subsidiaries	
	(Emissions)	(Share)	(Emissions)	(Share)
Scope 1	48,536	1.3%	27,771	0.4%
Scope 2	314,430	8.1%	81,374	1.2%
Scope 3	3,496,569	90.6%	6,622,893	98.4%

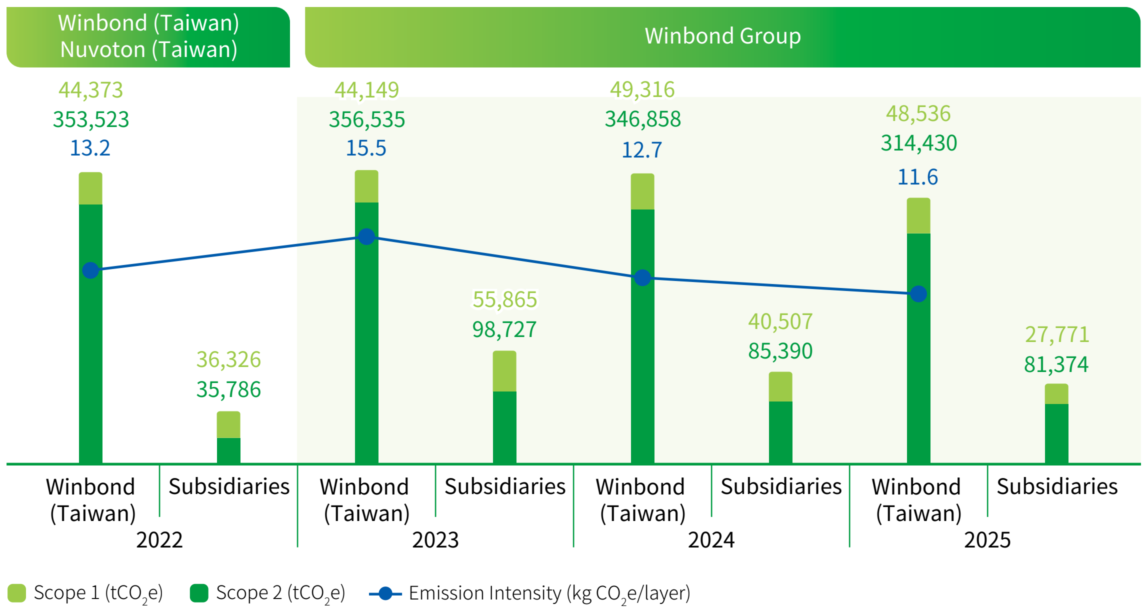
| Scope 3 Greenhouse Gas Emissions |

Unit: Metric Tonnes CO_2e

Category (Scope 3)	Winbond (Taiwan)	Subsidiaries
Purchased goods and services	321,870	247,430
Fuel- and energy-related activities	86,106	26,328
Upstream transportation and distribution	1,254	849
Waste generated in operations	2,288	108
Business travel	768	1,261
Employee commuting	2,905	613
Use of sold products	3,081,379	6,346,304

Note: Primary emission factors for each category referenced the Ministry of Environment Greenhouse Gas Emission Factor Management Table, the Ministry of Environment Carbon Footprint Information Network, supplier inventory factors, and the SimaPro database, among others.

| Greenhouse gas emissions |



Note 1: In response to greenhouse gas reduction and control requirements, the reporting boundary expanded in 2023 to include consolidated-financial-statement subsidiaries, providing more complete emissions information. Accordingly, 2023 serves as the base year for the greenhouse gas inventory.
Note 2: Global warming potential (GWP) references included IPCC AR4 (2007) for 2022. For Winbond (Taiwan), IPCC AR5 (2019) was applied in 2023–2025. For subsidiaries, IPCC AR6 (2021) was applied in 2023–2025.
Note 3: Greenhouse gas types included nitrous oxide (N_2O), methane (CH_4), carbon dioxide (CO_2), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), nitrogen trifluoride (NF_3), and others.
Note 4: Uncertainty data for emission factors referenced the latest version published by the Climate Change Administration. Uncertainty assessment for activity data referenced technical specifications for instrument metrology verification and inspection.
Note 5: 2022 covered Winbond (Taiwan) and Nuvoton (Taiwan). 2023–2025 covered the Winbond Group.

Greenhouse Gas Reduction

Greenhouse gas reduction strategy

Winbond’ s greenhouse gas emissions primarily originate from fluorinated gases (Fluorocarbons, FCs) used in manufacturing processes and from purchased electricity, accounting for more than 90% of Scope 1 and Scope 2 emissions. Accordingly, direct reduction of FCs (process improvement and installation of abatement systems), indirect reduction through energy efficiency, and the adoption of renewable energy form the core strategy. Decarbonization programs continued to advance, supported by improved energy efficiency, strengthened carbon information platforms, and green product design and development. Low-power products and low-carbon processes, together with renewable-energy manufacturing, supported decarbonization and electricity-saving outcomes across production and the manufacture and use of end products.

In 2025, Scope 1 and Scope 2 greenhouse gas emissions decreased by 15% compared with the 2023 base year. Scope 3 greenhouse gas emissions (within the SBTi target boundary) decreased by 8.5% compared with the 2023 base year.

In 2025, greenhouse gas emissions intensity reached 11.6 kg CO_2e/layer. Compared with 12.7 kg CO_2e/layer in 2024, year-on-year intensity decreased by approximately 8.7%.

Greenhouse gas reduction action plan

Actions included process improvements to reduce greenhouse gas use; replacement of equipment with energy-saving components and installation of abatement equipment; energy-saving projects for production equipment and utilities; increased use of renewable energy; and reduced consumption of gases, chemicals, and raw materials. New projects added in 2025 covered Scope 1 to Scope 3 and delivered an estimated annual reduction of 21,491 tCO_2e (Scope 1: 3,029 tCO_2e; Scope 2: 11,615 tCO_2e; Scope 3: 6,847 tCO_2e). (For reduction actions, please refer to Section Energy-saving action plan.)

Reduction of fluorinated greenhouse gases began in 2000 through participation in the TSIA/WSC PFC greenhouse gas reduction program. Process adjustments, alternative gas use, and installation of fluorinated gases (Fluorocarbons, FCs) abatement equipment reduced emissions. In 2025, the reduction reached approximately 252,000 tCO_2e. These actions mitigated climate risk impacts, strengthened climate resilience, enhanced industrial competitiveness, and created value.

Energy Management

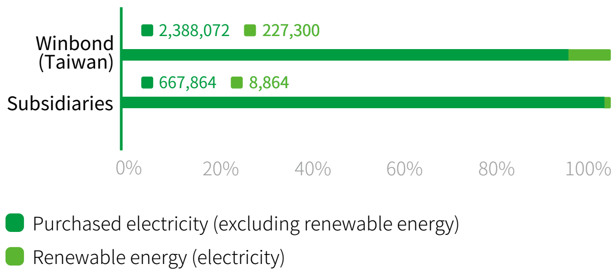
All Winbond Group manufacturing sites achieved ISO 50001 Energy Management System certification. Engineering-side management was institutionalized, supporting energy conservation and efficiency while enhancing product value. Targeted resources supported equipment energy-saving optimization to strengthen social responsibility and sustainable operations. Please refer to the ESG website-sustainability documents for more details.

Energy use overview

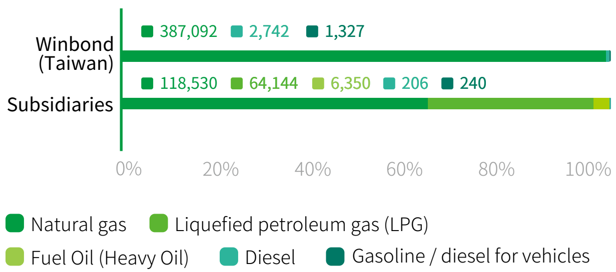
In 2025, total energy consumption reached approximately 3,006,534 gigajoules (GJ) for Winbond (Taiwan) and approximately 866,198 GJ for subsidiaries.

In 2025, the unit product energy consumption indicator—average electricity consumption per mask layer for 12-inch wafer production—reached 83.9 megajoules (MJ). Compared with 85.8 MJ in 2024, year-on-year unit electricity consumption decreased by approximately 2.2%. Electricity savings reached 3.4% in 2025. The 2026 reduction target is to keep average electricity consumption below 83 MJ per mask layer for 12-inch wafer production. Looking ahead, equipment replacement, usage reduction, process optimization, smart energy saving, and performance improvement programs will continue to advance to strengthen environmental sustainability outcomes.

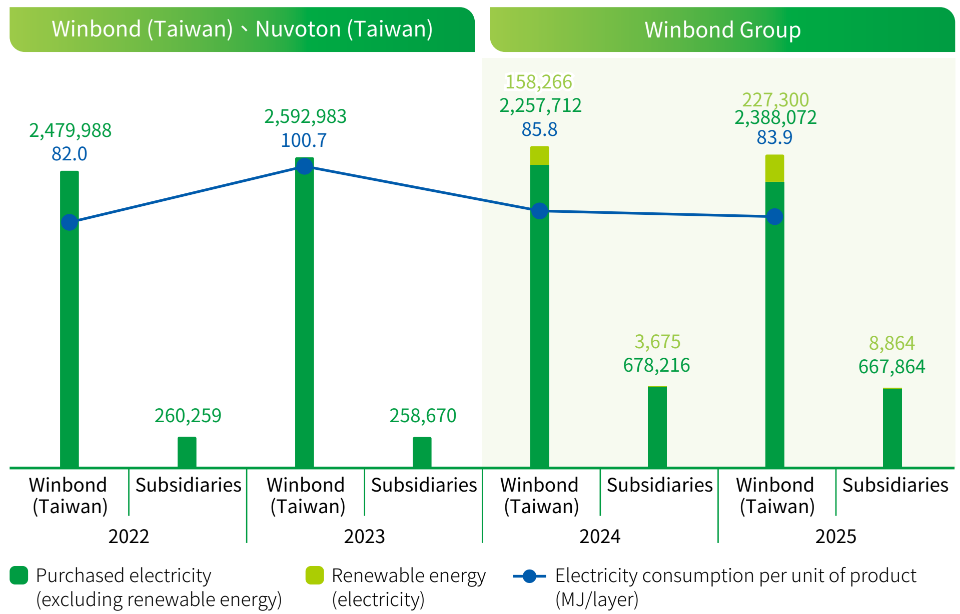
Electricity consumption (GJ)



Fuel consumption (GJ)



Winbond Group electricity consumption (GJ)



Note 1: Energy use was converted to joules. Natural gas was calculated based on the heating value provided by suppliers; other items referenced greenhouse gas emission factors published by the Climate Change Administration. Electricity: 1 kWh = 3,600 kJ; natural gas: 1 m^3 = 8,896 kcal; LPG: 1 L = 5,993 kcal; fuel oil: 1 L = 9,600 kcal; diesel: 1 L = 8,636 kcal; gasoline: 1 L = 7,586 kcal; 1 cal = 4.184 J.

Note 2: Energy consumption data were based on measured values from billing receipts, monthly natural gas settlement statements, and issue slips/material-number inventory movement verification sheets. No estimated values were used.

Note 3: 2022–2023 covered Winbond (Taiwan) and Nuvoton (Taiwan). 2024–2025 covered the Winbond Group.

Renewable Energy Advancement

Winbond continued to expand renewable energy adoption. In 2023, its first renewable energy procurement secured onshore wind power, expected to provide close to 10 million kWh annually, exceeding the annual electricity demand of Winbond (Taiwan) service sites outside manufacturing operations.

In November 2024, Winbond' s Board of Directors approved a long-term renewable energy power purchase agreement with Sustainable Energy Solution Co., Ltd. (SES), a renewable power retailer under the Sino-American Silicon Products Group. Following completion of the R3-1 offshore wind farm, SES is expected to supply offshore wind power and solar photovoltaic (PV) electricity to Winbond. The parties launched a 30-year collaboration with a total contracted supply of approximately 4.8 billion kWh. This collaboration is expected to reduce carbon emissions by approximately 80,000 tonnes annually and deliver cumulative reductions of 2.4 million tonnes over 30 years. This represented Taiwan' s first landmark transaction in which a power retailer sold offshore wind power to a domestic enterprise, demonstrating forward-looking planning and execution along the net zero transition pathway. The agreement also extended to solar PV supply. Complementary generation profiles supported around-the-clock green power demand and strengthened progress toward sustainability and net zero targets. In 2025, Winbond accelerated green power adoption and planned to bring forward supply of 24 MW solar PV under this collaboration effective January 1, 2026, with an estimated total 30-year supply of approximately 0.9 billion kWh. This approach enabled stable renewable energy supply before offshore wind grid connection and supported the low-carbon transformation of the electricity mix.
Looking ahead, the Winbond Group will continue to assess expansion of renewable energy capacity, progressively increasing renewable energy use toward the goal of building a green enterprise.

2019

Installed 0.499 MW rooftop solar power at the Central Taiwan Science Park Fab

2023

First acquisition of T-REC renewable energy certificates

Obtained the first renewable energy certificate; 2,103 certificates obtained during the year

Purchased renewable electricity

- Onshore wind power
- Nengyuan Convenience Store
- Completed the first 3.6 MW onshore wind power procurement

Rooftop solar self-generation and self-consumption

Nuvoton Taiwan installed 0.819 MW in 2023

2024

Obtained T-REC renewable energy certificates

Total renewable energy consumption reached 43.96 million kWh, and 43,961 T-REC certificates were obtained

Rooftop solar self-generation and self-consumption

The Central Taiwan Science Park Fab converted 0.499 MW of renewable energy generation capacity to self-consumption in 2024.

Diversified renewable electricity procurement

In 2024, the Board approved the procurement of 75 MW solar PV, 9.24 MW onshore wind, and 25 MW offshore wind

- Onshore wind power \ Nengyuan Convenience Store
- Procured 9.24 MW generation in September 2024

- Floating solar PV \ Chenya Energy
- Procured 27 MW generation in April 2024

Taiwan's first representative transaction in which a power retailer sold offshore wind power to a domestic enterprise

Solar PV and offshore wind\Xuxing

In November 2024, the Board approved a 30-year procurement plan of 48 MW solar PV and 25 MW offshore wind, expected to help Winbond reduce approximately 80,000 tons of CO_2 emissions annually, with cumulative reductions reaching 2.4 million tons over 30 years

2025

Increasing the share of renewable energy

Winbond (Taiwan) total renewable energy consumption reached 63.14 million kWh, up 43% year over year; 63,143 T-REC certificates obtained; renewable energy share reached 8.7%

Accelerating green electricity deployment and advancing carbon reduction benefits ahead of schedule

Planned from January 1, 2026, to begin wheeling 24 MW from the above projects, with approximately 900 million kWh of total electricity supply over 30 years, enabling early adoption of stable renewable power before offshore wind is fully grid-connected and strengthening the low-carbon transition of the electricity mix

Energy-Saving Action Plan

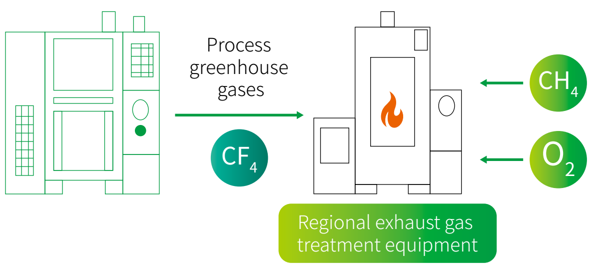
Aligned with the vision of "being a hidden champion in providing sustainable semiconductors to enrich human life," Winbond strengthened accountability for green manufacturing through benchmarking, precision control, and technical collaboration. In 2025, electricity-saving measures continued across six categories and 214 initiatives, including equipment replacement, equipment modification, performance improvement, usage reduction, process optimization, and smart energy saving. Measures included process improvements, cooling tower system optimization, compressed air system performance improvement, and replacement with energy-saving pumps.

In 2025, electricity savings at Winbond (Taiwan) increased by approximately 88,236 GJ compared with 2024, equivalent to approximately 24.5 million kWh.

Category	Action plan	Number of measures	Electricity savings (10,000 kWh)	Electricity savings (GJ)	Emission reduction (tCO_2e)
Equipment replacement	• Replace energy-saving pumps; replace energy-saving heating equipment and cooling devices	36	1,037	37,332	4,913
Performance improvement	• Improve cooling tower performance; improve compressed air system performance	19	590	21,240	2,795
Usage reduction	• Optimize settings for heating and cooling equipment; reduce equipment exhaust	96	329	11,844	1,561
Smart energy saving	• Smart equipment control system; smart chiller	8	261	9,396	1,236
Equipment modification	• Variable-frequency retrofit for equipment cooling system	12	179	6,444	847
Process optimization	• Process optimization to reduce steps	43	55	1,980	262

Case Study 1 ▶ Improving the Efficiency of Process Abatement Systems

Process gases were treated using abatement equipment with electric heating, combustion, or plasma destruction to remove harmful, flammable, and fluorinated greenhouse gases generated by processes. Exhaust containing inorganic acids and alkalis was then routed to a central scrubber for water washing and neutralization. Parameter optimization adjusted fuel use based on treatment efficiency, consolidated abatement requirements by integrating equipment to reduce unit count and energy consumption, and reallocated usable space to increase the installation ratio of fluorinated abatement equipment. Cumulatively through 2025, these actions reduced emissions by approximately 3,200 tCO_2e annually.



Case study 2 ▶ replacing cooling tower fan blades with high-efficiency, energy-saving blades

Cooling towers discharged waste heat generated by industrial production or air-conditioning systems to the atmosphere. Fan blade rotation enabled heat exchange between air and cooling water. Evaporation cooled high-temperature water to a lower temperature for recirculation. Conventional fan blades were typically made of aluminum alloy. Long-term exposure to high-humidity air caused oxidation and corrosion, increasing surface roughness and airflow resistance, which increased fan motor energy consumption. Replacing blades with fiberglass-reinforced plastic (FRP) high-efficiency, energy-saving blades prevented corrosion-driven roughness and resistance. FRP blades reduced weight and used streamlined designs that improved fluid dynamics, increasing airflow at the same rotational speed and further improving fan efficiency. These improvements saved approximately 1.1 million kWh annually.


Before : Aluminum alloy fan blades


After: FRP energy-saving fan blades

4.3 Water Stewardship

Winbond strengthened green semiconductor technology development and fulfilled its responsibilities for green manufacturing. In 2025, Winbond revised the Water Efficiency Management Policy. The policy integrated identification and assessment of dependencies on water, impacts, risks, and opportunities across operations and the supply chain, together with interactions and environmental trade-offs among environmental factors. Across all product life cycle stages, these mechanisms reduced natural water withdrawals and maximized water-use efficiency, promoted on-site water recycling and reuse, continued to reduce pollutants in water discharge, strengthened value chain resilience to water risk, and reinforced water conservation priorities.

Water withdrawal, water discharge, and water consumption

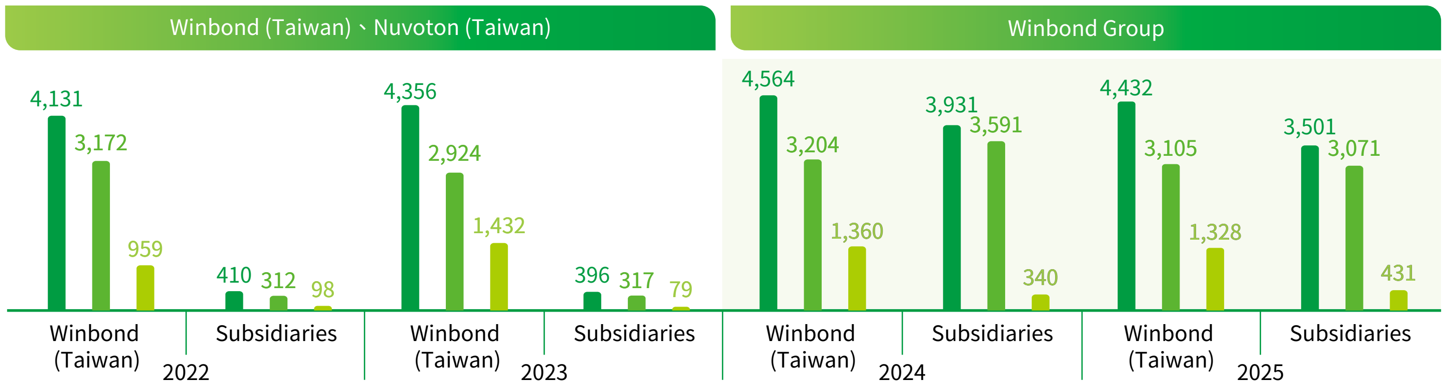
In 2025, total water withdrawal at the Group' s manufacturing sites reached 7,934 megaliters. Water sources for Winbond and Nuvoton were primarily tap water. Nuvoton (Japan) used groundwater. All sources were freshwater.

2025	Winbond	Subsidiaries	Winbond Group
Tap Water	100.0%	14.2%	62.1%
Groundwater	0.0%	85.8%	37.9%

In 2025, total water use at Winbond manufacturing sites reached approximately 4,432 megaliters. Water consumption intensity reached 143 L/layer. Compared with 147 L/layer in 2024, year-on-year unit water consumption decreased by approximately 2.7%. Recycling system performance and water-use efficiency continued to improve.

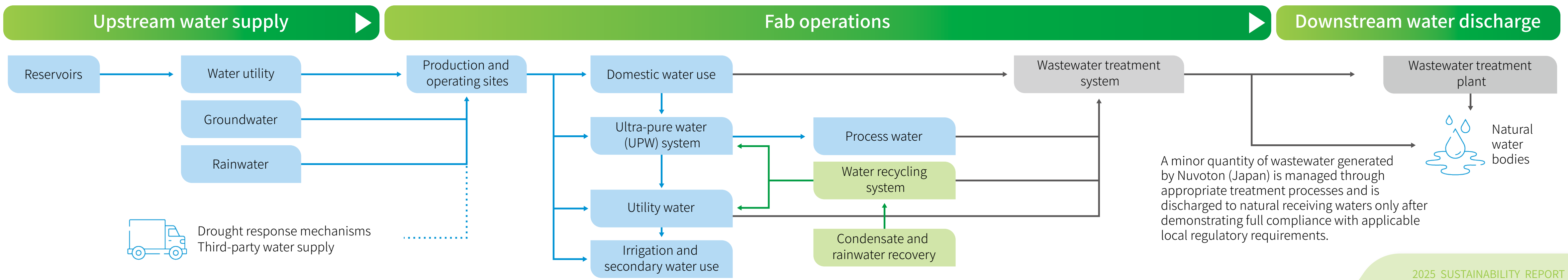
Rainwater and condensate water served as alternative water resources. Collection and reuse reduced impacts on local water resources. Rainwater and condensate water were mainly used for irrigation and secondary water uses. In 2025, total use reached 301 megaliters.

| Water resource statistics for the winbond group' s manufacturing and operating sites |



Note 1: Data scope covered manufacturing and operating sites of the Winbond Group.
Note 2: Water withdrawal = the sum of withdrawals from surface water (excluding rainwater and condensate water), groundwater, and third-party water.
Note 3: Water discharge = the volume of water discharged to groundwater and wastewater treatment plant.
Note 4: Water consumption = water withdrawal - water discharge.

| Upstream and downstream water use relationship diagram for manufacturing sites |



Water resource efficiency management

Winbond (Taiwan) all manufacturing and operating sites passed ISO 46001 Water Efficiency Management System certification. Winbond strengthened systemized mechanisms for water performance objectives and targets, action plans, performance indicators and baselines, monitoring and data analysis, regular performance review and audit, and daily management of significant water-using equipment. These mechanisms improved water-use efficiency and strengthened water resource utilization through reduction, substitution, or reuse methods.

Water risk

The World Resources Institute (WRI) served as the water risk assessment tool. Results from the Aqueduct Water Risk Atlas on the AQUEDUCT website indicated that all manufacturing and operating sites of the Winbond Group were located in low water stress areas.

In response to extreme climate conditions, Winbond established crisis handling procedures for major disasters or incidents. Manufacturing sites installed underground water storage tanks and pursued stable water sources to support factory operations. Maintenance plans for water treatment facilities strengthened equipment performance and reliability to mitigate water shortage and water rationing risks during dry seasons.

Water conservation and reuse

Winbond (Taiwan) set a mid-term target to maintain an average site-wide water recycling rate above 80% annually by 2030. In 2025, recycled water reached 14.068 million cubic meters. The site-wide water recycling rate reached 82.7%, and the process water recycling rate reached 90.3%, consistent with commitments under the science park environmental impact assessment.

Ultrapure water served as the primary water consumption point at manufacturing sites. Process improvements and technology upgrades reduced ultrapure water intensity year by year. In 2025, ultrapure water use reached 4,345 megaliters. Ultrapure water intensity reached 0.141 m^3/layer.

Winbond (Taiwan) continued to reduce manufacturing water use and increase recycled water reuse through four dimensions: reducing water withdrawal and water consumption, selecting water-saving designs, optimizing production processes, and improving facility water-use efficiency. In 2025, 11 water-saving measures continued, including recycling and reuse, process optimization, and process improvement. Total water savings reached 52.99 megaliters.

Category	Action plan	Water savings (megaliters)
Recycling and reuse	Recycle process wastewater from wet etching equipment	28.50
Process optimization	Optimize and adjust utility system procedures	19.35
Process improvement	Adjust process water use and optimize parameters	5.14

Case study ▶ Optimizing chemical dosing control through data science applications

Traditional wastewater treatment often relied on fixed chemical dosing or manual adjustments based on experience, which frequently resulted in over-dosing and increased environmental load. In the fluorinated wastewater system, Winbond built an intelligent dosing model using real-time water quality monitoring data and historical operating data. The model dynamically adjusted dosing in response to inflow water quality and load fluctuations. Chemical use decreased while stable effluent quality was maintained, delivering dual benefits of chemical savings and stable system operation.

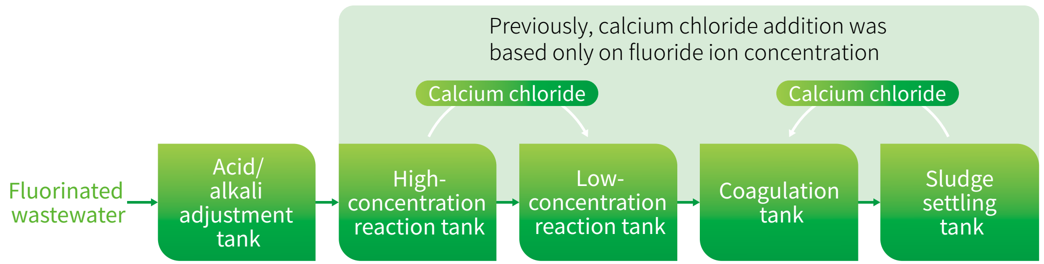
Following on-site validation at the Central Taiwan Science Park site, the Kaohsiung site also implemented the model. Intelligent AI technology also extended to the ammonia nitrogen wastewater treatment system, demonstrating scalable environmental sustainability benefits.

Real-time Transparency: Dashboards for effluent quality, discharge volume, recycling rate, chemical consumption, and energy consumption

Predictive Alerts: Effluent concentration forecasting, anomaly detection, and proactive response and handling

Intelligent Optimization: Gradually expanded applications from fluorinated wastewater systems to ammonia nitrogen systems

Continuous Management: Established data quality maintenance and access control mechanisms to enable institutionalized operations and continuous optimization



Calcium chloride usage per unit of wastewater decreased by **4.5%**

Intelligent dosing control

In addition to fluoride ions, operating parameters such as flow rate and pH were added. Predictive models were used to execute optimized dosing, reducing chemical waste and environmental burden

Water pollution prevention

Winbond (Taiwan) continued to advance wastewater resource management. Based on wastewater composition and concentration, 28 diversion systems were established to support recycling and reuse. Wastewater that could not be reused was properly treated and then discharged into the science park wastewater treatment plant system. In 2025, the water pollution composite index reduction rate reached 86.3%, exceeding the annual target of 78%.

Operating discharge permits were obtained in accordance with water pollution prevention regulations and the Soil and Groundwater Pollution Remediation Act. In addition to rigorous monitoring and management of utility wastewater systems, third-party testing was conducted twice a year by accredited laboratories. In 2025, all test results exceeded the science park water quality acceptance standards. [Appendix VII: Third-party testing for wastewater discharge to the sewer system]

The wastewater treatment system incorporated redundancy and early-warning mechanisms to strengthen stable operation. In the event of system failure, backup equipment started immediately to ensure continuous operation. No abnormal wastewater discharge incidents were recorded in 2025.

In response to domestic requirements to include total phosphorus in effluent standards beginning in 2027, Winbond (Taiwan) incorporated total phosphorus into Water pollution composite index reduction rate management in 2025. Wastewater diversion technology recovered phosphoric-acid-containing wastewater, which was then concentrated and purified into industrial-grade phosphoric acid by qualified waste treatment vendors. This approach reduced total phosphorus concentration to meet effluent standards.

Source Reduction

- Adopted actions to reduce water intake and consumption
- Selected water-saving designs
- Optimized production processes
- Improved water-use efficiency of facilities

Source-based Characteristic Segregation

28 Categories

- Based on wastewater concentration and characteristics, 28 segregation systems were established
- Significantly reduce end-of-pipe treatment load and increase opportunities for water recycling
- Increased by-product resource recovery

Recycling Systems

5 Types

- Five wastewater recycling systems were designed by wastewater characteristics Improve water recycling and wastewater treatment efficiency. Create resource recovery opportunities for various chemical wastewater streams

Treatment Systems

9 Types

- Through wastewater segregation, wastewater quality was simplified
- Reduce environmental load and chemical usage in wastewater treatment facilities
- A total of nine wastewater treatment units were deployed

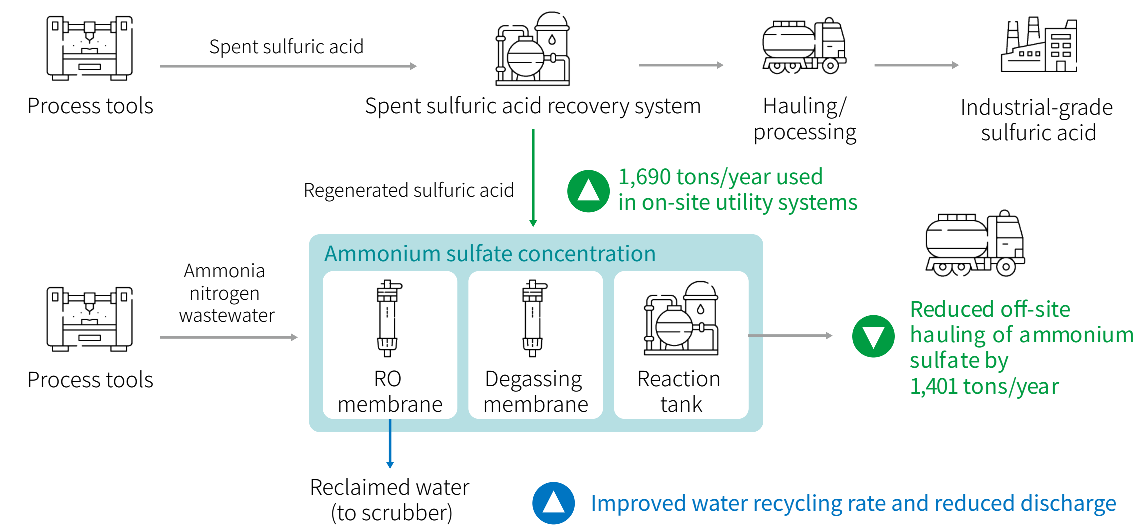
By-product Valorization

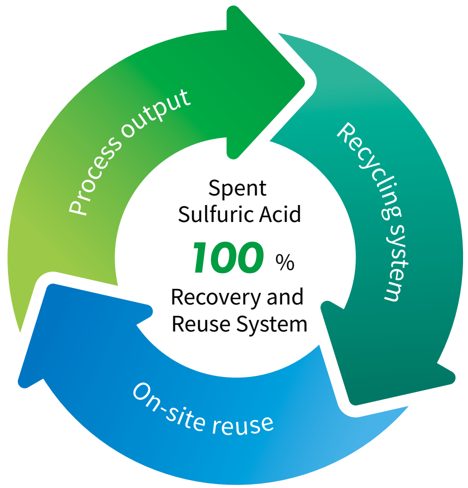
3 Initiatives

- Internal recycling of spent sulfuric acid; ammonium sulfate concentration to reduce off-site hauling
- Off-site distillation of ammonium sulfate could be converted into industrial ammonia water; after dehydration and crystallization, it could be converted into solid ammonium sulfate fertilizer
- TMAC (tetramethylammonium chloride) could be electrolytically refined off-site into TMAH (tetramethylammonium hydroxide), which could be used as a developer for the optoelectronics industry

Case study

▶ by-product value enhancement—on-site recycling of waste sulfuric acid and concentration of ammonium sulfate to reduce off-site transport





Degassing membrane technology

Ammonia nitrogen wastewater reacted with sulfuric acid to produce ammonium sulfate for recovery and reuse; In 2025, a total of 1,690 tons of recovered sulfuric acid were utilized

Ammonia nitrogen wastewater segregation management

Wastewater was traced and segregated to increase ammonia nitrogen concentration

NEW Ammonium sulfate concentration

Innovative pilot testing of ammonium sulfate concentration technology; data science analysis was introduced to adjust the recirculation valve opening based on influent ammonia nitrogen concentration. System stability improvements were implemented concurrently, including installation of ammonia nitrogen analyzers, diaphragm valves, specific gravity meters, pH meters, and other instruments to enhance stability, reducing off-site hauling of ammonium sulfate by 1,401 tons in 2025

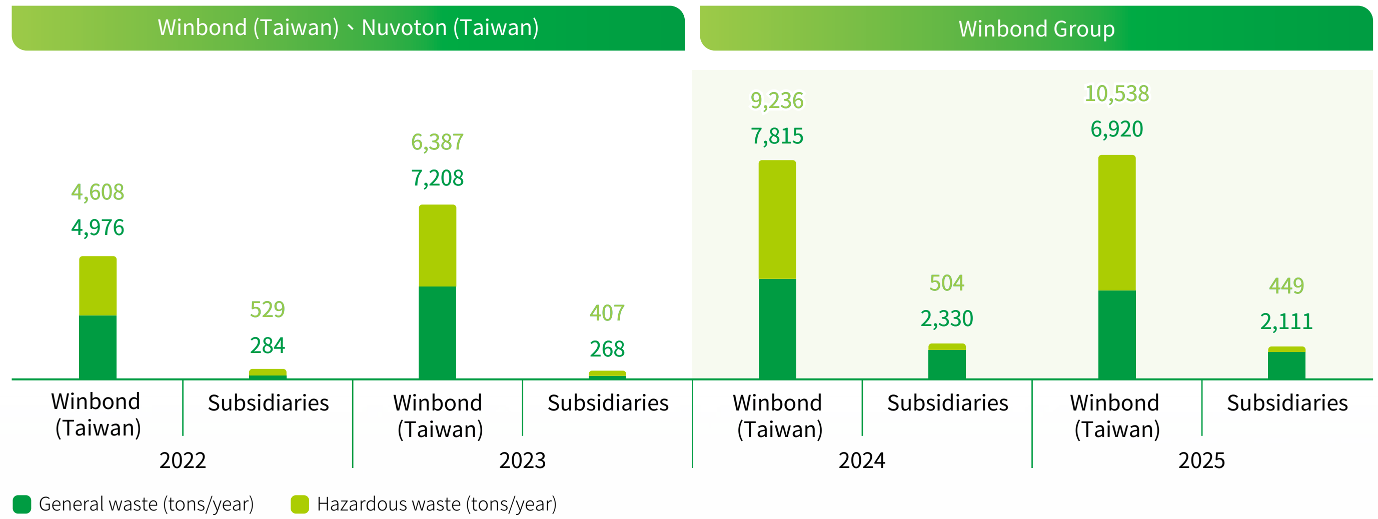
4.4 Sustainable Resource Management

Winbond delivered commitments under the《Environmental Responsibility Policy》and the《ESH Protection Policy》. The sustainable resource management strategy focused on “minimizing waste treatment and maximizing resource circulation.” Source reduction strengthened recycling and reuse and reduced environmental load from production. Ecological benefit considerations were integrated across operating stages to improve energy performance and to build a green value chain characterized by low energy consumption and reduced resource use. Procurement supported high energy efficiency and green products and services to maximize energy and resource utilization efficiency. Proper waste handling supported circular economy practices and reduced environmental impacts.

In 2025, total waste generation across the Group’ s manufacturing and operating sites reached 20,018 metric tons. [Appendix VII: Environmental Sustainability Information]

In 2025, total waste generation at Winbond (Taiwan) manufacturing and operating sites reached 17,458 metric tons. Outsourced waste treatment intensity reached 0.565 kg/layer. All waste was properly handled by qualified waste treatment organizations. No waste disposal was conducted directly on-site. The mid- to long-term management target set the waste recycling rate above 90%. In 2025, recycled waste reached 16,351 metric tons, and the waste recycling rate reached 93.7%, achieving the target.

Waste generation statistics for the Winbond Group’ s manufacturing and operating sites



Waste vendor compliance audits

In 2025, Winbond (Taiwan) completed 64 audits. Of these, 36 audits were conducted before cooperation and during the treatment phase. All results met Winbond requirements. Audit ratings in 2025 included 30 vendors rated “Excellent,” 4 rated “Standard,” and 2 rated “Requires Attention.” Vendors rated “Requires Attention” were subject to enhanced audits to ensure alignment with Winbond requirements.

Before cooperation

5 Evaluated five new vendors

Conducted vendor legitimacy checks, treatment technology evaluation, and on-site inspections; cooperation and contracting proceeded only after qualification

Removal stage

28 Observed safety practices for 28 vendor operations

Before operations at the site, verified removal equipment and hauling records

Treatment stage

31 Conducted 31 annual audits

Audit scope covered on-site operations management of treatment and recycling facilities, environmental management, penalties and non-compliance records, and cooperation with hauling and treatment

Sustainable resource management actions

At Winbond, the majority of manufacturing waste is effectively recovered through recycling, reuse, or waste-to-energy incineration, with only a small portion requiring final disposal. Guided by resource circulation principles, Winbond continued to identify new reuse pathways and advanced sustainable resource management. Winbond engaged vendors and supply chain partners through an environmental forum, plastic reduction actions, shared reusable circulation boxes, and packaging reduction. UL2799 Zero Waste to Landfill principles were promoted across the supply chain to support source reduction and resource reuse.

On-site circular reuse

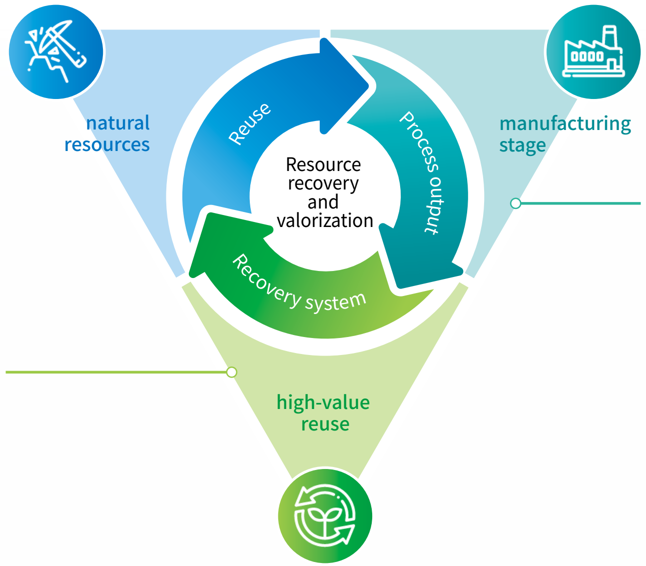
- TMAH (tetramethylammonium hydroxide) reused in manufacturing processes
- After recovery, approximately 40% of spent sulfuric acid could be reused in on-site utility systems

Off-site circular reuse

- Sludge: Used as cement raw material and low-strength concrete
- Chemicals: Converted into industrial-grade chemicals and regenerated solvents for industry reuse

Off-site waste-to-energy incineration

- Thermal energy used by the central scrubber



Source reduction

- Reduced raw material usage
- Leasing instead of purchasing: Official vehicles, copiers, and other general equipment
- Food: Winbond was an early participant in the Ministry of Environment's "Green Dining Table" initiative, refraining from proactively providing single-use items, using local ingredients, and ordering responsibly to reduce food waste. Winbond manufacturing sites obtained the "Green Dining Table" label from the Ministry of Environment.

Materials circulation

- Implemented shared logistics mechanisms and adopted reusable circulation boxes based on annual demand to deliver to Winbond operating sites.
- After return, the circulation boxes were cleaned and prepared by sheltered workshops, creating income for sheltered workshops and employment opportunities for disadvantaged groups, generating integrated sustainability benefits.

Back-end packaging and testing services

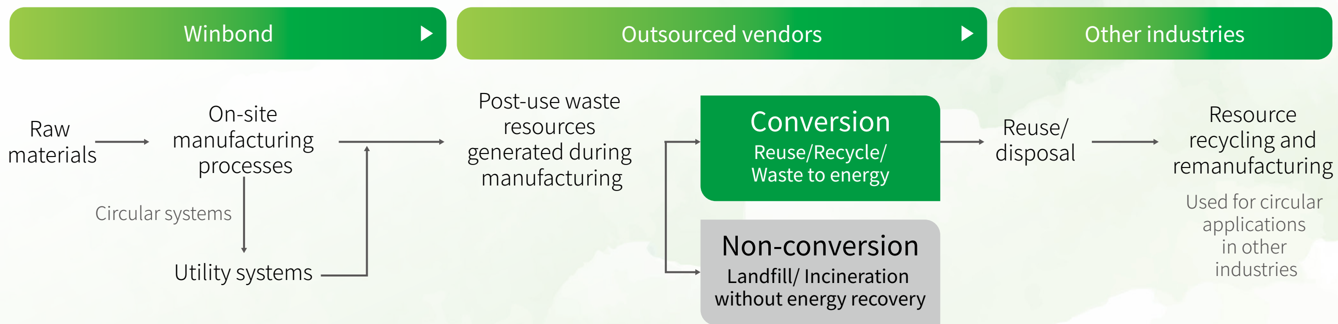
- Promoted packaging material carbon reduction projects, including replacing paper boxes with antistatic boxes, reducing reel materials, recycling and reusing carrier tapes and tube materials, and eliminating duplicate labeling tags.

Case Study ▶ UL2799 Zero Waste to Landfill certification—All manufacturing sites achieved Platinum level

UL 2799 Zero Waste to Landfill (ZWTL) is an environmental sustainability certification standard developed by Underwriters Laboratories Inc. (UL). Through quantified scientific calculation, all waste was required to undergo reduction, recycling and reuse, and energy recovery processes to avoid landfilling and to prevent waste of thermal energy after incineration. This approach improved overall resource conversion rates and enabled continuous waste reduction strategies toward comprehensive resource utilization.

In 2025, Winbond (Taiwan) adopted UL2799 Zero Waste to Landfill certification. All manufacturing sites obtained the highest UL2799 certification level, Platinum, demonstrating strong outcomes in advancing waste resource utilization.

In 2025, the Winbond environmental forum focused on resource circulation. UL Solutions Taiwan, ASE, and Innolux shared experiences in advancing UL2799 Zero Waste to Landfill and the circular economy. Participants included employees, subsidiary Nuvoton, supply chain partners, and science park vendors. The forum was delivered through in-person and online formats, with 924 participations.



4.5 Air Pollution Prevention

Source reduction and high-Efficiency Treatment

Winbond prioritized source reduction as the air pollution prevention strategy. Process improvements rationalized and reduced air pollutant generation. High-efficiency prevention equipment treated pollutants in exhaust gas, enabling atmospheric emissions to outperform government requirements. Historical monitoring and testing results indicated that air pollutant emissions consistently outperformed regulatory emission standards.

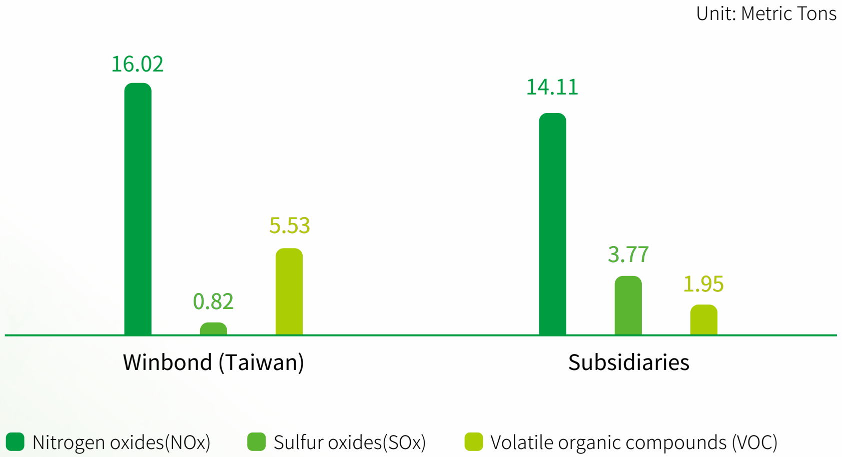
Proper Treatment and Performance Beyond Regulatory Requirements

For specific harmful, flammable, and fluorinated gases (Fluorocarbons, FCs) process exhaust, on-site local scrubbers were installed to deliver adsorption and combustion oxidation treatment. Exhaust containing inorganic acids and alkalis was then routed to central scrubbers for water washing and neutralization. Exhaust containing volatile organic compounds (VOCs) was treated via zeolite rotors for adsorption and then processed through direct-fired oxidizers. In 2025, average VOC removal efficiency reached 99%, outperforming regulatory requirements.

Real-Time monitoring and stable operation

Air pollution control equipment was designed with the capability to immediately switch to backup systems during emergencies or maintenance activities and was supported by emergency power supplies and other redundancy mechanisms. Advanced real-time monitoring systems continuously tracked operating parameters 24 hours a day. When deviations exceeded internally defined control thresholds, the system immediately issued alerts, enabling prompt response by personnel. This ensured stable, uninterrupted operation 24 hours a day, 365 days a year, effectively treating air pollutants and complying with Taiwan’ s Air Pollutant Control and Emission Standards for the Semiconductor Manufacturing Industry and the Air Pollutant Emission Standards for Stationary Pollution Sources.

Air Pollutant Emissions



Note: Emissions data reflect values reported in accordance with local regulatory requirements. POP, HAP, and PM were not included in the scope of regulatory-required detection.

Winbond (Taiwan) VOC removal efficiency