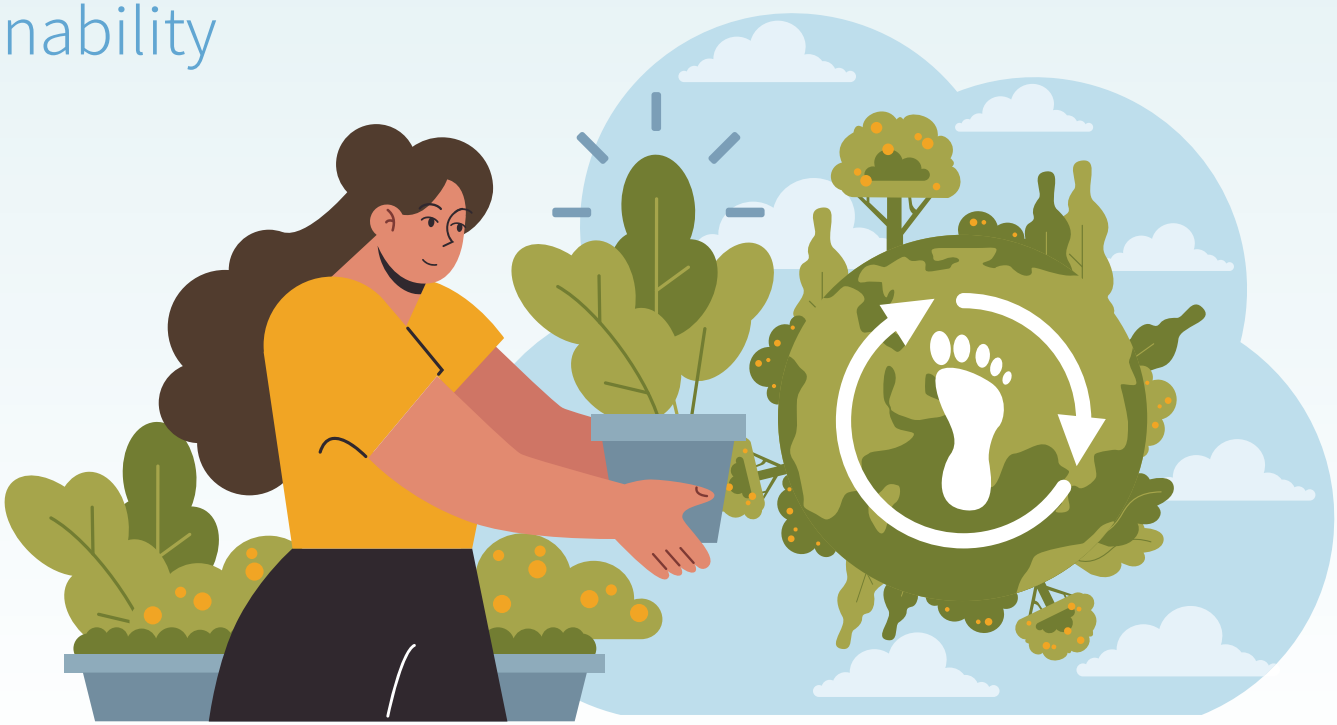
Chapter 4

Environmental Sustainability and Climate Change



Material topics in this chapter

Water management
Air pollution control
Waste management
Climate change and energy management

Performance Highlights

- Environmental Expenditure: approx. NT$ **109.27**million
- Annual reduction: Electricity by **1.72**% energy decreased by **1.35**%, carbon decreased by **1.55**%, water decreased by **5.51**%
- Increased materials recycling rate to **14.6**%
- Continuous implementation of ISO 14064-1 GHGs Inventory and Verification and Scope 3 inventory
- Receiving an **A-** rating from the CDP Water Security Management Assessment.
- Implementation of ISO 14067:2018 Carbon Footprint of Products and verification

4.1 Environmental management system

In 1998 we established the ISO 14001 environmental management system (EMS), with 100% coverage. EMS provides USI with a good environmental protection framework for controlling and reducing environmental impacts, preventing accidents from impacting the environment, and ensuring legal compliance. Following international trends, we have integrated the EMS and the health and safety system to draw up an HSE (health, safety, and environmental protection) policy and the "five zero goal".

Upholding and realizing the business philosophy of the Chairman, we optimize occupational safety and health, process safety, and environmental protection to protect the health and safety of employees and maintain the environment and ecosystem. This is our wish and the responsibility of every employee.

To promote sustainable development, fulfill ESG with due diligence, and support clean production and environmental protection, Kaohsiung Plant will make continual improvement of the workplace environment, operation safety, process waste reduction, water efficiency, energy conservation, and carbon reduction in order to achieve the “five zero goal: zero pollution, zero emission, zero accident, zero occupational hazard, and zero failure".

Environmental objectives and management programs

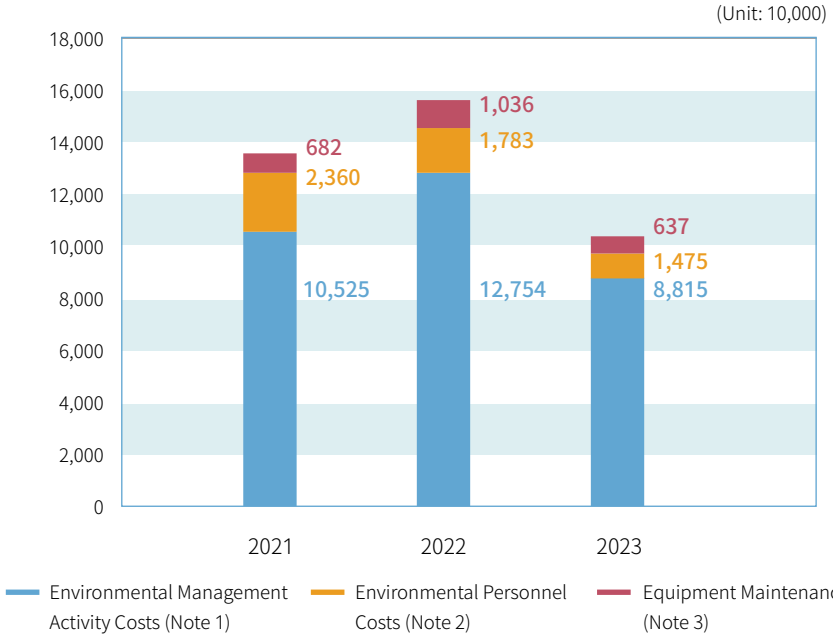
2023 Environmental Protection Targets and Management Programs

Policy	Goals	Program	Effectiveness	2024 Management Program
Zero Emission	Zero air pollution: Equipment/component VOC leakage <0.5%	1. Reduce equipment/component for emission leakage of VOCs (Plant I) 2. Reduce the annual leakage of VOCs (Plant II) 3. CBC Leaked Emissions of VOCs Reduction Plan (CBC Plant)	Reduced VOCs leakage of plants I/II/CBC to below 0.5% in 2023.	1. Monthly greenhouse gas emissions and carbon tax estimates 2. Monthly carbon reduction estimates
	Zero Wastewater Emissions: Improve wastewater recovery rate by 2% (based on 2021 baseline)	Purchase the new float oil pump	2023 wastewater reclamation volume: 30,614MT	Improve sludge treatment in wastewater pools
	Reduce GHGs Emissions by 1,560 tCO_2e	Implement 2 energy-saving projects	2023 cumulative energy savings: 3,267,614 kWh, reducing GHGs by 1,618 tCO_2e	2024 cumulative energy savings: 2,015,910 kWh; LNG savings: 306,134 tons; reduce GHGs by 1,629 t CO_2e
	Reduce water discharge by 5,280MT	Continuous monitoring and reclamation of effluents	2023 wastewater water reclamation: 30,614MT	2024 estimated wastewater water reclamation: 20,000MT
Zero Pollution	Zero air pollution: Reduce the leaked emissions of VOCs	1. Replace the VA transfer pump in Plant I 2. Replace the ethylene unloading pump in Plant I 3. Replace the EF-line xylene CIP pump	Reduced VOC leakage, enhanced transmission efficiency, and reduced energy consumption.	1. Reduce equipment/component leaked emissions of VOCs. 2. Reduce the annual leakage of VOCs. 3. CBC Leaked Emissions of VOCs Reduction Plan (CBC Plant) 4. Recover 31,500 kg/year from Plant 1 V-404 VA tank 5. Adding a new Modifier pump J-220H to the C-line reduces VOC emissions to the atmosphere by 292.76 kg. 6. Adding two new Modifier pumps J-220P and J-220Q to the EF-line reduces VOC emissions to the atmosphere by 585.52 kg.
	Prevent environmental contamination caused by plastic resin pellet leakage	Management of Plastic Resin Pellet Leakage	1. Enhanced publicity of dust zone cleaning and tanker loading area cleaning. 2. Ensured that the unloading pipe is inserted in the inlet and surroundings are covered with dust screens before unloading in the tanker loading operating process to prevent materials from splashing. 3. Inventoried the leakage prevention and management measures of plastic resin pellets in the processing area and recovered 12MT of plastic resin pellets in 2023.	Continuously implement the prevention and management of plastic resin pellet leakage.

Environmental Expenditures

Our environmental management costs include the cost for environmental management activities, environmental-protection-related personnel expenses, and equipment maintenance costs. In 2023, we actively implemented the reduction of leaked emissions of VOCs, water recycling and reuse, energy conservation and carbon reduction, and emissions reduction. The total amount of environmental expenditures in 2023 decreased by 29.8% over 2022 to about NT$109.27 million. The primary differences are due to the reduction in natural gas consumption for control equipment and decreased repair expenditures for environmental and safety equipment in 2023.

Environmental Expenditure Over the Past Three Years



Note 1: The cost for environmental management activities includes the fees for air pollution control, water pollution prevention, waste disposal, noise pollution prevention, management of toxic and concerned chemical substances, industrial safety improvement, depreciation of fixed assets and others (e.g., cleaning and mowing).

Note 2: Environmental-protection-related personnel expenses include personnel expenses and environmental protection-related training fees.

Note 3: Equipment maintenance cost includes the fees of environmental-related equipment and the fees for equipment maintenance.

4.2 Water management GRI 2-25, 3-3, SDG 6

Sustainability Principle: Sustainable Development

Significance and Strategy

Significance to USI

In response to global climate change, valuable water resources are reclaimed for reuse through water conservation and emission reduction measures.

Strategy

1. Reduce pollution and emission through process and source improvement and then end-of-the-pipe treatment promote water resource recycling and reuse.
2. Constantly invest in discharge reduction management, implement water conservation, and water resource reclamation management.
3. Implement the water efficiency management system and flood prevention measures

Commitment

Annual water conservation >1%

Data scope: USI coverage 100%

Impact Management

Short-, Medium- & Long-Term Positive/Negative Impacts

Short-term Positive actual impact: Enhance water recycling efficiency and reduce production costs.
Short-, Medium- & Long-Term
Negative actual impact: Water shortages, production disruption due to torrential rain
Short-term negative potential impact: Water Consumption Costs from November 2022 to April 2023 - Approximately NT$280,000.

Impact Boundary

USI Kaohsiung Plant and Environment, Global Customers and Government Agencies

Processes to remediate and prevent negative impacts

Enhance water recycling and reuse, improve manufacturing processes to reduce steam consumption, and buy water with water trucks.

Achievement and Goal

2023 Goals

Wastewater treatment system, Estimated water conservation with the MRT condensate recovery improvement and retention basic rainwater harvesting system: 48,500MT/year, saving water by 4.63%.

2023 Achievements

1. The CDP Water Security Project has achieved an A-rating.
2. MRT Condensate Water Recycling Improvement and Rainwater Harvesting System with Detention Ponds: 56,485MT/year, saving water by 5.51%.
3. Collected 12MT of plastic resin pellets through the Plastic Resin Pellet Collection Program.

2024 Goals

1. Estimated water conservation with the Wastewater Treatment System, MRT Condensate Water Recycling Improvement and Rainwater Harvesting System with Detention Ponds: 46,00MT/year, saving water by 4.40%.
2. In 2023, the unit water consumption is projected to decrease by 0.5% compared to the baseline year of 2022.

Medium- & Long-Term Goals

Reducing water withdrawal and consumption and improving water quality to enhance water recycling and reuse.

Management

Effectiveness Assessment

1. Water conservation volume
2. Wastewater reclamation volume

Grievance Mechanism

- “Contact us” on the corporate website.
- Stakeholder contact information
- Stakeholder questionnaire

Chapter Summary

1. Water management*
2. Promote the water efficiency management system
3. Management of Plastic Resin Pellet Leakage

Water management

GRI 303-1:2018, 303-3:2018, 303-4:2018, 303-5:2018

RT-CH-140a.3

Goals and Management Units

The circular economy is an industrial system designed for recovery and regeneration to replace “end of life” with “recovery" in order to turn waste into resources and thereby achieve waste reduction. By continuously implementing the circular economy, we implement water conservation and drainage reduction through improvement programs to reclaim and recycle valuable water resources for reuse and set the annual water conservation target at “1%". The actual conservation in 2023 was 5.51%. The boundary of water resource and effluent management is the Kaohsiung Plant, with data coverage of 100%.

In 2023, to further strengthen water management, the head of the Kaohsiung plant designated the Technical Department as the responsible unit. They are tasked with reporting to the Board regularly, with the baseline year being 2022. The goal is to reduce unit water consumption by 0.5% annually.

Water resource

In terms of water stress distributions, based on the water stress by country in the ‘Aqueduct Water Risk Atlas’ published by the World Resources Institute (WRI), the water stress of Taiwan falls at the low to medium level, with water stress at 10-20%.

According to the 2021 water resources statistics published in the Water Resources Agency Register Statistical Report, MOEA, the water consumption of Kaohsiung City was 2,760,964 ML, including 328,136 ML of water for domestic use and public use, 139,220 ML of water for industrial use, 1,314,473 ML of water for agricultural use, and 253 ML of water for other uses. The 2022 total water withdrawal of Kaohsiung Plant was 925.439 ML, accounting for about 0.0335% of Kaohsiung City’s total water consumption. Kaohsiung Plant withdraws water mainly from tap water supplied by the Pingding Waterworks and Cheng Ching Lake Waterworks for product production, equipment cooling, boiler, domestic use of employees, and other uses. In 2023, due to an increase in annual production, the water withdrawal increase by about 44.1 ML to 969.538 ML compare to 2022.

2023 Water Withdrawal, Discharge, and Consumption

GRI 303-3:2018, 303-4:2018, 303-5:2018

RT-CH-140a.1

Total water withdrawal 969.538 ML

Low to medium water stress areas
Water stress: 10-20%

- Third-party water - freshwater (≤ 1,000 mg/L TDS): 947.049 ML
- Surface water - Rainwater: 8.764 ML
- Water cart capacity: 13.725 ML
- No runoff, groundwater, seawater, output water

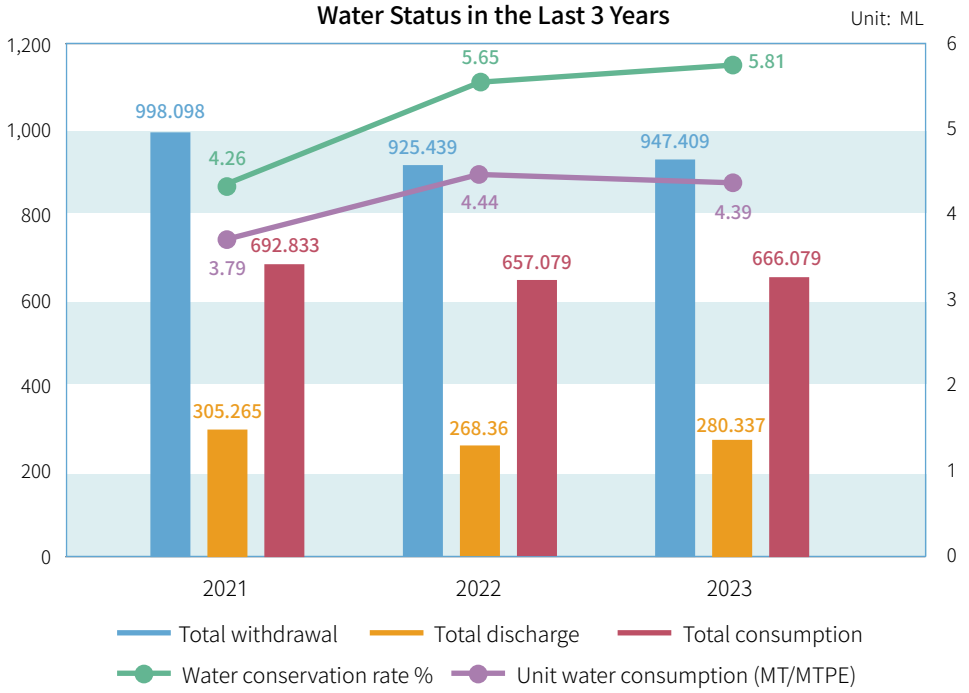
Note: The intake of third-party water is recorded based on meter readings (flow meter). The intake of rainwater is calculated according to the water resource recovery plan "Detention Ponds and Rainwater Harvesting in Tank Areas." The water cart capacity is based on data from the supplier's water withdrawal records.

Total water discharge: 280.337ML

- Runoff- fresh water (≦ 1,000mg/L TDS): 280.337ML
- Discharge contains no groundwater, seawater, and third-party water.
- NH4 in 2023H1 and 2023H2 was 0.13 mg/L and 0.06 mg/L，far below the effluent standard (20mg/L).

Note: Discharge is subject to the readings on the effluent meter (flow meter).

Total Consumption = Total Withdrawal – Total Discharge = 689.201ML



Note: The CBC plant is still in the trial operation stage before 2021, and unit water consumption is not included in the calculation

Water conservation and reclamation GRI 303-1:2018

Following the rising water demand, escalating climate change impact, and expanding sustainability pressure, we keep a constant track on water shortages and endeavor to reduce water consumption or enhance water reclamation in response.

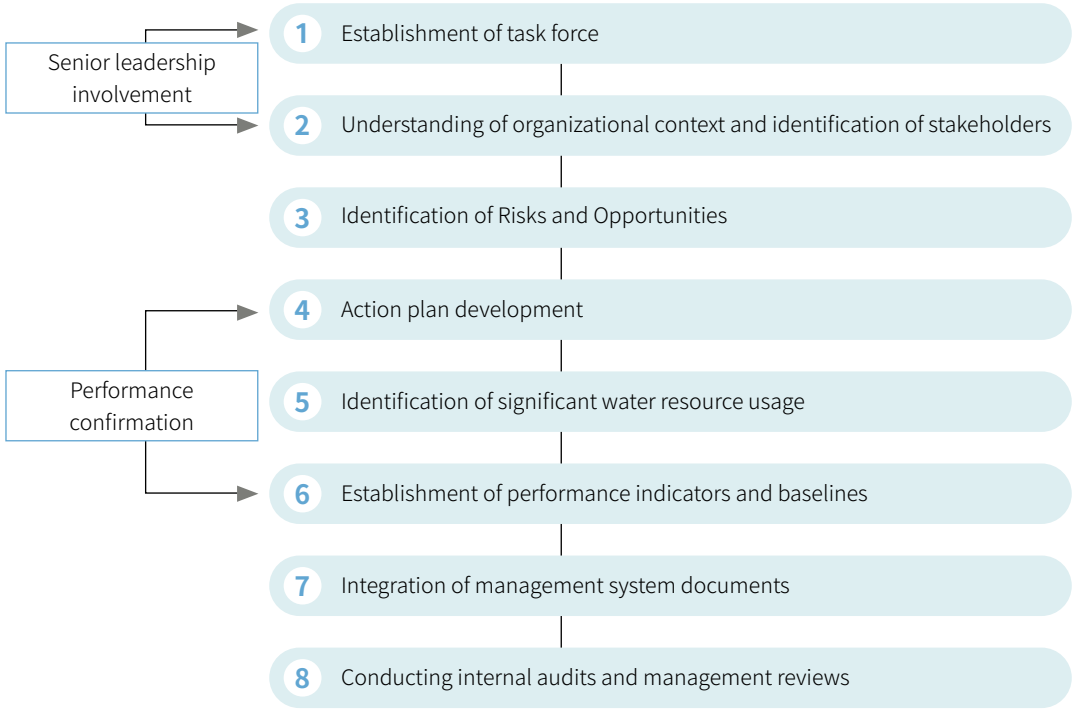
We began to build the water monitoring system in 2020 to keep constant track of the water supply. Based on the drought response measures, apart from cutting unnecessary water consumption, enhancing pipeline and switch tour inspection, and reducing cooling water discharge, we also get support for water in the fire fighting storage tanks, buying water with water trucks, following the government's 3-stage rationing measures, and actively implement various water improvement programs to reduce total water withdrawal each year.

Water reclamation program	Effectiveness
Continuous monitoring and reclamation of effluents	Continuous monitoring of the in-house effluent quality to enhance effluent treatment and response capacity and ensure that effluents comply with the discharge standards. After reclaiming by the system, effluents are treated before being transported to the cooling tower for re-use to reduce tap water consumption and process effluents. **Calculation: According to the actual pump reading on-site, the total wastewater recycled in 2023 was 30,614 MT.**
Detention basin and storm water reclamation channel	Pipelines will be installed from the existing detention basin and storm water reclamation channel to the cooling tower. After filtering by the storm water separator next to the cooling tower, storm water will be re-used by the cooling tower. The estimated water reclamation in 2022 was about 5,786MT. Calculation: The project was completed in 2017 and started operation in 2018. The plant rainwater collection area is 3,500m^2, the tank site dike area is 2,300m^2, Kaohsiung's annual rainfall in 2023 was 1,679cm (Note 2). Based on a reclamation rate of 90%(Note3), the estimated water reclamation is about 8,764MT/year.
MRT Steam Condensate Recovery	Steam condensate is recovered for reuse in the boiler to reduce tap water consumption. The project annual recovery is 17,107MT. Calculation: Steam condensate recovery at 2.4MT/*24hours/day. The number of workdays is 330 days/year* reclamation rate 90%. The annual recovery is thus 2.4×24×330*90%=17,107 (MT/year).

Note: 1. The estimated volume of reclaimed and recycled water in 2023 was 56,485MT; the total water withdrawal was 969.538MT; the volume of reclaimed and recycled water was 5.83% of the total water intake.
2. Annual rainfall data sourced from the "Central Weather Administration, Ministry of Transportation and Communications."
3. MRT Steam Condensate Recovery, detention basin and storm water reclamation channel - Due to possible losses from pumps, pipelines, and rainwater evaporation, the estimated recycling amount is calculated at 90% of the computed value.
4. MRT Steam Condensate Recovery - The time required for actual equipment maintenance or repair, the number of working days in the year is calculated as 90% of the 365 days in the year (based on 330 days).

Water Efficiency Management System GRI 303-1:2018

In 2021 we implemented the ISO 46001:2019 Water Efficiency Management System (Certificate valid from March 17, 2022, to May 17, 2025). By inventorying the current status and ways of water consumption across the plant, through identifying, planning, managing, and improving the risks and opportunities of water with systematic water consumption management, and thereby optimizing water demand management, we effectively achieved the goals of water conservation and discharge reduction to enhance water efficiency and reduce water costs.



In 2023, we enhanced wastewater system management and optimized operation to reduce wastewater discharge and increase wastewater reclamation. The actual reclamation was 30,614MT. Additionally, about 8,764MT of water was reclaimed within the retention basin and rainwater harvesting in the tank area.

In 2024, the estimated volume of recycled water was 46,000 MT, with an estimated wastewater recovery rate of 4.40%.

Effluents Management GRI 303-1:2018

Wastewater from the plant is the main source of effluents from USI. According to KSEPB's effluent runoff discharge permit, effluents that cannot be refused after treatment and comply with the environmental protection laws and regulations can be discharged to the surface water body -- Houjing River. The pollution of Kaohsiung Plant is below 0.00324 %.

Wastewater is transported to the water treatment plant for treatment via wastewater pipelines. The wastewater treatment system includes the pre-treatment and primary (physical) treatment. Through trash screening, oil removal, sedimentation, and chemical treatment, and the sludge treatment unit for wastewater solid-liquid separation, effluents meet the drainage quality before discharge.

To reduce the environmental impact of discharge and promote waster recycling and reuse, besides complying with environmental protection laws and regulations, we optimized the functions of the wastewater (sewage) treatment plant in 2020, including adding the sludge concentration tank, improving the bottom sludge removal system of the sedimentary tank, and building the sludge rinsing system for the flotation system to enhance sludge treatment and collection efficiency. **The actual 2023 wastewater reclamation volume was 30,614MT, with an achievement rate of 9.85%.**

Water quality monitoring and management GRI 303-2:2018, 303-4:2018

Every half year, we hire environmental analysis organizations approved by the Environmental Analysis Laboratory (EAL) to examine water quality of effluents from our plants, including NH4 required for total volume control. Every year, effluent test items required for reporting are well-followed the effluent standard. According to previously amended and promulgated "Effluent Standards", the water quality control of discharge from the petrochemical industry includes 22 items, including 7 general water quality items and 15 specific water quality items. In our 2023 untreated wastewater and effluent quality tests and analysis, effluents met the effluent emission standard.

Results of Water Quality Examination in Last 3 Years

Water Quality Indicator	2021		2022		2023		Effluent Standard (Petrochemistry)
	H1	H2	H1	H2	H1	H2	
SS (mg/L)	9.0	5.7	8.0	9.7	8.6	14.2	30
Grease (mg/L)	6.6	4.5	9.5	5.7	5.3	4.3	10
COD (mg/L)	14.4	25.5	26.4	19.7	33.5	77.8	100
NH4 (mg/L)	0.78	0.48	0.2	0.63	0.13	0.06	20

Prevention and Management of Plastic Resin Pellet Leakage

The US Plastics Industry Association and American Chemistry Council co-promote the Operation Clean Sweep (OCS) campaign dedicated to preventing plastic resin pellets, flakes, and power loss from entering the ocean to cause environmental pollution.

In 2020, we began implementing the measures for prevention and management of plastic resin pellet leakage and awareness education for in-house plastic resin pellet leakage management. In 2023, we performed the on-site walk-through inspection of contractors and comprehensive process area inventory to understand the methods that contractors and employees adopted to clean up and prevent the leakage of plastic resin pellets. We also established new or revised related control documents to ensure the collection of plastic resin pellets, flakes, and powder to prevent them from polluting the environment by rainfall or sewage. In 2023, we recovered a total of 12MT of plastic resin pellets across the plant.

Year	2021	2022	2023
Recovery Weight (kg)	1,2871.1	11,889.4	11,996.9

Operation management

- Site Inspection and Review
- Enhancing Employee Awareness
- Establishment of Procedure Documents
- Tracking Execution Results

Workplace

- Leveling of Site Ground
- Setting Up Barriers
- Providing Employees with Cleaning Equipment

Personnel Training

- Education/training
- Enhancing Colleague Compliance with Operating Procedures
- Workplace Advocacy

Management Measures

- Unloading Management
- Transportation Packaging Management
- Area Cleaning
- Collection Management

4.3 Air pollution control

Sustainability Principle: Sustainable Development

GRI 2-25, 3-3, SDG 11

Significance and Strategy

Significance to USI

Continuous environment improvement to achieve "zero pollution and zero emission."

Strategy

1. Reduce pollution and emission through process source improvement in support of end-of-the-pipe treatment.
2. Constant investment in environmental pollution control (prevention) management.
3. Compliance with the Gaoping total volume control.

Commitment

Enforce zero pollution and zero emission.

Data scope: Kaohsiung Plant

Impact Management

Short-, Medium- & Long-Term Positive/Negative Impacts

Short-, Medium- & Long-Term negative actual impact: Air pollution

Impact Boundary

Community residents, environmental and ecological impacts of pollution

Processes to remediate and prevent negative impacts

Negative impact remediation: Sponsor plantation and forestation for 5 hectares and began sponsoring air quality purification area on an annual bases in 2018

Preventive measures: Improve air pollution and environmental protection equipment and increase materials recycling to reduce air pollution.

Achievement and Goal

2023 Goals

1. Zero air pollution: Equipment/component VOC leakage <0.5%
2. Zero air pollution: Reduce the leaked emissions of VOCs

2023 Achievements

1. VOCs equipment component leakage: 0.038%
2. Pump replacement project progress at 100%

2024 Goals

1. Equipment/component VOC leakage <0.5%.
2. Zero air pollution: Estimation of GHGs and reduction
3. Zero air pollution: Reduction of VA emissions to the atmosphere by 31,500MT through recovery
4. Zero air pollution: Replacement of old pumps with new ones to reduce VOC emissions to the atmosphere. Implementation of 2 schemes involving the replacement of 3 pumps, resulting in a total reduction of 878.28 kilograms of VOC emissions to the atmosphere.

Medium- & Long-Term Goals

1. Implement VOCs reduction programs
2. Reduction of equipment/component leakage.
3. Reduction of pollutant emissions.

Management

Effectiveness Assessment

1. VOCs test report
2. Emission data

Grievance Mechanism

- "Contact us" on the corporate website.
- Stakeholder contact information
- Stakeholder questionnaire

Management Approach Description

USI is located in Kaohsiung City within the Gaoping Total Volume Control Area and the level 3 control area of PM_{10}, $PM_{2.5}$, and O_3. Therefore, air quality improvement has always been our prime target. To fulfill our corporate social responsibility, we spare no effort in implementing environmental improvement, hoping to achieve the "zero pollution and zero emission" goals in the five zero's policy and contribute to air quality improvement.

Management Targets

We constantly promote pollution reduction, replace fuels with clean energy, and effectively collect exhaust to control equipment for proper treatment. We also cooperate with the total volume control and reduction of the Gaoping River to achieve the goals of zero pollution and zero emissions. In 2023, pump replacement is completed, including: a. VA transfer pump upgrade in Plant 1 b. Ethylene unloading pump upgrade in Plant 1 c. EF-line Xylene wash pump upgrade. All of the mentioned pump upgrade works were completed in 2023.

Management Approach

In addition to regularly testing and reporting air pollutants, we have planned the following reduction programs to effectively reduce air pollutants:

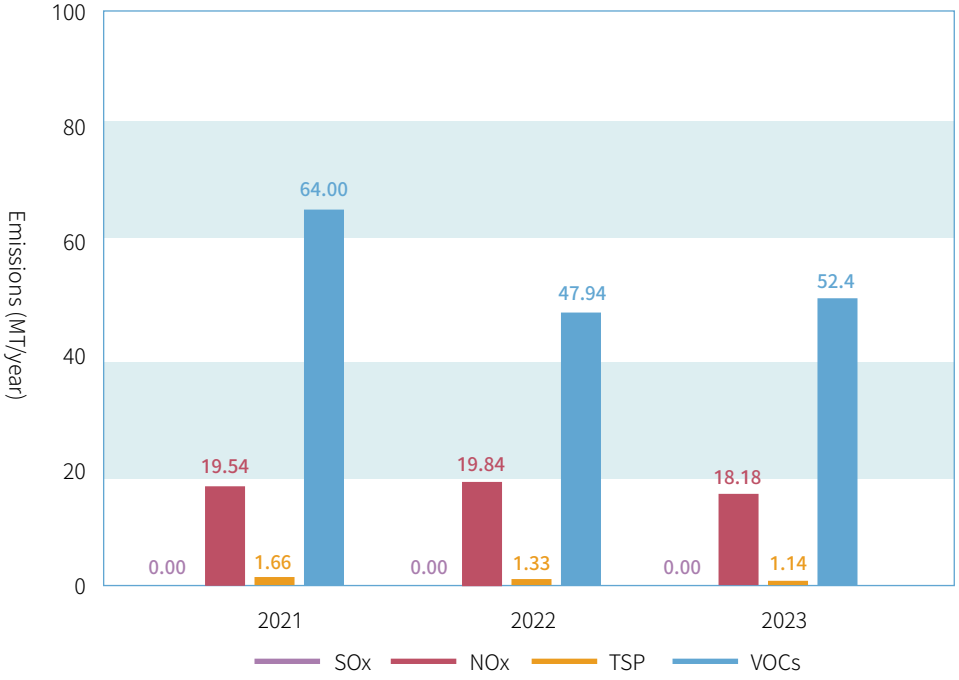
VOCs Reduction	We implemented the equipment/component management plan. Besides establishing SOPs and creating master files for equipment/component management, outsourcing quarterly external inspection, and purchasing monitoring and measuring equipment and gauges and performing periodic instrument calibration, all plants also enhance equipment/component self-management, periodically review and follow up the inspection and service progress, run equipment maintenance and repair re-inspection, identify and improve equipment/component with a high leakage rate, reduce the quantity of equipment/component or replace with equipment/component with a lower leakage rate or leakage resistance, and enhance the inspection of equipment/component with a high leakage rate and more motions. 1. In 2023, we continued to implement the management of the leaked emissions of VOCs for equipment/components. The in-house performed self-imposed equipment/component spot checks on 1,904 points and found leakage at five point. Improvement was completed immediately. 2. Programs in 2023: a. Replace the VA transfer pump in Plant I b. Replace the ethylene unloading pump in Plant I c. Replace the EF-line xylene CIP pump The pump replacement projects were all completed in 2023.
The RTO treats high-intensity VOCs in-house	The RTO treats high-intensity VOCs in-house. In 2023 we commissioned an outsourced inspection. The results showed that the content of non-methane hydrocarbons (NMHC) before and after treatment was 1,200 ppm and 55 ppm respectively, with a removal rate of 95.1%, better than the regulatory requirement of 95% or 150ppm. In 2023 we continued the equipment operation and maintenance training, management system establishment, and education and training.
Reduction of Pollutant Emissions	In 2023, it is planned to install a VA storage tank condenser and a finned condenser. By increasing the contact surface area, the condensation efficiency will be improved to increase VA recovery and reduce pollution.
Emergency Response to Air Quality Deterioration	In 2020-2023, we implemented the air quality deterioration response drill to enhance the response ability of employees and review the opportunity for improvement after the drill. We also joined the LINE group of the Environmental Protection Bureau to keep updated with the air quality condition in Kaohsiung City at any time and take counteractions immediately.
Managing hazardous air pollutants (HAPs)	In 2023 test of hazardous air pollutants (HAPs), the intensity of all other tested items was below 200ppb, except for xylene at 400ppb.

Management Performance

GRI 305-7 RT-CH-120a.1

Major air pollutants emitted by USI include sulfur oxides (SOx), nitrogen oxides (NOx), total suspended particulate (TSP), and volatile organic compounds (VOCs). Fuel burning of the steam boiler is the main source of SOx, NOx and TSP detected in the plant, while RTO, flares, storage tanks, and equipment components are the main sources of VOCs emissions. Over the years, we hired EAL-accredited environmental engineering companies to test USI pipeline emissions, and the emission test results have been consistently well below the EPA emission standards announced by the Ministry of Environment.

Air Pollutant Emissions in Last 3 Years



Note: Air pollutant volume was reported based on the air pollution control fee.

Testing Results of Boiler Discharge Pipes in the Last 3 Years

Pollutant	2021	2022	2023	Emission Standard (announced 2020)
SOx(ppm)	ND	ND	ND	50
NOx(ppm)	54	88.9	92.6	100

Note1: The results of VOCs emissions of Kaohsiung Plant comply with the statutory requirements over the years, with a reduction rate over 95%.
Note2: ND means not detected.

Testing Results of the RTO Discharge Pipes in the Last 3 Years

Pollutant	2021	2022	2023	Emission Standard
SOx(ppm)	ND	ND	ND	100
NOx(ppm)	2	2	1.4	150
TSP (mg/NM3)	-	2	-	100
VOCs (ppm)	52	56	55	Reduction rate>95%or <150ppm

Note: The results of VOCs emissions of Kaohsiung Plant comply with the statutory requirements over the years, with a reduction rate over 97%.

4.4 Waste management

GRI 2-25, 3-3, SDG 11, 12

Sustainability Principle: Sustainable Development

Significance and Strategy

Significance to USI

Continuous environment improvement to achieve "zero pollution and zero emission."

Strategy

1. Strengthen the waste management system
2. R&D of waste reduction

Commitment

Enforce zero pollution and zero emission.

Data scope: Kaohsiung Plant

Impact Management

Short-, Medium- & Long-Term Positive/Negative Impacts

Medium-term positive actual impact: Resource recycling, waste reduction
Long-term negative actual impact: Improper waste treatment.

Impact Boundary

Community residents, environment and ecology affected by pollution

Processes to remediate and prevent negative impacts

1. Reduce at the source and source qualified waste disposal contractors
2. Establishing the waste audit and management systems.

Achievement and Goal

2023 Goals

Establishing the waste audit and management systems.

2023 Achievements

1. Spot checks on 8 waste cleanup contractors and 7 waste disposal contractors, and no nonconformity was found
2. Upgrading 4 adsorption towers resulted in a decrease of 15.51tons in the output of waste fillings compared to 2022.

2024 Goals

1. Continue to implement the waste audit and management systems
2. Implement waste recycling and reuse

Medium- & Long-Term Goals

1. Establishing the waste audit and management systems
2. Implementing waste reduction

Management

Effectiveness Assessment

1. Waste reporting data.
2. Targeted research reports.

Grievance Mechanism

- “Contact us” on the corporate website.
- Stakeholder contact information
- Stakeholder questionnaire

Management Approach Description

For proper waste disposal, we hire licensed contractors to dispose of such waste according to laws and regulations related to waste disposal. Apart from reviewing the qualifications of contractors and requesting them to provide support documents for proper waste disposal on a regular basis, we perform onsite inspections on contractors to verify their waste disposal performance, in order to perform our supervision obligation.

Management Approach

We produce mostly general industrial waste and dispose of such waste by incineration, physical treatment and cleaning. In recent years, the QC lab has been constantly assessed the reviewed the methods for analyzing hazardous waste management to reduce solvent consumption and effectively reduce the output of hazardous industrial waste. In addition, after washing and processing by qualified contractors, waste plastic containers are crushed and sliced for recycling to achieve the circular economy of resources.

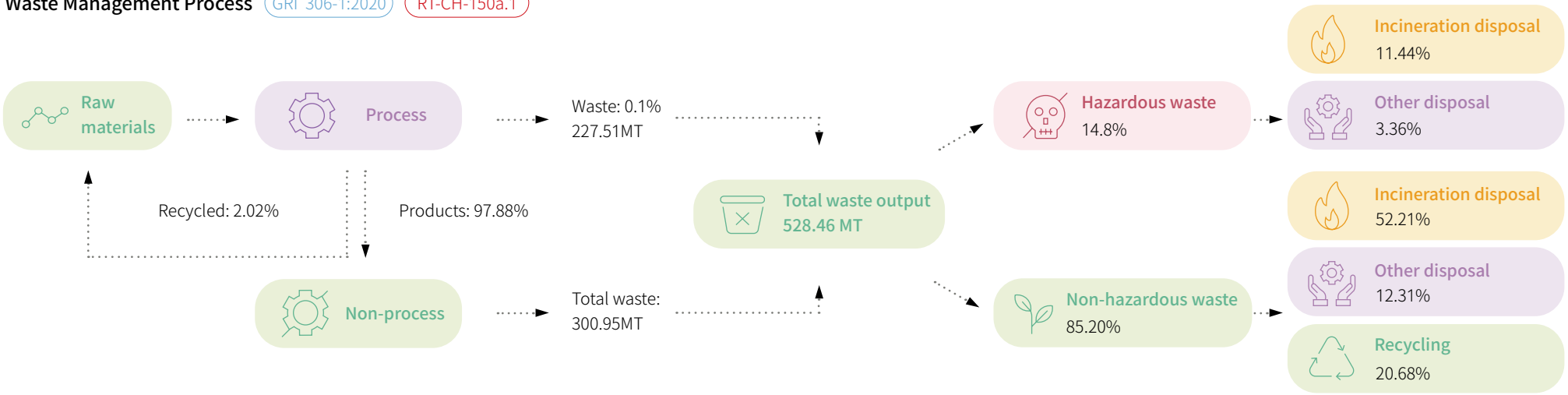
In 2023, we continued with the comprehensive review of waste legitimacy, compared and proofread the monthly report data to facilitate the accurate control of waste information. Additionally, industrial waste is sorted by the property of major composition before storing in the storage site, and the storage sites, containers, and facilities are properly labeled. We also built covered waste storage sites equipped with blocking ditches to prevent groundwater and water from runoff contaminations. In 2023, we audited waste storage sites every month, and all sites complied with the related regulations.

Management effectiveness

Waste Reduction Achievement: CBC Plant Adsorption Tower Update: In order to reduce waste generation and improve the environment, four adsorption towers were updated, replacing the existing eight towers. The weight of waste fillers produced by the new adsorption towers is significantly lower than that produced by the existing towers.

In 2023, the output of waste fillers was 5.96 tons. This marks a decrease of approximately 15.51 tons or about 72.24% compared to 2022.

Waste Management Process GRI 306-1:2020 RT-CH-150a.1



Usage of waste output/resources

- Waste collection and classification management
- Regular online reporting of waste output and storage conditions
- Monthly regular inspection of storage areas to confirm compliance with regulations
- Source management review to reduce waste generation
- Promotion of waste reduction schemes

Waste transportation management

- Online declaration of waste weight cleared from the factory
- Real-time tracking system for transportation equipment (GPS positioning)
- Commissioning of joint disposal control delivery slips for record keeping
- Management of waste disposal vendors audits

Waste disposal management/resource utilization

- Online declaration by disposal vendors of the weight of waste received
- Proper cleanup record keeping for reference
- Management of disposal vendor audits
- Compilation of records for resource utilization

Waste disposal contractors audit and management GRI 306-2:2020

We only hire licensed waste disposal contractors to clean up and dispose of waste by law. Since 2021, in accordance with the"Regulations Governing Determination of Reasonable Due Care Obligation of Enterprises Commissioning Waste Clearance" (amended on February 23, 2021), 8 waste cleanup contractors and 7 waste disposal contractors with the items listed in Annex 2 of the regulations were inspected in 2023. The inspections aimed to understand the storage, removal, disposal, and recycling of waste of disposal contractors, and no nonconformity was found.

1 **Basic document review**
- Environmental Protection Contractor Permit
- ISO management system

2 **Waste storage/disposal**
- Degree of legal compliance
- Compliance with disposal methods and contractors/receipts

3 **Waste final disposal**
- Verification of final disposal methods and flow
- Compliance with final disposal methods and contractors/receipts

Management effectiveness

GRI 306-3:2020, 306-4:2020, 306-5:2020

We are also committed to waste sorting to categorize, collect, and manage recyclable resources. Apart from weighing and recording waste before shipping out of the plant, we hire licensed contractors to recycle waste metal. In 2023, we recovered 67.9 MT of waste metal, and 1.49 MT of paper waste was disposed of by nearby resource recycling contractors. The recycling rate for non-hazardous waste reached 24.27%, an increase of 3.87% from 2022. Although the amounts of recovered waste metal and paper decreased by 25.60 MT and 3.21 MT respectively compared to 2022, the amount of plastic waste recycled increased by 39.88 MT in 2023. Additionally, in 2023, the total waste production was 528.46MT. No spill of oils, fuels, waste, or chemical substances was reported in 2023.

Waste Production, Transfer, and Disposal in the Last 3 Years

Waste		Disposal/Recycling	2021	2022	2023
Hazardous waste	Toxic Industrial Waste Direct disposal	Incineration (including nonrecyclable waste)	3.46	47.5	60.46
		Other treatment	18.77	15.85	17.76
Total weight of hazardous waste			22.23	63.35	78.22
Non-hazardous waste	General Industrial Waste Direct disposal	Incineration (including nonrecyclable waste)	269.40	248.95	275.91
		Other treatment	178.32	70.16	65.06
	Total weight of non-hazardous waste		447.72	319.11	340.97
	Recycling	Recycling for reuse	420.87	98.20	109.27
		Resource recycling rate (%)	47.2	20.40	24.27
Total weight of non-hazardous waste			868.59	417.31	450.24
Total weight of waste (MT)			890.82	480.66	528.46

Note: 1. Data regarding the production, transfer, and disposal of waste were extracted from the Waste Report and Management Information System of the Ministry of Environment. Data of recycling were extracted from in-house records and accounting documents.
2. Waste is transported by licensed cleanup contractors to the qualified disposal contractors for disposal. Waste for recycling was recycled for reuse outside of the plant. Waste for recycling was recycled for reuse outside of the plant.

Waste reduction programs

Reinforcement of awareness education

Reinforce the awareness education of the need for waste sorting and labeling to increase waste recovery volume and reduce the disposal volume of general waste.

Clean production

Strengthen process management to minimize end-of-pipe treatment and reduce the output of sludge and other industrial waste.

Hazardous Waste Reduction Management

1. After washing and processing by qualified contractors, waste plastic containers are crushed and sliced for recycling.
2. In analysis method improvement, the QC lab skipped the extraction process in inhibitor analysis to stop using solvents. As a result, solvent consumption reduced significantly. In addition, solvents are recovered for reuse in washing to reduce the consumption of washing solvents. In the future, we will continue to assess and review the analysis methods to effectively promote the reduction of hazardous waste.

4.5 Climate change and energy management

GRI 2-25, 3-3, SDG 7, 13

Sustainability Principle: Sustainable Development

Significance and Strategy

Significance to USI

Drawing up of related energy conservation and emissions reduction measures, enhancing climate change responsiveness, reducing GHG emissions, lower operating cost, raise process efficiency, and enhance competitiveness.

Strategy

Establish the energy management system, lower unit product energy consumption, reduce GHG emissions, and develop green power.

Commitment

Saved electricity: >1%

Data scope: USI

Impact Management

Short-, Medium- & Long-Term Positive/Negative Impacts

Short-term positive actual impact: Invest in green power with profit gained from EVA solar energy products.

Short-term positive potential impact: Develop AI systems to lower energy consumption

Negative actual impact:

Short-& medium-term negative actual impact:

1. Increased electricity prices estimated at NT$100 million/year
2. Disrupted production by power curtailment

Negative potential impact: The imposition of carbon taxes increases costs. Based on the 2023 carbon emissions of 142,600 MT from USI, and assuming a carbon fee would be NT$47.28 million, accounting for approximately 4.1% of the entity's revenue.

Impact Boundary

USI, global customer and green power supplyer

Processes to remediate and prevent negative impacts

1. Sponsor forestation of 5 hectares
2. Implement various energy conservation and carbon reduction programs.
3. Develop green power

Achievement and Goal

2023 Goals

1. Annual electricity savings of 1.27%.
2. GHGs emissions of 145,000 tCO_2e.
3. In 2023, implementation of three energy-saving and carbon reduction projects is planned, aiming to reduce emissions by 838 tCO_2e.
4. Implement ISO 14064-1 GHG emissions inventory and verification.

2023 Achievements

1. Annual reduction: Electricity by 1.72% (2015-2023 average 1.4%).
2. GHGs inventory new scope 3
   a. Indirect emissions from transportation: carbon emissions generated by employee commuting and business travel.
   b. Indirect emissions from the use of company products: carbon emissions generated during the production process of raw materials such as ethylene and vinyl acetate.
3. Implemented two energy-saving and carbon reduction projects, resulting in a total carbon reduction of 1,614 tons of CO_2e.
4. Completed ISO 14064-1:2018 GHGs inventory and verification.

2024 Goals

1. Saved electricity: 1.18%
2. In 2024, implementation of six energy-saving and carbon reduction projects is planned, aiming to reduce emissions by 1,629 tCO_2e.
3. GHGs emissions of (Scope 1+ Scope 2) 140,800 tCO_2e.

Medium- & Long-Term Goals

1. Build the AI intelligent management platform to advise energy conservation operations.
2. Continue to plan energy conservation to enhance energy efficiency, saving electricity by 1% /year.
3. Plan and implement green power strategies within the group: Kaohsiung Plant will use green power (solar PV) of about 3.698GWh in 2025 by law.
4. Fulfill the commitment of carbon reduction by 27% in 2030 over 2017 (baseline year).
5. Continue to increase the use of renewables.

Management

Effectiveness Assessment

1. Unit product energy consumption.
2. Energy conservation volume.
3. Energy review and identification table (monthly).
4. HSE/Emergy Management Committee meeting (quarterly)5.
5. GHG inventory.

Grievance Mechanism

- “Contact us” on the corporate website.
- Stakeholder contact information
- Stakeholder questionnaire

Management Performance

Climate Change: Addressing climate change brings the opportunities for sustainable development

TCFD climate change risk management

Climate change is a common challenge around the world. To keep up with the world and match the demand for sustainable development, Taiwan announced the amendment of the "Greenhouse Gas Reduction and Management Act" to the "Climate Change Response Act" on February 15, 2023. Facing the impact of climate change, carbon reduction has become a global goal. To enhance carbon reduction, USIG set the 2030 carbon reduction target which is "carbon reduction by 27% over 2017 by 2030" in early 2022 and set "Carbon neutrality by 2050" in 2023 as the Long-term Goals of the Corporation.

In order to achieve the corporate sustainability vision, USIG has actively implemented corresponding response strategies and management mechanisms with practical actions. The group's domestic plants continue to implement ISO 14064-1 GHG Inventory and Verification, and plan and implement carbon reduction programs. The group also actively develops external renewable energy sites. By the end of 2023, the accumulative on-grid capacity of solar PV sites has reached 7.2MW.

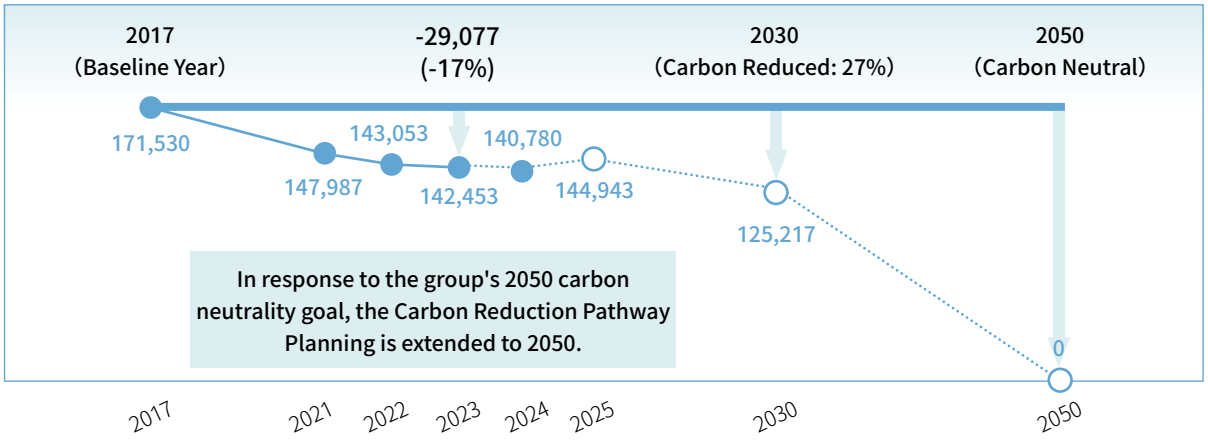
We plan our carbon reduction pathway according to the group's 2030 carbon reduction target. Our 2023 GHG reduction already reached 17% over the baseline year (2017). In the future, we will implement energy conservation and carbon reduction programs more actively. The medium-term carbon reduction strategy will proceed towards the transition to low-carbon energy, enhancement of energy efficiency, intelligent monitoring, and the setup and use of renewable energy. The long-term carbon reduction strategy will continuously focus on low-carbon fuels, carbon capture, reuse technology, and negative carbon emissions technology, to implement the carbon neutrality goals and promote sustainable development.

USI 2030 Carbon Reduction Pathway Planning

As indirect GHG emissions from purchased electricity accounts for over 80% at USI, green power deployment is an important strategy:

Solar PV	Installed capacity reached 7.2MW in 2023 and will increase to 20MW in 2027.
Geothermal	We have selected sites in Taitung, and terminal survey is in progress.
Offshore wind power	We have formed CURE (Chem Union Renewable Energy Corporation) with other petrochemical companies to discuss electricity purchase with wind power developers.

Greenhouse gas emissions ● Actual Emissions ○ Target Emissions Unit: tCO_2e



2023			2024
Target emissions (10,000T)	Actual emissions (10,000T)	Achievement Rate	Target emissions (10,000T)
14.5	14.25	102%	10.84

Note: 1. Achieved rate = 2023 target emissions/2023 actual emissions
2. The carbon reduction contribution(TPC) from purchased electricity was not included in the carbon reduction pathway planning.
3. As full plant operation started in 2017 after the completion of new production lines, we set 2017 the baseline year for energy consumption and total GHG emissions.
4. The data of TPCS is from Scope 1 and 2 of Kaohsiung Plant

Chaired by independent directors, the ESG committee reviews the Company's climate change strategies and targets every year, manages the actions and reviews the performance in climate change risks and opportunities, and reports to the Board. Based on the framework recommended by the Task Force on Climate-related Financial Disclosures (TCFD), we identify climate-related risks and opportunities, assess risks and opportunities from different departments, assess financial impacts and set responsive plans, plan overall assessment every three years, and review updates every year.

Climate change management framework

Category		Management strategy and action
Governance	ESG Committee	As the highest governance body of climate change management chaired by independent directors, it reports climate change planning, implementation and performance to the Board every year.
	Operations Management Meeting	Chaired by the Board chairman, it plans and implements material policies for energy conservation and carbon reduction and reports the results from time to time.
	Division of Equipment Preventive Maintenance and Environmental Risk Control Quarterly Meeting	As the highest governance body of the Group's energy management, it reports the planning and progress to the Group's chairman each quarter and makes decisions on energy management.
	Group Green Power Team	As the Group's responsible unit for green power promotion, it reports the status of and future plans for green power development to the chairman of the Board.
Strategy	Identification of risks and opportunities	Identify material risks and opportunities based on their likelihood and impact.
	Assessment of risks and opportunities	Assess the potential financial impacts of identified material risks and opportunities.
	Scenario analysis	Set plans to achieve net zero emissions in different scenarios.
Risk Management	Implementation of TCFD-recommended framework	Identify risks and opportunities based on the TCFD-recommended framework, communicate with all responsible units, and confirm by senior management.
	Report of identification results	Included in the annual risk assessment. Each year, personnel designated by the president reports the control measures and management performance to the Audit Committee and Board.
Indicators and Targets	Group carbon reduction target	27% less than 2017 (baseline year) by 2030 and achieve carbon neutrality by 2050.
	Climate change countermeasures	Equipment replacement, construction of renewables facilities, optimization of production scheduling, planning building aircon, energy management system, extreme weather events contingency plans
	GHG emissions disclosures	Disclose the data of Scopes 1, 2 and 3 emissions in the ESG report every year and review the causes for changes periodically.

Note: Please refer to 2.3 Risk Management for the details of the risk management process and mechanism.

Identification of Climate Risks and Opportunities

In response to the intensifying global climate change, USI continues to adopt the TCFD framework to deepen its understanding of potential risks under extreme climate conditions and to seize new business opportunities. Referencing the Taiwan Climate Change Projection Information and Adaptation Knowledge Platform (TCCIP) and the National Science and Technology Center for Disaster Reduction, analyze the projected changes in temperature, rainfall, flooding, and drought from 2016 to 2035 under the RCP 8.5 scenario and identify three physical risk issues. Also, identified nine transition risks and 12 opportunity issues, totaling 24 potential risk and opportunity issues, based on the group's strategy, industry characteristics, Intended Nationally Determined Contribution (INDC), and TCFD indicators.

In 2023, a survey was conducted targeting the ESG Committee and senior management to assess the relevance and potential impact timing of various risks on the company's operations, as well as the development and feasibility of various opportunities. A total of 14 questionnaires were collected. After statistical analysis by the team, 12 significant climate issues were identified (1 physical risk item, 5 transition risk items, and 6 opportunity items).

USI evaluated the potential financial impacts and formulated response strategies and management mechanisms for these 12 major risk and opportunity items. This aims to understand the possible impacts of climate change across various aspects, reduce operational disruptions caused by extreme weather events, and establish a resilient climate change culture.

Climate-related risk items are categorized by the time frame of their potential impacts into three periods: short-term (<3 years), medium-term (3-5 years), and long-term (>5 years). Climate-related opportunity items are categorized into five levels based on their impact on the company's development and technical feasibility. The relevant correspondence is shown in the table below:

Type	Item	Duration
Physical risk	Drought	Short-term (<3 years)
Transition risk	Government regulation or supervision - water consumption fees	Short-term (<3 years)
	Carbon fee	Short-term (<3 years)
	Renewable energy regulations - risk of Energy-heavy Industries Clause	Short-term (<3 years)
	Transition of low-carbon technology	Short-term (<3 years)
	Increased raw materials price	Short-term (<3 years)

Type	Item	Developmental	Duration
Opportunity	High-efficiency production	Progressive and aligned with the existing policies of the company	Expanding development
	Recycle–circular economy		Expanding development
	Reduce water usage and consumption		Matured
	Use low-carbon energy		Matured
	Development of Low Carbon Goods and Services - Entry into Renewable Energy Market		Expanding development
	R&D and innovation of new products and services - research and development of low-carbon and energy-saving products		Expanding development

Financial implications and other risks and opportunities due to climate change and countermeasures GRI 201-2

Climate Change Topic	Topic Type	Description of Risk and Opportunity Items	Potential Financial Risk	Strategy and Countermeasures
Drought	Physical risk/ Chronic	1. Taking 1986 to 2005 as the base period, it is estimated that the climate conditions of USI Kaohsiung plant in the near future (2016 to 2035) will be 58 consecutive days without rainfall each year, and water shortages or droughts may occur. 2. In response to abnormal weather conditions, water restrictions or water shortages in the factory area may occur. In severe cases, production lines may be reduced or completely shut down.	**Increase in operating costs** In case of water shortages, we need to purchase water from outside. In case of water scarcity, we need to reduce production line output or shut down operations. It is estimated that water purchase will increase production costs by over NT$0.1 million/day. In case of production line shutdown, the loss will increase to about NT$2.5 million/day. In case of operation suspension, the loss will be over NT$10 million/day. In 2023, the cost of purchasing water by a water tankers will be approximately NT$3.8 million.	USI has established an AI water monitoring system since 2020 to monitor water supply at all times. In addition to stopping non-essential water use as a drought response measure, we have strengthened inspections of pipelines and switches, reduced cooling water emissions, and implemented water storage buffers in fire tanks. We also purchase water with water trucks and actively carry out various water use improvement plans to reduce the total water intake year by year.
Government Regulation or Supervision - Water Consumption Fees	Transition risk/ Policy and Law	The Water Resources Agency of the Ministry of Economic Affairs issued the "Regulations on the Water Conservation Charge" in January 2023, which took effect on February 1, 2023. Under these measures, large water consumers using more than 9,000 cubic meters per month during the dry season (January to April and November to December) will be charged a "water consumption fee" of NT$3 per cubic meter. However, if the recycling rate meets the announced standards, the fee can be preferentially reduced to NT$2 or NT$1 per cubic meter.	**Increase in operating costs** Based on the actual water consumption of USI from February to April 2023, the water consumption fee paid in 2023 was NT$284,000, which is approximately 0.002% of individual revenue.	1. Implement the ISO 46001 Water Efficiency Management System. 2. Improve the wastewater reclamation system and enhance operational management to increase the capacity of water reclamation.
Carbon Fee	Transition risk/ Policy and Law	The "Draft of Regulations for Charging of Carbon Fees" was released by Ministry of Environment in December 2023, with the expectation to impose carbon fees on large carbon emitters whose annual emissions exceed 25,000MT in 2025.	**Upfront costs were high, while later carbon emissions were low and operating costs were reduced** Based on USI's estimated carbon emissions for 2023, assuming a carbon fee of NT$300 per ton, the estimated carbon fee would be between NT$37 million and NT$44.5 million, which is approximately 0.32% to 0.39% of individual revenue.	1. USI plans to introduce internal carbon pricing in 2024, setting it through a shadow pricing method. This will incorporate carbon costs into investment evaluations, enhancing the opportunities for implementing carbon reduction projects. 2. Establish an energy management system to analyze various metrics and identify areas for improvement. 3. Evaluate the addition of solar equipment on the roofs of new buildings.
Renewable Energy Regulations - Risk of Energy-heavy Industries Clause	Transition risk/ Policy and Law	The Ministry of Economic Affairs implemented the "Regulations for the Management of Setting up Renewable Energy Power Generation Equipment of Power Users above a Certain Contract Capacity" in 2021. This regulation requires large electricity users with a contract capacity greater than 5,000 kW to install renewable energy equipment amounting to 10% of their contract capacity by 2025.	**Increase in operating costs** USI holds 100% of the shares of USI Green Energy Corporation with a paid-in capital of NT$366 million. USI Green Energy Corporation will continue to develop solar power plants with the goal of completing the installation of 20MW capacity by 2027.	USI established USI Green Energy Corporation, actively seeking suitable sites to invest in green energy development projects. By 2023, the cumulative solar photovoltaic installation capacity reached 7.2 MW, with an annual power generation of 9.15 million kWh. It is estimated that USI will purchase 3.698 million kWh of green electricity from USI Green Energy Corporation.

Climate Change Topic	Topic Type	Description of Risk and Opportunity Items	Potential Financial Risk	Strategy and Countermeasures
Transition of low-carbon technology	Transition risk/Energy, Technology	Investing in energy transition, efficiency improvement, fuel substitution and other low-carbon technology developments for carbon reduction has led to an increase in technical costs for corporates.	**Increased capital expenditure and decreased in operating costs** Project investment amount: 16.27 million Annual savings: 1,487,878 kWh of electricity, 84T of raw material usage reduction, 757T of carbon reduction Quantified benefits: 7.85 million per year	1. Due to the electricity price hike by Taiwan Power Company in April 2024, the electricity bill for the Kaohsiung plant is estimated to increase by NT$53.78 million per year based on 2023 as the baseline. USI will actively invest in low-carbon technology transformation to mitigate the impact of the electricity price hike. 2. Improvements in the insulation of chilled water tanks and pipelines help reduce the loss of cooling energy and decrease electricity consumption. 3. Enhancements to the ethylene purification system effectively remove carbon dioxide from the system, reducing the inefficiency of compressors and thereby lowering electricity usage. 4. Equipment upgrades (such as renewing chillers), adjustments to operational methods, and identifying opportunities to shut down non-essential power consumption.
Increased raw materials price	Transition risk/ Market	Considering the potential imposition of carbon taxes in the future, the cost of raw materials is likely to increase due to the additional carbon emission costs.	**Increase in operating costs** Ethylene is our major material. To increase ethylene sources, we invested in the Gulei Project (nearly NT$8 billion) and the Ethylene Storage Tank Project of Kaohsiung Intercontinental Container Terminal Project (NT$906 million).	1. Accelerate AI production scheduling to enhance efficiency and reduce material losses from number plate change. 2. Undertaking a project to upgrade the refrigeration system and related improvements aims to enhance the recovery rate of the existing vinyl acetate ethylene condenser, thus increasing the recovery rate of raw materials. 3. 2023 materials recycling rate at 14.6%, about NT$9.6 billion.
High-efficiency production	Opportunity/ Resource Efficiency	By leveraging AI intelligent production, industrial motors, and automated packaging, overall production efficiency can be enhanced while reducing energy consumption.	**Increased capital expenditure and decreased in operating costs** Recent investments in various AI projects amount to approximately 30 million dollars.	Implementation of efficiency enhancement initiatives and AI projects include: 1. DCS + Field Data System Implementation 2. Vibration monitoring of high-pressure reactors 3. AI quality prediction 4. Soot detection system 5. Digital Product Data Management System
Recycle – circular economy	Opportunity/ Resource Efficiency	According to the three principles of the circular economy (3R): Reduce, Reuse, Recycle. This aims to decrease waste treatment costs or raw material usage.	**Increase in capital expenditure decrease in operating expenses.** The cost of wax recycling equipment is NT$776,574. The 2023 wax recycling volume was 75,320kg, with a profit of NT$150,000, saving wax disposal fee by about NT$4.09 million.	1. Wax recycling and reuse 2. Through collaboration with the National Taiwan University and National Taiwan University of Science and Technology, we implemented the cyber-physical integration technology development industry-academia collaboration project to predict quality with AI in order to reduce the generation of secondary materials and enhance the utilization rate of raw materials
Use low-carbon energy	Opportunity/ Resilience, Energy source	Promote coal gasification, enhance the proportion of renewable energy usage, reduce carbon costs, and lower the product carbon footprint.	**Increase in operating costs, reduction in carbon fees** Project Investment in Carbon Reduced, Cost, and Benefit	1. Developing a self-built solar energy field. 2. Prioritizing natural gas as the source of steam supply. 3. Focusing on and participating in the renewable energy market. 4. Equipment and project investment costs amount to NT$25 million, with energy-saving benefits of NT$4.11 million in 2023.

Climate Change Topic	Topic Type	Description of Risk and Opportunity Items	Potential Financial Risk	Strategy and Countermeasures
Reduce water usage and consumption	Opportunity/ Resource Efficiency	Water resources are irreplaceable in the manufacturing process. Reducing plant water leakage and increasing the proportion of water reclamation and reuse can save operational cost expenditures and enhance the resilience of the plant.	**↑ Increase in capital expenditure, ↓ decrease in operating expenses.** 1. Investment in continuous wastewater monitoring system is approximately 16 million dollars. 2. Investment in retention tanks and rainwater recovery systems in tank areas is approximately 1.2 million dollars. 3. Investment of 1.6 million dollars for process improvement in steam condensate water recovery, with an annual recovery amount of 17,500MT. In 2023, process operation improvements reduced steam usage, saving approximately 56,485MT of water per year, saving around NT$682,536.	1. Investment in wastewater treatment system, improvement of MRT condensate water recovery, and retention of rainwater in retention tanks. 2. Improve process equipment and operation to reduce steam use 3. Constantly develop water conservation programs. 4. In 2023, the amount of water reclaimed was 30,614 MT. Considering a water tariff of NT$12 per unit, the cost savings amounted to NT$367,368.
Development of Low Carbon Goods and Services - Entry into Renewable Energy Market	Opportunities/ Products and Services, Resilience	Investing in renewable energy development and establishing a platform for purchasing and selling electricity to reduce the barriers to accessing green energy.	**↑ Increase in capital expenditure, increase in revenue** 1. USI holds 100% of the shares of USI Green Energy Corporation, with a paid-up capital of NT$366 million. 2. USI holds 33.3% of the shares of Chem Union Renewable Energy Corporation, with a capital of NT$30 million.	1. USI established USI Green Energy Corporation and actively seek suitable sites for: a. green power development b. Solar photovoltaic: Accumulated installed capacity reached 7.2 MW in 2023, with an annual electricity generation capacity of up to 9.15 million kWh. c. Geothermal: We have selected sites in Taitung, and terminal survey is in progress. 2. USI, together with petrochemical industry peers, formed Chem Union and is negotiating with wind power developers for electricity purchase agreements.
R&D and innovation of new products and services - research and development of low-carbon and energy-saving products	Opportunity/ Product and Services	R&D low-carbon products from the perspective of a complete product and service life cycle toward developing products in circular economy, low-carbon, and energy-saving.	**↑ R&D expenses increased, revenue increased.** USI's environmentally friendly water-based heat-insulating coating can significantly reduce surface temperatures by 15-20 degrees and internal temperatures by 3-7 degrees in large storage tanks. The estimated market value for tank coatings domestically is approximately NT$3.5 billion, leading the industry towards high value-added development.	1. USI has developed an environmentally friendly water-based heat-insulating coating with a solar reflectance rate of 90%. This coating not only reduces heat absorption in factory buildings to decrease air conditioning usage but can also be applied to the surfaces of chemical storage tanks. It effectively blocks heat from sunlight, preventing VOC emission and chemical instability issues caused by temperature increase. Simultaneously, it reduces the frequency of water spraying for cooling to achieve energy-saving and carbon reduction. 2. USI has also developed low-solvent anti-corrosion paint, green fire-resistant materials, and PCR plastic recycling.

Promote group internal carbon pricing

The Climate Change Response Act was announced in February 2023, introducing a mechanism for carbon pricing. Detailed regulations, including charging methods and specific rates, will be formulated by the Ministry of Environment. The levy will be implemented gradually, starting from large emitters to smaller ones, and the rates will be periodically reviewed for progressive adjustments. In anticipation of government policies and to effectively address climate change and reduce carbon risks, the USIG will implement an internal carbon pricing system in 2024. The pricing will reference domestic carbon fees and be integrated into the company's decision-making and investment evaluation processes to assess the impact of carbon emissions on business operations and expedite carbon reduction measures. USIG will also hold two educational training sessions to help relevant unit employees understand the concept and application of internal carbon pricing, assist each plant in prompt implementation, and also plan for a general course on carbon-related topics. Invite all group employees to participate in order to enhance everyone's carbon reduction awareness and achieve our Sustainable Development Goals.

The company continues to invest in innovative materials and products to mitigate the impacts of climate change, as detailed in Section 3.1 Technology R&D.

Energy management

Group Energy Management Targets

USIG voluntarily set energy management targets in 2016 and began to make dynamic target reviews in accordance with the country's energy development policies and by keeping track on the internal trends and domestic laws and regulations. After measuring the internal and external factors, we set the 2030 carbon reduction target in early 2022. The 9 USIG core businesses began to implement the ISO 50001 energy management system and obtained the certificate on after another in 2018 to effectively manage energy performance and continuously improve energy conservation and carbon reduction, hoping to demonstrate USIG's influence and so to lower environmental impact.

USIG 2030 Carbon Reduction Goals

Carbon reduction by 27% over 2017 by 2030

Carbon inventory/ carbon footprint

- TVCM, CGPC and USI plants have implemented carbon inventories and verifications for many years. Starting from 2022, the Taiwan plants of the group's TWSE/TPEx listed companies have fully completed carbon inventories and verifications.
- Product carbon footprint in 2021 USI promotes EVA, in 2022 CGPC and CGPCP promote PVC powder, PVC cloth, PVC leather, TPE, and in 2023 TVCM promotes VCM

Energy saving and carbon reduction in the plant

- All plants in Taiwan of the group's TWSE/TPEx listed companies have passed ISO 50001 energy management system verification
- Our plants in Taiwan continue to implement energy conservation and carbon reduction, with the carbon reduction performance reaching 15,000 metric tons CO_2e from 2021 to 2022.
- Convene technical case presentation conferences in the group's factories every year to learn from each other and share resources

Pioneer renewable energy

- Establish a green power group in 2021 to carry out green power strategy planning and execution
- As of the end of 2023, the group has completed investment in 8 solar power projects with a cumulative capacity of 7.2MW, generating approximately 9.15 million GWh of electricity annually and contributing to carbon reduction of approximately 4,500 metric tons of CO_2e.
- Continue to actively develop other renewable energy sources

Every year USIG holds the "plant technology exchange meeting" and several "northern/Kaohsiung plants resource integration meetings" for plants to share resources and exchange technologies to improve performance in energy conservation and carbon reduction. In 2023 the "plant technology exchange meeting" was held in October. Case presentation with themes including "industrial safety and environmental protection", "equipment preventive maintenance", and "energy conservation and carbon reduction" were conducted through competitions. Through plan technology case submission and documentary review, a total of 7 cases entered the final. Senior USIG officers and plant representatives elected the three best cases. The USIG chairman presented the certificates and bonuses to winners. Through ratings and encouragement, sharing, and mutual learning, we aim to advance technology in the group.

In 2023, Kaohsiung Plant announced "Related updates and related improvements to the refrigeration system of the Plant 1" (Latest News) technical case and won the second place.

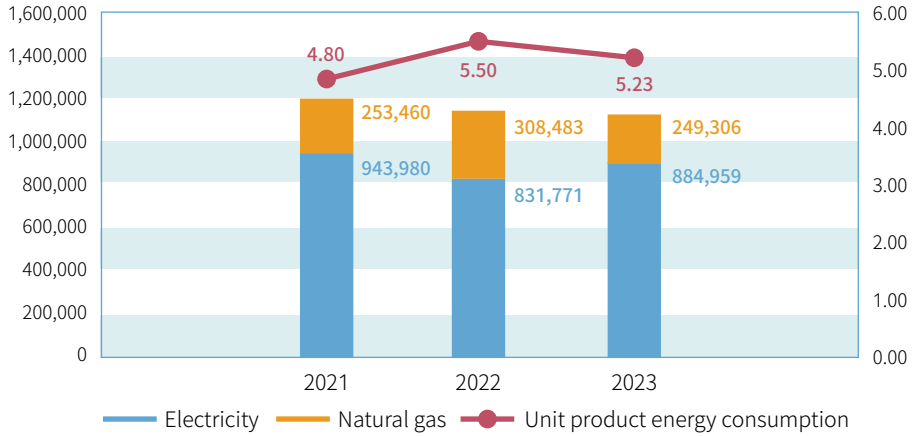
Photo of 2023 group factory technical case presentation meeting

Kaohsiung Plant won the second place in technical case presentation

Energy consumption GRI 302-3

In 2022, equipment failures led to production line shutdowns, resulting in increased natural gas consumption and higher energy intensity per unit. In 2023, electricity consumption increased due to higher production volumes. However, thanks to energy-saving and carbon reduction measures, as well as shifts in production types, total energy consumption decreased, and energy intensity per unit of production also declined.

Energy Consumption(GJ) and Unit Product Energy Consumption(GJ/MT PE) of USI Kaohsiung Plant in Last 3 Years



Note: Since the usage of diesel and gasoline is much lower than that of electricity and natural gas, their data cannot be shown in the above chart. Please refer to the table below.

Energy Consumption and Unit Product Energy Consumption in Last 3 Years

GRI 302-1 RT-CH-130a.2

Energy Type	Unit	2021	2022	2023
Electricity	GJ	943,980	831,771	884,958
Natural gas	GJ	253,460	308,483	249,306
Diesel	GJ	581	415	502
Gasoline	GJ	204	266	312
Total consumption	GJ	1,198,225	1,140,935	1,135,078
Production	MT	249,402	207,413	217,173
Unit product energy consumption	GJ/MT	4.80	5.50	5.23

Note:
1. Referring to the Energy Heating Value Per Unit Product Table announced by the Energy Administration, Ministry of Economic Affairs, the conversion factor of energy consumption of electricity, LNG, and diesel is as follows: 860 kcal/kWh, 9,000kcal/m^3, and 8,400 kcal/L; where 1 kcal = 4.187 kJ.
2. Sources of natural gas and electricity consumption: fuel bill statistics; Source of diesel consumption: Material collection forms; Source of Gasoline: Purchase invoices.
3. Only non-renewables is used.
4. Energy data coverage rate = 100%.
5. Information recoding explanation: In years 2021 and 2022, the addition of gasoline as an energy category aligns with the temperature disk. GRI 2-4

Electricity Conservation Rate in the Past 3 Years

Item	2021	2022	2023
Electricity Saved (kWh)	1,972,419	2,835,801	4,309,015
Electricity Conservation (%)	0.75	1.21	1.72

Note:
1. Based on the 2023 Report on the Annual Energy Saving Audit System of Energy Users of the Energy Administration.
2. Subject to the energy audit equation of the Energy Administration, reported energy saved divided by the total electricity consumption.

The 2023 target and performance of electricity conservation and the planned 2024 target are tabulated below:

Year	2023		2024
Item	Targets	Performance	Targets
Electricity Conservation (%)	1.27	1.72	1.18

Factory smart energy management system

After applying to the IDB for the Factory Smart Energy Management Demonstration Guidance Program in 2020, we engaged in active construction. With the assistance of IDB and Taiwan Green Productivity Foundation (TGPF), we progressively achieved the KPIs of energy management system.

1. Establish energy performance indicators and baseline requirements.
2. Develop the data collection and analysis and control and management capabilities of plant personnel.
3. Practice the application of smart production and management.
4. Provision of decision-making references of corrective action for management.
5. Reduction of management workforces and costs.
6. Discovery of room for improvement of energy conservation and references for improvement of energy performance supervision.

In March 2021, we were selected as a demonstration plant for the smart energy management system. In 2022, the Industrial Development Bureau (now restructured into the Industrial Develoment Administration) published in the media about the adoption of the ISO 50001 international standard to transform into a low-carbon smart factory. In 2023, in addition to continuing to follow up on 93 performance indicators, we will gradually propose improvement plans, seek opinions from external experts and manufacturers, revise goals and baselines, in order to optimize the system.

GHG management

GRI 302-2, 305-1, 305-2, 305-3 RT-CH-110a.1

Based on the ISO 14064-1:2018 GHG inventory standard and the GHG Emissions Inventory and Registration Guidelines of the Ministry of Environment, we performed GHG inventory, consolidation, and system establishment with the assistance of external experts. We set organizational boundary for GHG inventory based on the "operational control method." The organization has 100% of GHG emissions from facilities under its operational control. GHGs under inventory include CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, and NF_3. The emission coefficients are cited from Ministry of Environment's GHG Emission Coefficient Management Table V.6.0.4, and the global warming potential (GWP) is reported based on IPCC's AR5 (2013).

The scope of the GHGs inventory in 2023 is Kaohsiung plant, Guishan R&D Division and Taipei HQ, including Scope 1 - 21,070 tCO_2e/year, Scope 2 - 121,600 tCO_2e/year, Scope 3 - 493,680 tCO_2e/year.

GHGs inventory in the past two years

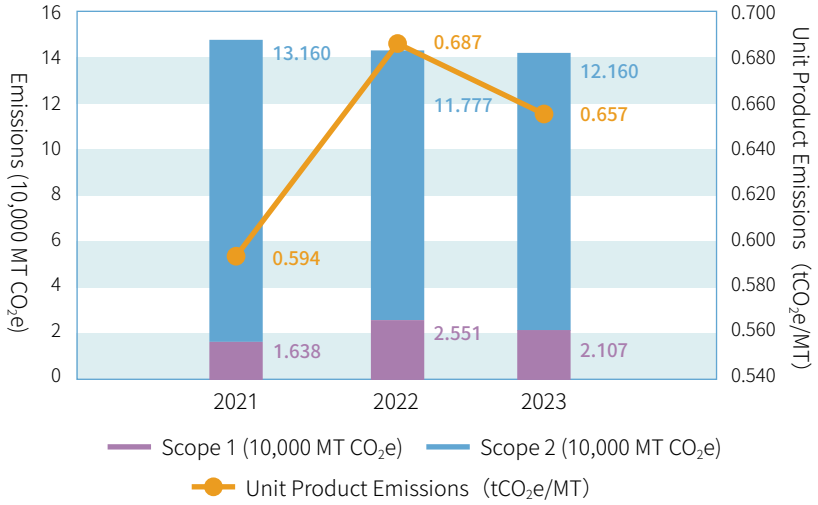
Unit: 10,000 MT CO_2e/year

Type	Kaohsiung Plant		Guishan R&D Division		Taipei HQ	
Year	2022	2023	2022	2023	2022	2023
Scope 1	2.548	2.104	0.001	0.001	0	0.002
Scope 2	11.758	12.141	0.009	0.009	0.012	0.010
Scope 3(Cat. 3) Transportation Indirect Emissions	-	0.024	-	0	-	0.001
Scope 3 (Cat. 4) Indirect emissions from products used by the company	0.013	49.338	-	0.002	-	0.003
Total	14.319	63.607	0.01	0.012	0.012	0.016

Note:
1. *Scope I refers to the direct emissions from stationary combustion sources, direction emissions from mobile combustion sources, direct process emissions from industrial manufacturing processes, and direct leaked emissions from GHGs generated by artificial systems.
   *Scope 2 refers to the indirect emissions of purchased electricity.
   *Scope 3 refers to other indirect emissions.
   a. Indirect emissions from the disposal of solid and liquid waste.
   b. Emissions from transportation: carbon emissions generated by employee commuting and business travel
   c. Carbon emissions from the production process of raw materials such as ethylene and vinyl acetate.
2. In 2023, Kaohsiung Plant increased the number of employee checks on commuting/business trips/raw material production/tap water projects (Scope 3).
3. In 2023, Taipei HQ will increase the number of checks on employee commuting/business trips/tap water items
4. The Kaohsiung Plant is a GHG emission control unit under the Ministry of Environment, with Scope 1 emissions accounting for 99.9% of USI's individual emissions.
5. All figures are aggregated from the original audit data and displayed to three decimal places.

Analyzing the intensity of GHG Emissions in the past three years, in 2022 due to equipment failure and production line shutdown, emissions per unit product increased. In 2023, emissions fell slightly compared with the previous year, but output increased by 4.1%. This was also due to the conversion of production types. Unit emissions increased compared with 2021.

GHGs emissions in the past three years



Year	2021	2022	2023
GHGs emissions of Scope 1 + Scope 2 (10,000 MT CO_2e)	14.817	14.328	14.267
Production (MT)	249,402	208,648	217,172
Emission Intensity per unit product (MT CO_2e/MT)	0.594	0.687	0.657

Note: 1. The calculation boundary includes USI's Scope 1 and Scope 2 GHG emissions.
2. The carbon emission coefficient for electricity is based on the latest data published by the Energy Administration: 0.502T CO_2e per kWh in 2021, 0.495T CO_2e per kWh in 2022, and 0.494T CO_2e per kWh in 2023.
3. In 2023, diesel without biofuels was used, resulting in zero emissions from biofuel combustion.
4. Compliance with ISO 14064-1:2018 standards is required, and SGS Group has been commissioned for verification.

Energy conservation and carbon emissions targets and performance GRI 302-4 RT-CH-110a.2

The energy conservation and carbon reduction programs in 2023 and their performance are tabulated below. A total of 2 programs with a total investment of NT$88,000 were implemented to reduce carbon by 1,614 tCO_2e.

Item	Category2	Program	Energy Saved	Carbon Reduced (metric tons CO_2e/year)
1	Electricity Saving	Reactor pressure reduction of Plant I	837,146 kWh	413.6
2	Electricity Saving	CBC plant parking, choose one of J-290D/E/F to stop operation.	2,430,468 kWh	1,200.7
Total			3,267,614 kWh	1,614

Note: 1. Carbon emission factor of electricity as 0.494 tCO_2e/MWh.
2. Based on the 2023 Report on the Annual Energy Saving Audit System of Energy Users of the Energy Administration.
3. Item 1 calculation method: Calculate energy savings based on the difference in operating current values and operating times before and after adjusting the operating pressure of the secondary compressor.
4. Item 2 calculation method: Calculate energy savings based on equipment specifications and the time the production line is idle.

The planned energy-saving measures for 2024 include the replacement of steam condensers, replacement of insulation materials for pipelines, pressure reduction operations for reactors, shutting down non-essential power sources, and the addition of modifier injection points for secondary compressor inlet engineering. A total of 2,015,910kWh of electricity is projected to conserve in 2024, resulting in a reduction in LNG consumption of 306,134M^3.

The planning and targets of energy conservation and carbon reduction programs in 2024 are tabulated below. Six programs will be implemented to reduce carbon by 1,629 tCO_2e (projected).

2024 Principal Energy Conservation and Carbon Reduction Program	2024 Target Reduction
· Steam condenser replacement · Replacement of insulation materials for pipelines · Pressure reduction operations for reactors · Shutdown of non-essential power sources · Addition of modifier injection points for secondary compressor inlet engineering	1,629 tCO_2e

Energy conservation and carbon reduction plan

Forestation Adoption Program

In response to energy conservation, carbon reduction, and environmental protection, we promoted the Forestation Adoption Program in collaboration with the Experimental Forest, College of Bio-Resources and Agriculture, National Taiwan University to grow more trees with the technical assistance of professional teams. Additionally, the program allows the public to understand the benefits of growing trees for CO_2 adsorption by soil and water and its importance to environmental protection.

In December 2021 we signed the agreement to donate NT$9 million for forestation through adopting 7,500 trees occupying an area of about 5 hectares for a term of 20 years, with a total carbon fixation capacity of 1,350tCO_2e, equivalent to the capacity of about 3.5 Daan Parks. (According to the Council of Agriculture, the per hectare carbon adsorption of forests is 15tCO_2e/year. The area of Daan Park is 25.8 hectares, i.e., its annual carbon adsorption capacity is about 387tCO_2e.)

Supported "Earth Hour", a global energy conservation activity.

We began supporting this event in 2018. During 20:30-21:30 on March 25, 2023, we joined the “Earth Hour” activity with the world by turning off the landscaping lights of the plant’s exterior walls and unnecessary lighting fixtures so as to advocate the idea that everyone, regardless of age and socioeconomic status, has the ability and responsibility to protect Earth in climate change.

We supported the government's energy conservation and carbon reduction policies and activities in real action. Besides reducing energy use and lowering the cost, we also hope to encourage the public and businesses to value energy conservation and carbon reduction by setting an example through participating in Earth Hour.

During the activity, we turned off a total of 98 skyline lamps and 1 signboard lamp to save about 1.18kWh of electricity and reduce carbon of about 0.6kgCO_2e.

Product carbon footprint

We promoted product carbon footprint verification (CFV) in 2021 and obtained the assurance certificate (valid until 2024/3/2) in March 2022. Based on the data of lifecycle assessment, the GHG emissions from direct and indirect activities or accumulated in the product is considered according to the product lifecycle from materials acquisition or natural resource production to disposal at the end of life is considered. Verification for conformity to the ISO 14067:2018 product carbon footprint standard was completed on EVA, the target product, according to ISO 14064-3:2006. The declared/functional unit is per kilogram (including package).

Lifecycle GHG Emissions

Declared Unit of Emissions of Target Verification Product (kgCO_2e)				Functional Unit Emissions (kgCO_2e)
Lifecycle Stage	Materials	Manufacturing	Total	
EVA®UE2828	2.270	0.689	2.96	2.96
EVA®UE649-04	2.128	0.689	2.82	2.82
EVA®UE659	2.223	0.689	2.91	2.91

4.6 Raw materials management

Our main products are: LDPE, EVA, HDPE, and LLDPE. Major raw materials include ethylene, VAM, and butene. Major secondary materials include Iso-Paraffin Solvent, propylene, n-Hexane, and isopentane. Raw materials are only used by Kaohsiung Plant, with a coverage rate of 100%.

n the product manufacturing process, we are committed to enhance the recovery efficiency of raw materials, hoping to reduce raw materials consumption. Recovery methods included the improvement of the high-pressure recovery system, monomer refine tower (MRT), connection of new and existing tanks, installation of the condenser at the frontend of the ethylene purification tower (EPT), addition of the compressor leak gas recovery system, and others at Plant II. As a result, the recovery rate of raw materials in 2023 was 14.6%.