7.3 Energy, Resource Management and Recycling

In addition to producing high-efficiency solar cells, modules, and power station systems that reduce greenhouse gas emissions for the planet, URECO is also actively engaged in water and electricity conservation efforts. Our plants in the Hsinchu Science Park, Zhunan, and Tainan have all obtained ISO 14001 Environmental Management System certification. An energy-saving project team is dedicated to promoting energy-saving management programs in offices, public areas and production lines. The energy-saving project team is subdivided into electrical machinery, air conditioning and exhaust, gas chemistry, water supply and drainage, etc. Each plant appoints an engineer to participate, with one of them serving as the convener of the team and the appointed supervisor in charge of counseling. URECO has been implementing energy and water saving programs since 2011, and has been awarded the water and energy saving excellence awards by National Science and Technology Council. Over the past three years, we have achieved cumulative energy savings of 25,222.8 gigajoules. This achievement translates into a reduction of 3,512 metric tons of CO2 emissions and savings of NT$16.11 million in electricity costs, underscoring URECO's steadfast commitment to sustainable energy practices.

7.3.1 Energy Management GRI 302-1, 302-3, 305-4

As the leading solar power plant in Taiwan, URECO not only generates profits, but also has a high ethical standard for energy management. Energy saving is definitely an important issue for URECO.

URECO uses energy from both renewable and non-renewable sources. Non-renewable energy is primarily purchased electricity, followed by a small amount of diesel fuel (used in power generators). In 2023, our total energy consumption was approximately 318,470.4 gigajoules. Renewable energy, generated primarily through solar panels installed since 2014, accounted for a self-generated total of 1,075.6 gigajoules by the end of 2023.

The total energy consumption statistics are as follows

Unit: Gigajoule

Energy Type	2021	2022	2023
Purchased electricity	456,094.2	452,361.6	318,470.4
Self-generated and self-used solar power	84.1	61.7	0.0
Total consumption	456,178.2	452,423.3	318,470.4
Intensity (GJ/NT$1 million)	37.9	27.7	31.4

Note 1: Joule conversion unit is 1 degree of electricity = 0.0036 gigajoules.

Note 2: The unit has been converted from terajoules (TJ) to billion joules (GJ), rounded to one decimal place.

Note 3: Density = Total consumption / Revenue (in million NT dollars).

Note 4: The Hsinchu Science Park Plant's self-consumed solar power has been without maintenance since September 2022, and there is no data available for the year 2023. The Tainan plant sells its self-generated solar power to Taiwan Power Company.

Energy saving measures and performance over the years

By comparing energy efficiency in cross-plant meetings and identifying the best mode of operation, the energy saving team launched operations in all plants in parallel to improve energy efficiency in all plants. In 2023, the main electricity consumption was for plant systems and production equipment. Energy-saving measures included load management, energy efficiency initiatives, and production capacity transformation, resulting in savings of approximately 11,728.1 gigajoules, equivalent to reducing 1,613 tons of carbon emissions.

Note: The calculation of 0.495 kilograms of CO2e generated per unit of electricity, source from Bureau of Energy, Ministry of Economic Affairs.

URECO's efforts to invest in energy savings include:

- Load management: Adjust UPS load measurement configuration, OEX/AEX/GEX/CDA/PV/ice machine load reduction, cooling water tower cleaning to improve efficiency.
- Energy saving measures: cooling water tower cleaning, office/stairs/corridor air conditioning energy saving, office area lighting additional zipper switch & warehouse lighting improvement (pull lamp + reduction), adjusting dust-free room lighting according to production line, etc.

The energy-saving results of each plant in the past three years are summarized as follows:

Unit: Gigajoule

Year	2021	2022	2023	Subtotal
Electricity (Terajoule)	4,677.5	8,817.2	11,728.1	25,222.8
Greenhouse Gas (Tonnes CO_2e)	652.3	1,246.6	1,612.6	3,511.5

Note 1: Energy saving calculation: Estimated energy saving before and after improvement of each project

Note 2: Electricity emission factor measured at 0.502 kg CO_2e/kWh in 2020 and 0.509 kg CO_2e/kWh in 2021 and 2022; source from Bureau of Energy, Ministry of Economic Affairs.

Note 3: The unit has been converted from terajoules (TJ) to gigajoules (GJ), rounded to one decimal place.

7.3.2 Water Resources Management GRI 303-1, 303-3

URECO uses water from various reservoirs in each area, including the Baoshan Reservoir for the Hsinchu and Hsinchu Science and Industrial Park plants, the Yung-Ho-Shan Reservoir for the Zhunan plant, and the Nan-Hua Reservoir for the Tainan plant. In terms of natural resource saving, the energy saving team not only invests in water recycling efforts, but also uses a small amount of water from rainwater recycling. Cherishing water resources is also an important part of the green industry, and URECO's water saving efforts have resulted in the following:

Water Sources

Unit: million liters

Water Sources	2021	2022	2023
Storage water (rainwater, recycled water)	293.7	269.7	104.1
Tap water	682.6	693.9	361.6

Note 1: The unit has been rounded to one decimal place.

Annual water recycled over the past years

URECO has optimized the machine's water consumption by adapting its production capacity and designed the lowest water consumption model.

The following two main management guidelines have been established for water saving measures based on environmental considerations and evaluations:

- Process water reduction: Optimized process water evaluation and reuse of process recycled water
- Water recycling and reuse: Rainwater, cooling water and local scrubber drainage recycling and reuse

Among them, as the Hsinchu Science and Industrial Park plant ceased production of the cell process in 2022, the proportion of water recycled and improved in 2022 compared to 2021 was lower. The following table summarizes the water saving benefits of each major plant in the past three years:

Unit: million liters

		2021	2022	2023
Hsinchu Science and Industrial Park Plant	Total water consumption	66.85	43.48	-
	Recycle and reuse	10.17	0.07	-
	Water saving improvement percentage	15.2%	0.1%	-
Zhunan Plant	Total water consumption	405.16	293.03	106.66
	Recycle and reuse	150.18	132.81	36.49
	Water saving improvement percentage	37.1%	45.3%	34.2%
Tainan Plant	Total water consumption	395.99	357.41	221.53
	Recycle and reuse	172.22	136.85	67.61
	Water saving improvement percentage	43.5%	38.3%	30.5%

Note 1: The formula for calculating recycle and reuse is: the amount of water recycled / the number of days in the month.

Note 2: The data source is based on the meter reading data of each plant equipment flow.

Note 3: The Hsinchu Science Park Plant ceased production in April 2023; hence, relevant data for 2023 is not disclosed.

Note 4: Recycled water includes the amount of process wastewater recycled plus rainwater harvested.

Water saving measures over the years

URECO has implemented a number of wastewater recycling system improvements, including: the use of pure water and recycled water system resin regeneration fast and slow wash water recycling, pure water system sand filter tower and activated carbon tower forward and reverse wash water recycling, rooftop rainwater recycling system and Fan coil unit cooling water recycling; process water saving improvements focused on adjusting the machine Taiwater parameters, process machine water reduction, plant annual maintenance water saving control, plant watering, water saving by cutting water supply by half, pure water system RO drainage recycling to the filter tank, wet process wastewater recycling, cleaning of machine filter board after mud dewatering, additional process wet cleaning tower recycling system, improved water recycling of wet process. In 2023, water conservation measures at our facilities included discontinuing automated irrigation in the plant area, switching to manual and irregular watering, converting process wet-type local scrubber machines to dry-type machines, recycling process wastewater, and adopting water-saving equipment. These initiatives resulted in an estimated annual water savings of approximately 186.83 million liters.

Cumulatively, from 2013 to 2023, our plants have saved approximately 755.2 million liters through water conservation efforts.