


Status of Energy Management and Usage

TSRC's global operations continue to implement measures to improve energy efficiency and reduce energy consumption. In addition to innovating low-carbon processes and replacing process equipment to achieve carbon reduction targets, major plants and subsidiaries (Kaohsiung Factory, Shen Hua Chemical, Nantong Industries and TSRC-UBE) have set annual energy saving targets.

	Achievements in 2024	2024 Goals	2025 Goals	2030 Goals
 Goals and Achievement	<ul style="list-style-type: none"> Renewable energy accounted for 7.55% of TSRC Group's total electricity consumption Shen Hua Chemical, Nantong Industries, TSRC-UBE, and TSRC (Vietnam) Company Limited all achieved their annual energy conservation targets 	<ul style="list-style-type: none"> Renewable energy accounted for 7.5% of TSRC Group's total electricity consumption The Kaohsiung Factory reduced electricity consumption by 750 MWh and steam consumption by 250 tons Shen Hua Chemical electricity use per unit product ≤ 310 kWh/ton and steam use per unit product ≤ 114 ton/ton Nantong Industries' comprehensive energy consumption was $\leq 42,900$ (tce), and comprehensive energy consumption per unit product was ≤ 0.588 (tce/ton) TSRC-UBE's comprehensive energy consumption was 26,100 (tce), and comprehensive energy consumption per unit product was ≤ 0.390 (tce/ton) Shanghai Industries' electricity use per unit product was < 415 kWh/ton in summer and < 410 kWh/ton in non-summer TSRC (Vietnam) Company Limited's electricity use per unit product was $\leq 1,100$ (kWh/ton) 	<ul style="list-style-type: none"> Renewable energy accounted for 10% of the Group's total electricity consumption The Kaohsiung Factory reduced electricity consumption by 750 MWh and steam consumption by 250 tons Shen Hua Chemical electricity use per unit product ≤ 310 kWh/ton and steam use per unit product ≤ 114 ton/ton Nantong Industries' comprehensive energy consumption was $\leq 41,000$ (tce), and comprehensive energy consumption per unit product was ≤ 0.584 (tce/ton) TSRC-UBE's comprehensive energy consumption was 26,500 (tce), and comprehensive energy consumption per unit product was 0.379 (tce/ton) Shanghai Industries' electricity use per unit product was < 415 kWh/ton in summer and < 410 kWh/ton in non-summer 	<ul style="list-style-type: none"> Renewable energy accounted for 30% of TSRC Group's total electricity consumption

1. Energy Saving Targets and Achievements of TSRC

Only Kaohsiung Factory, Shen Hua Chemical and TSRC-UBE failed to meet the target in 2023, while the other plants met the target. The failure to meet the targets was mainly due to the increase in electricity and steam consumption as a result of the change in production volume, additional equipment, and the increase in cooking changeover time and pre-opening heat transfer to meet environmental protection requirements.

Energy Conservation Goals and Achievements of TSRC Key Factories and Subsidiaries						
	Kaohsiung Factory	Shen Hua Chemical	Nantong Industries	TSRC-UBE	Shanghai Industries	TSRC (Vietnam) Company Limited
Energy Conservation Goals for 2024	<ul style="list-style-type: none"> Reduce electricity use by 750 MWh/year Reduce steam use by 250 tons/year 	<ul style="list-style-type: none"> Electricity use per unit product ≤ 310 (kWh/ton) Steam use per unit product ≤ 114 (ton/ton) 	<ul style="list-style-type: none"> Comprehensive energy consumption $\leq 42,900$ (tce) Comprehensive energy consumption per unit product ≤ 0.588 (tce/ton) 	<ul style="list-style-type: none"> Comprehensive energy consumption $\leq 26,100$ (tce) Comprehensive energy consumption per unit product ≤ 0.390 (tce/ton) 	<ul style="list-style-type: none"> Summer electricity use per unit product < 415 (kWh/ton) Non-summer electricity use per unit product < 410 (kWh/ton) 	<ul style="list-style-type: none"> Electricity use per unit product $\leq 1,100$ (kWh/ton)
Achievement in 2024	<ul style="list-style-type: none"> Reduced electricity use by 1,969 MWh/year Reduced steam use by 211 tons/year 	<ul style="list-style-type: none"> Electricity use per unit product 2.98 (kWh/ton) Steam use per unit product 1.07 (ton/ton) 	<ul style="list-style-type: none"> Comprehensive energy consumption = 39,378.41 (tce) Comprehensive energy consumption per unit product 0.575 (tce/ton) 	<ul style="list-style-type: none"> Comprehensive energy consumption = 25,803.58 (tce) Comprehensive energy consumption per unit product 0.378 (tce/ton) 	<ul style="list-style-type: none"> Summer electricity use per unit product of 445 (kWh/ton) Non-summer electricity use per unit product of 412.8 (kWh/ton) 	<ul style="list-style-type: none"> Electricity use per unit product of 819.39 (kWh/ton)
Description and Improvement Plan	<ul style="list-style-type: none"> Purchased a new type of steam trap. Currently still making adjustments, as overly large exhaust pores will use up larger amounts of steam, while pores that are too small will make it harder for pellets to dry out. 	<ul style="list-style-type: none"> Goal achieved 	<ul style="list-style-type: none"> Goal achieved 	<ul style="list-style-type: none"> Goal achieved 	<ol style="list-style-type: none"> The non-summer electricity consumption rate is due to there being a lower number of working days as a result of the Spring Festival in February, and a higher share of electricity consumption from auxiliary equipment, air compressors, environmental equipment, and public utilities equipment after being turned back on. Upgraded the high-availability main power generator for the production line to a newer and more efficient generator. Electricity consumption for the summer increased due to switching to using water chillers for the workshop cooling system for 3 months during this period, resulting in higher electricity consumption and a failure to achieve goals for the summer period. We will manage the use of water chillers in the summer and enforce different temperature ranges for the summer. 	<ul style="list-style-type: none"> Goal achieved

2. TSRC's Energy Consumption

TSRC Group's total energy consumption in 2024 was 5,145,114.47 gigajoules (GJ). While TSRC's production output in 2024 increased by 4.00% compared to 2023, energy consumption only increased by 2.04% compared to 2023. Energy intensity per metric ton of production was 9.32 GJ/metric ton, a decrease of 1.89% compared to the previous year, and showing an effective improvement to energy efficiency.

2021-2024 TSRC Energy Consumption

(Unit: Gigajoule (GJ))

		2021	2022	2023	2024
Non-renewable energy	Bituminous coal	0.00	0.00	0.00	0.00
	Fuel oil	0.00	0.00	0.00	0.00
	Diesel in factory area	5,283.02	12,126.96	9,936.36	11,521.72
	Natural gas	1,822,886.21	1,763,823.66	1,815,902.91	1,923,062.93
	Liquefied petroleum gas (LPG)	1,824.44	769.22	239.91	1,021.19
	Gasoline	1,415.94	1,241.03	1,530.97	1,371.03
	Recycled butadiene	59,917.15	66,979.31	76,259.51	42,606.65
	Purchased electricity	975,172.68	929,941.41	866,128.46	760,668.85
	Purchased steam	2,290,025.73	2,366,576.76	2,234,203.88	2,332,618.67
	Subtotal	5,156,525.17	5,141,458.35	5,004,202.00	5,072,871.06
Renewable energy	Purchased electricity	0.00	0.00	36,000.60	63,593.86
	Self-generated electricity	0.00	0.00	2,077.38	8,649.56
	Subtotal	0.00	0.00	38,077.98	72,243.42
Total energy consumption		5,156,525.17	5,141,458.35	5,042,279.98	5,145,114.47
Self-generated electricity (non-renewable energy + renewable energy)		22,952.62	60,071.87	84,226.28	177,784.80
Percentage of electricity used from the power grid (%)		97.70%	93.93%	87.81%	75.91%
Percentage of renewable energy (%)		0.00%	0.00%	0.76%	1.40%
Percentage of electricity from the grid out of total energy consumption (%)		18.91%	18.09%	17.18%	14.78%

Note 1: The 2021 data includes the Global Business Headquarters, two factories (Kaohsiung and Gangshan), and 6 subsidiaries that engage in manufacturing activities within the reporting boundary. 2 holding companies Polybus and TSRC (Lux.) which mainly engage in trading activities were excluded.

Note 2: The 2022-2024 data includes within the reporting boundary the Global Business Headquarters, two factories (Kaohsiung and Gangshan), 6 subsidiaries that engage in manufacturing activities, and 2 holding companies Polybus and TSRC (Lux.) which mainly engage in trading activities.

Note 3: The energy conversion factors are based on the Greenhouse Gas Emissions Guidelines published by the Environmental Protection Administration of Taiwan. The data is calculated based on the Lower Heating Values (LHV) of the fuels. The results are rounded to the second decimal place.

Note 4: Total energy consumption of organization = the internal energy consumption + non-renewable energy + renewable energy.

Note 5: Percentage of electricity used from the power grid (%) = (Purchased electricity (non-renewable energy)) / (Purchased electricity (non-renewable energy) + Purchased electricity (renewable energy) + self-generated electricity (renewable energy) + self-generated electricity (Non-renewable energy)).

Note 6: Percentage of renewable energy (%) = (Purchased electricity (Renewable energy) + Self-generated electricity (renewable energy)) / Total energy consumption.

Note 7: Percentage of electricity from the grid out of total energy consumption (%) = Purchased electricity (non-renewable energy) / Total energy consumption.

Note 8: The Heating value conversion factor for each type of energy used is based on version 6.0.4 of the Greenhouse Gas Emission Factor Management Table of the Environmental Protection Agency of Taiwan. Among them, the recycled butadiene reference petroleum heating value, is calculated as 7,800 kcal/L. For steam, except for Shen Hua Chemical and Nantong Industries, a standard conversion factor of 2.26 GJ for the heat required to vaporize one ton of water at one atmosphere pressure is used. Shen Hua Chemical and Nantong Industries use a conversion factor provided by their supplier, which is 2.96626 GJ for one ton of water.

Note 9: Starting from 2021, all TSRC manufacturing factories no longer use bituminous coal and fuel oil as energy sources.



3. TSRC Purchased Energy

2021-2024 TSRC Purchased Energy (by Subsidiary)

	Purchased Energy	TSRC Corporation (Includes the Global Business Headquarters, Gangshan Factory, and Kaohsiung Factory)	Shen Hua Chemical	Nantong Industries	TSRC-UBE	Shanghai Industries	TSRC (Vietnam) Company Limited	TSRC Specialty Materials LLC	Polybus	TSRC (Lux.)	TSRC Group Total
2021	Consumption of purchased electricity (MWh)	108,106	54,051	60,513	21,338	4,170	2,290	20,413	n/a	n/a	270,881
	Consumption of purchased steam (metric ton)	59,025	192,407	392,510	230,190	0	0	139,154	n/a	n/a	1,013,286
	Total consumption of purchased energy (GJ)	Electricity	389,182	194,584	217,847	76,817	15,012	8,245	73,487	n/a	975,173
		Steam	133,397	434,839	887,073	520,229	0	0	314,488	n/a	2,290,026
		Electricity + Steam	522,578	629,423	1,104,919	597,046	15,012	8,245	387,975	n/a	3,265,197
	Production volume (metric tons)	194,194	170,988	73,815	65,285	9,934	0	47,921	n/a	n/a	562,138
	Indirect energy intensity per unit of product (GJ/ton)	2.69	3.68	14.97	9.15	1.51	0	8.10	n/a	n/a	5.81
2022	Consumption of purchased electricity (MWh)	92,803	53,899	65,727	21,165	2,703	1,164	20,850	4	2	258,317
	Consumption of purchased steam (metric tons)	27,993	177,090	320,918	215,399	0	0	138,157	0	0	879,556
	Total consumption of purchased energy (GJ)	Electricity	334,091	194,038	236,616	76,195	9,730	4,190	75,060	14	929,941
		Steam	63,263	400,222	951,927	638,929	0	0	312,235	0	2,366,577
		Electricity + Steam	397,355	594,260	1,188,543	715,123	9,730	4,190	387,295	14	3,296,518
	Product volume (metric tons)	178,484	170,522	72,822	67,217	5,494	577	44,910	0	0	540,026
	Indirect energy intensity per unit of product (GJ/ton)	2.22	3.48	16.32	10.64	1.77	7.26	8.62	0	0	6.10

(Continued)

	Purchased Energy	TSRC Corporation (Includes the Global Business Headquarters, Gungshan Factory, and Kaohsiung Factory)	Shen Hua Chemical	Nantong Industries	TSRC-UBE	Shanghai Industries	TSRC (Vietnam) Company Limited	TSRC Specialty Materials LLC	Polybus	TSRC (Lux.)	TSRC Group Total
2023	Consumption of purchased electricity (MWh)	89,225	56,633	51,395	20,831	2,440	1,379	18,683	3	3	240,591
	Consumption of purchased steam (metric tons)	223	183,646	291,595	225,965	0	0	125,417	0	0	826,846
	Total consumption of purchased energy (GJ)	Electricity (non-renewable energy)	321,212	203,880	185,020	74,992	8,782	4,964	67,257	10	866,128
		Electricity (renewable energy)	0	0	36,001	0	0	0	0	0	36,001
		Steam	504	415,040	864,947	670,271	0	0	283,442	0	2,234,204
		Electricity + Steam	321,716	618,920	1,085,968	745,263	8,782	4,964	350,700	10	3,136,333
	Production volume (metric tons)	178,370	171,221	66,747	67,622	6,094	1,101	39,846	0	0	531,001
	Indirect energy intensity per unit of product (GJ/ton)	1.80	3.61	16.27	11.02	1.44	4.51	8.80	0	0	5.91
2024	Consumption of purchased electricity (MWh)	63,816	57,626	44,432	21,504	2,735	1,495	19,683	3	3	211,297
	Consumption of purchased steam (metric tons)	10,407	181,687	292,166	218,924	0	0	169,231	0	0	872,414
	Total consumption of purchased energy (GJ)	Electricity (non-renewable energy)	229,737	207,452	159,956	77,416	9,848	5,381	70,859	9	760,669
		Electricity (renewable energy)	0	0	63,594	0	0	0	0	0	63,594
		Steam	23,520	410,612	866,640	649,386	0	0	382,461	0	2,332,619
		Electricity + Steam	253,256	618,064	1,090,190	726,801	9,848	5,381	453,321	9	3,156,881
	Production volume (metric tons)	178,727	181,266	68,434	68,253	6,540	1,291	47,732	0	0	552,243
	Indirect energy intensity per unit of product (GJ/ton)	1.42	3.41	15.93	10.65	1.51	4.17	9.50	0	0	5.72

4. Energy Management System

TSRC refers to the ISO 50001 energy management system structure and adopts the PDCA model to periodically analyze energy use and consumption by major production sites, and conducts checks on process efficiency and system regulations to ensure energy efficiency in all TSRC factories to achieve the goal of energy control and efficiency improvement. Kaohsiung Factory, Nantong Industries and TSRC-UBE have obtained ISO 50001 certification.

Site	ISO 50001 Certification validity period
Kaohsiung Factory	2023/01/10-2025/12/08
Nantong Industries	2022/11/30-2025/11/29
TSRC-UBE	2022/12/29-2025/12/28