

Energy Management & Usage

I. Energy Management

TSRC adopts the PDCA model to regularly analyze the energy use and consumption status of the main production sites and conduct audits on process efficiency and system to ensure the energy efficiency of all TSRC factories. TSRC continues to take measures to improve energy efficiency and reduce energy consumption and to promote low-carbon manufacturing process innovation and equipment replacement in conjunction with carbon reduction goals. The key factories and subsidiaries (including Kaohsiung Factory, Shen Hua Chemical, Nantong Industries, and TSRCUBE) have annual energy saving targets. The Kaohsiung Factory, Nantong Industries and TSRC UBE are certified with the ISO 50001 Standard.

In 2022, all other factories met the energy efficiency target, except for Shen Hua Chemical. Shen Hua Chemical did not meet the target of electricity consumption per unit of product due to the record high temperature of the year and the frequent on-and-off of environmental improvement equipment (including incinerators and activated furnaces), resulting in high electricity consumption. In 2022, factories adjusted the energy portfolio, reduced the use of liquefied petroleum gas and recycled process waste gas as fuel to implement a circular economy. In 2023, we will keep improving energy efficiency by adjusting the on-and-off pattern according to the production plan, investing in new absorption chillers and replacing old facilities.

TSRC Group's total energy consumption in 2022 was 4,833,530 gigajoules (GJ), with a reduction of 6.26% compared to the previous year. TSRC's energy intensity of product has been declining for four consecutive years. The energy intensity in 2022 was 8.95 GJ/ton, a decrease of 2.43% from the previous year.

Key Factories and Subsidiaries	2022 Energy Saving Targets	2022 Outcomes	2023 Targets
Kaohsiung Factory	<ul style="list-style-type: none"> Reduce electricity consumption by 884 kWh per year Reduce steam consumption by 10,000 tons per year 	<ul style="list-style-type: none"> Reduced power usage 481 kWh per year Reduced steam usage 11,280 tons per year 	<ul style="list-style-type: none"> Reduced power usage 750 kWh per year Reduced steam usage 250 ton per year
Shen Hua Chemical	<ul style="list-style-type: none"> Electricity use per unit product ≤ 295 (kWh/ton) Steam use per unit product ≤ 1.17 (ton/ton) 	<ul style="list-style-type: none"> Unit product power usage ≤ 297 (kWh/ton) Unit product steam usage ≤ 1.10 (ton/ton) 	<ul style="list-style-type: none"> Unit product power usage ≤ 303 (kWh/ton) Unit product steam usage ≤ 1.14 (ton/ton)
Nantong Industries	<ul style="list-style-type: none"> Total consumed energy (toe) $\leq 43,294$ Combined energy consumption per unit product ≤ 0.608 (toe/ton) 	<ul style="list-style-type: none"> Integrated energy usage toe=43,202 Unit product integrated energy usage 0.593(toe/ton) 	<ul style="list-style-type: none"> Integrated energy usage toe $\leq 42,750$ Unit product integrated energy usage ≤ 0.592 (toe/ton)
TSRC-UBE	<ul style="list-style-type: none"> Integrated energy usage toe $\leq 26,100$ Unit product integrated energy usage ≤ 0.899 (toe/ton) 	<ul style="list-style-type: none"> Integrated energy usage toe=25,840.85 Unit product integrated energy usage 0.884 (toe/ton) 	<ul style="list-style-type: none"> Integrated energy usage toe=25,470 Unit product integrated energy usage ≤ 0.882 (toe/ton)

II. Energy consumption in last three years

2020-2022 TSRC Energy Consumption

(Unit: GJ)		2020	2021	2022
Direct energy consumption (non-renewable energy)	Bituminous coal	1,179,652.25	0.00	0.00
	Fuel oil	22,762.09	0.00	0.00
	Plant diesel	14,775.47	5,288.02	12,188.86
	Natural gas	1,621,896.17	1,822,886.21	1,768,828.66
	Liquefied petroleum gas (LPG)	4,161.60	1,824.44	212.00
	Gasoline	1,070.08	1,415.94	1,241.08
	Recycled butadiene	58,400.51	59,917.15	66,979.81
	Subtotal	2,897,718.17	1,891,826.76	1,844,394.87
Indirect energy consumption	Purchased electricity (non-renewable energy)	921,085.20	975,172.68	984,482.24
	Purchased electricity (Renewable energy)	0.00	0.00	0.00
	Purchased steam	1,402,588.40	2,290,025.78	2,054,658.61
	Subtotal	2,323,618.60	3,265,198.41	2,989,185.85
Total energy consumption		5,221,886.77	5,156,525.17	4,883,580.22
Self-generated electricity		0.00	22,952.62	60,071.87
Percentage of electricity used from the power grid (%)		100.00%	97.70%	98.96%
Percentage of renewable energy (%)		0.00%	0.00%	0.00%
Percentage of electricity from the grid out of total energy consumption (%)		17.64%	18.91%	19.83%

For the details of energy consumption, please refer to the [2022 sustainability report](#)

2020-2022 TSRC Purchased Energy (by Subsidiaries)

Purchased Energy		TSRC Corporation	Shen Hua Chemical	Nantong Industries	TSRC-UBE	Shanghai Industries	TSRC (Vietnam) Company Limited	TSRC Specialty Materials LLC	Polybus	TSRC (Lux.)	TSRC group	
2020	Amount of electricity purchased from external sources (kWh)	105,790	53,467	49,993	21,868	4,576	0	20,163	N/A	N/A	255,857	
	The steam purchased from external sources (metric ton)	49,068	192,784	176,435	22,935	0	0	179,368	N/A	N/A	620,590	
	The energy consumption of external purchases (mega joule, MJ)	electricity	380,844,000	192,481,200	179,974,800	78,724,800	16,473,600	72,586,800	N/A	N/A	N/A	921,085,200
		steam	110,893,680	435,691,840	398,743,213	51,832,987	0	405,371,680	N/A	N/A	N/A	1,402,533,400
		electricity & steam	491,737,680	628,173,040	578,718,013	130,557,787	16,473,600	477,958,480	N/A	N/A	N/A	2,323,618,600
	Production volume (metric tons)	173,773	170,426	55,560	63,036	12,214	0	46,521	N/A	N/A	N/A	
Indirect energy intensity per unit of product (MJ/metric tons)	2,830	3,686	30,416	2,071	1,349	0	10,274	N/A	N/A	N/A	4,455	
2021	Amount of electricity purchased from external sources (kWh)	108,106	54,051	60,513	21,338	4,170	2,290	20,413	N/A	N/A	270,881	
	The steam purchased from external sources (metric ton)	59,025	192,407	392,510	230,190	0	0	139,154	N/A	N/A	1,013,286	
	The energy consumption of external purchases (mega joule, MJ)	electricity	389,181,600	194,583,600	217,846,800	76,816,800	15,012,000	73,486,800	N/A	N/A	N/A	975,172,600
		steam	133,396,500	434,839,436	887,072,600	520,229,400	0	314,487,791	N/A	N/A	N/A	2,290,025,727
		electricity & steam	522,578,100	629,423,036	1,104,919,400	597,046,200	15,012,000	387,974,591	N/A	N/A	N/A	3,265,197,327
	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 (MJ/metric tons)	2,691	3,681	14,969	9,145	1,511	0	8,096	N/A	N/A	N/A	5,809	
2022	Amount of electricity purchased from external sources (kWh)	92,803	53,899	65,727	21,165	2,703	1,164	20,850	4	1,264	259,578	
	The steam purchased from external sources (metric ton)	27,933	177,090	320,918	215,399	0	0	138	N/A	N/A	741,537	
	The energy consumption of external purchases (mega joule, MJ)	electricity	334,091,432	194,037,563	236,616,063	76,194,707	9,729,763	4,189,582	75,059,812	13,633	4,549,680	934,482,236
		steam	63,263,360	400,222,406	951,927,013	638,928,651	0	0	312,182	N/A	N/A	2,054,653,612
		electricity & steam	397,354,792	594,259,969	1,188,543,076	715,123,358	9,729,763	4,189,582	75,371,994	13,633	4,549,680	2,989,135,848
	Production volume (metric tons)	178,484	170,522	72,822	67,217	5,484	577	45,910	0	0	540,026	
Indirect energy intensity per unit of product (MJ/metric tons)	2,226	3,485	16,321	10,639	1,771	7,261	1,678	N/A	N/A	N/A	5,535	

For energy usage of each factory and subsidiary, please refer to the [2022 sustainability report](#).