Greenhouse Gas Emission Performance 2025

Ratch Pathana Energy Public Company Limited

Reporting Date: 16 February 2026

Reporting Period: 1 January – 31 December 2025

For the verification and certification of the Carbon Footprint for Organization (CFO) by the Thailand Greenhouse Gas Management Organization (Public Organization) (TGO)

Summary of Greenhouse Gas Emissions

Direct Greenhouse Gas Emissions (Scope 1)

GHG Emission Source		GHG Emissions (Ton CO_2e)								Total GHG Emissions (Ton CO_2e)
		CO_2	Fossil CH_4	CH_4	N_2O	SF_6	NF_3	HFCs	PFCs	
1	Diesel Combustion for Generator	91.27	-	0.11	0.21	-	-	-	-	91.58
2	Diesel Combustion for Fire Pump	4.38	-	0.01	0.01	-	-	-	-	4.39
3	Diesel Combustion for Water Pump	2.79	-	0.00	0.01	-	-	-	-	2.80
4	Diesel Combustion for Boiler	4.16	-	0.00	0.01	-	-	-	-	4.18
5	Diesel Combustion for Boiler Ignition	0.10	-	0.00	0.00	-	-	-	-	0.10
6	Fuel Oil Combustion for Boiler	234.56	-	0.25	0.48	-	-	-	-	235.30
7	Natural Gas Combustion for Production Process	282,995.80	-	146.50	138.65	-	-	-	-	283,280.96
8	LPG Combustion for Maintenance Activities	0.23	-	0.00	0.00	-	-	-	-	0.23
9	Acetylene Combustion for Maintenance Activities	0.02	-	-	-	-	-	-	-	0.02

GHG Emission Source		GHG Emissions (Ton CO_2e)								Total GHG Emissions (Ton CO_2e)
		CO_2	Fossil CH_4	CH_4	N_2O	SF_6	NF_3	HFCs	PFCs	
10	LPG Combustion in the Production Process									
11	Biomass Combustion – Fuel Wood	-	-	1,718.62	2,168.73	-	-	-	-	3,887.34
12	Biomass Combustion – Sawdust	-	-	79.45	100.26	-	-	-	-	179.70
13	Biomass Combustion – Paddy Husk	-	-	226.94	286.38	-	-	-	-	513.32
14	Biomass Combustion – Bagasse	-	-	140.19	176.91	-	-	-	-	317.09
15	Biomass Combustion – Corn Cob	-	-	165.59	208.96	-	-	-	-	374.55
16	Diesel Combustion for Company Vehicles	110.88	-	0.17	1.62	-	-	-	-	112.67
17	Gasohol 91 Combustion for Company Vehicles	13.75	-	0.03	0.30	-	-	-	-	14.08
18	Gasohol 95 Combustion for Company Vehicles	8.11	-	0.02	0.18	-	-	-	-	8.31
19	E20 Combustion for Company Vehicles	12.87	-	0.04	0.28	-	-	-	-	13.18

GHG Emission Source		GHG Emissions (Ton CO_2e)								Total GHG Emissions (Ton CO_2e)
		CO_2	Fossil CH_4	CH_4	N_2O	SF_6	NF_3	HFCs	PFCs	
20	Diesel Combustion for Forklifts	852.01	-	1.44	93.70	-	-	-	-	947.15
21	SF_6 Leakage from Switchgear	-	-	-	-	-	-	-	-	-
22	R32 Refrigerant Leakage	-	-	-	-	-	-	1.83	-	1.83
23	R134a Refrigerant Leakage	-	-	-	-	-	-	3.58	-	3.58
24	R410a Refrigerant Leakage	-	-	-	-	-	-	-	-	-
25	R514a Refrigerant Leakage	-	-	-	-	-	-	-	-	-
26	CO_2 Leakage from Fire Suppression Systems	0.08	-	-	-	-	-	-	-	0.08
27	GHG Emissions from Septic Tank Treatment System	-	-	16.11	-	-	-	-	-	16.11
Total		284,331.02	-	2,495.47	3,176.68	-	-	-	-	**290,009.00**

Indirect Greenhouse Gas Emissions (Scope 2)

GHG Emission Source	GHG Emissions (tCO_2e)
1. Purchased Electricity Consumption	727.52
Total	**728.00**

Other Indirect Greenhouse Gas Emissions (Scope 3)

GHG Emission Source	GHG Emissions (tCO_2e)
1. Fuel- and Energy-Related Activities	
1.1 Upstream Emissions from Natural Gas	81,243.21
1.2 Upstream Emissions from Fuel Oil	26.87
1.3 Upstream Emissions from LPG	0.06
1.4 Upstream Emissions from Diesel Fuel	130.08
1.5 Upstream Emissions from Gasoline	5.47
1.6 Upstream Emissions from Purchased Electricity	143.64
Total	**81,550.00**

Note: The organization reports only significant greenhouse gas emission sources. Details of the significance assessment are provided in Appendix 1

Greenhouse Gas Emissions Reported Separately

GHG Emission Source	GHG Emissions (Ton CO_2e)
1. Diesel Combustion for Generator	4.18
2. Diesel Combustion for Fire Pump	0.20
3. Diesel Combustion for Water Pump	0.13
4. Diesel Combustion for Boiler	0.19
5. Diesel Combustion for Boiler Ignition	0.00
6. Biomass Combustion – Fuel Wood	229,148.67
7. Biomass Combustion – Sawdust	10,593.10
8. Biomass Combustion – Paddy Husk	27,016.73
9. Biomass Combustion – Bagasse	16,689.21
10. Biomass Combustion – Corn Cob	19,713.31
11. Diesel Combustion for Company Vehicles	5.08
12. Gasohol 91 Combustion for Company Vehicles	1.05
13. Gasohol 95 Combustion for Company Vehicles	0.62
14. E20 Combustion for Company Vehicles	2.21
15. Diesel Combustion for Forklifts	39.07
16. R22 Refrigerant Leakage	9.40
17. R123 Refrigerant Leakage	-
Total	**303,224.00**

Carbon Intensity

GHG Emission Source	GHG Emissions	Unit
Scope 1	290,009.00	Ton CO_2e
Scope 2	728.00	Ton CO_2e
Scope 3 (Fuel and energy related activity)	81,550.00	Ton CO_2e
Total GHG Emissions (Scope 1 + 2)	290,737.00	Ton CO_2e
Total GHG Emissions (Scope 1 + 2 + 3)	372,287.00	Ton CO_2e
Production Output	1,005,472.66	MWh
Carbon Intensity (Scope 1 + 2)	0.2892	Ton CO_2e/ MWh
Carbon Intensity (Scope 1 + 2 + 3)	0.3703	Ton CO_2e/ MWh

Base Year

Reference Base Year

This Carbon Footprint for Organization (CFO) assessment represents the organization's fourth year of assessment. Ratch Pathana Energy Public Company Limited has designated the calendar year from 1 January 2022 to 31 December 2022 as the base year for calculating greenhouse gas emissions.

Organizational Boundary in the Base Year

Operational Boundary	GHG Emission Sources	Base Year GHG Emissions (tCO_2e)	Remarks
Scope 1	1. Natural Gas Consumption	525,282.31	
	2. Fuel Oil Consumption for Boiler	184.36	
	3. Diesel Consumption for Boiler	4.01	
	4. Diesel Consumption for Generator	24.04	
	5. Diesel Consumption for Fire Pump	2.42	
	6. LPG Consumption for Maintenance Activities	0.19	
	7. Acetylene Consumption for Maintenance Activities	0.07	
	8. Biomass Consumption	6,440.55	
	9. Diesel Consumption for Company Vehicles	146.43	
	10. Gasoline Consumption for Company Vehicles	82.28	
	11. Diesel Consumption for Loaders and Forklifts	946.51	
	12. SF_6 Leakage from Switchgear	0.00	
	13. R134a Refrigerant Leakage	10.92	
	14. R410a Refrigerant Leakage	9.62	
	15. CO_2 Leakage from Fire Suppression Systems	0.74	
	16. GHG Emissions from Septic Tank Treatment System	13.48	
Scope 2	1. Purchased Electricity Consumption	462.97	
Scope 3	1. Fuel- and Energy-Related Activities	140,021.56	
Others	1. Diesel Consumption for Boiler	0.26	
	2. Diesel Consumption for Generator	1.54	
	3. Diesel Consumption for Fire Pump	0.16	

Operational Boundary	GHG Emission Sources	Base Year GHG Emissions (tCO_2e)	Remarks
	4. Biomass Consumption	373,486.86	
	5. Diesel Consumption for Company Vehicles	9.28	
	6. Diesel Consumption for Loaders and Forklifts	55.18	
	7. R22 Refrigerant Leakage	13.90	
	8. R123 Refrigerant Leakage	21.52	

Differences Between Base Year and Current-Year GHG Reporting and the Reasons for Such Differences

The current greenhouse gas report for 2025 represents the fourth Carbon Footprint for Organization (CFO) assessment conducted by Ratch Pathana Energy Public Company Limited. The Company has therefore designated the calendar year from 1 January 2022 to 31 December 2022 as the base year for calculating greenhouse gas emissions.

When comparing the organizational boundary and greenhouse gas emission sources between the reporting year (2025) and the base year (2022), no expansion of the organizational GHG reporting boundary was identified. However, several additional emission sources were included, namely: diesel combustion for water pumps used in raw water management by Sahacogen Green Company Limited (Biomass Power Plant); leakage of R32 refrigerant from air-conditioning systems at Ratch Pathana Energy Public Company Limited and Sahagreen Forest Company Limited; and leakage of R514a refrigerant from air-conditioning systems at Ratch Pathana Energy Public Company Limited.

In addition, the organization has enhanced its data collection by recording the specific types of fuel used in company vehicles. This enables the organization to identify the portion of fuel containing biogenic components and report the related emissions under “Direct GHG Emissions Reported Separately.”

When comparing greenhouse gas emissions in the reporting year (2025) with the base year (2022), Scope 1 direct GHG emissions decreased by 45.60%. This reduction was mainly attributable to lower consumption of GHG-emitting fuels, including natural gas, diesel for boilers, diesel for generators, diesel for company vehicles, and gasoline for company vehicles. In addition, the methodology for determining biomass weight was revised from an as-received basis to a dry basis.

Scope 2 indirect GHG emissions from purchased electricity increased by 57.24%, primarily due to higher electricity purchases from external sources. In 2025, the organization purchased 1,455,321.48 kWh of electricity, compared with 926,115.34 kWh in 2022, resulting in an increase in associated GHG emissions.

For Scope 3 other indirect GHG emissions, specifically Fuel- and Energy-Related Activities, GHG emissions decreased by 41.75%. This was mainly due to lower fuel consumption across the organization, which consequently reduced the upstream emissions associated with the acquisition and use of fuel and energy.

Appendix 1

Process for Identifying Other Indirect Greenhouse Gas Emission Sources (Scope 3)

For the identification of other indirect greenhouse gas emission sources (Scope 3) to be included in the organization's greenhouse gas inventory, the Company identifies Scope 3 emission sources in accordance with the **Greenhouse Gas Protocol** and assesses the significance of relevant indirect GHG emission sources as follows.

No.	Category	Source of GHG	Remark
1	Purchased goods and services	Yes	
2	Capital goods	No	The organization has no activities under this category.
3	Fuel and energy related activities	Yes	
4	Upstream transportation and distribution	Yes	
5	Waste generated in operations	Yes	
6	Business travel	Yes	
7	Employee commuting	Yes	
8	Upstream leased assets	No	The organization has no activities under this category.
9	Downstream transportation and distribution	No	
10	Processing of sold products	No	
11	Use of sold products	No	
12	End-of-life treatment of sold products	No	
13	Downstream leased assets	No	
14	Franchises	No	
15	Investments	Yes	Data were not collected for this category in the current reporting year.

Step 2: Assessment of Other Significant Indirect GHG Emission Sources (Scope 3)

At this stage, the organization assesses which Scope 3 emission sources identified as relevant in Step 1 are significant to the organization.

The significance assessment considers three main criteria:

1. Size or Magnitude

The size or magnitude of each emission source is assessed based on its percentage contribution to the organization's total GHG emissions from **Scopes 1, 2 and 3**.

The scoring criteria are classified as follows:

- **Large = 3 points**
- **Medium = 2 points**
- **Small = 1 point**

A weighting of **50%** is assigned to this criterion because the magnitude of emissions is considered highly important in assessing the significance of the organization's indirect GHG emissions.

Score	Level	Percentage of Total GHG Emissions (Scope 1, 2 and 3)
1	Small	0–10%
2	Medium	11–40%
3	Large	41% and above

2. Level of Influence (Reduction Potential)

This criterion evaluates the extent to which the organization has the ability or influences to reduce indirect GHG emissions from a particular emission source.

The assessment uses a score of **1–3**, as follows:

- **High = 3 points**
- **Medium = 2 points**
- **Low = 1 point**

A weighting of **30%** is assigned to this criterion because the organization's ability to influence emission reductions is important for establishing future and policies to reduce indirect GHG emissions.

3. Risk or Opportunity

This criterion assesses whether an indirect GHG emission source is associated with climate-related risks or opportunities that could affect the organization.

Potential risks may include, for example:

- Financial risks
- Legal, regulatory and compliance risks
- Supply chain risks
- Product and customer-related risks
- Litigation risks
- Reputational risks

Potential business opportunities may include, for example, access to **new markets** or the adoption of **new business models**.The assessment uses a score of **1–3**, as follows:

- **High = 3 points**
- **Medium = 2 points**
- **Low = 1 point**

A weighting of **20%** is assigned to this criterion.

After assigning scores based on the above significance criteria, the organization calculates the weighted score for each criterion and determines the overall assessment result.

Any indirect GHG emission source with a **total weighted score of 2.0 or higher** is considered a **significant indirect GHG emission source** of the organization.

The results of the assessment of significant other indirect greenhouse gas emission sources (Scope 3) are presented in the following table.

No.	Category	Source of GHG	Significance Assessment Criteria			Total
			(A)	(B)	(C)	
			Size or Magnitude	Level of influence	(Risk or opportunity)	(Ax50%) + (Bx30%) + (Cx20%)
			Large = 3	High = 3	High = 3	
			Medium = 2	Medium = 2	Medium = 2	
			Small = 1	Low = 1	Low = 1	
1	Purchased goods and services	Y	1	2	2	1.5
2	Capital goods	N				
3	Fuel- and energy related activities	Y	2	2	2	2
4	Upstream transportation and distribution	Y	1	2	2	1.5
5	Waste generated in operations	Y	1	2	2	1.5
6	Business travel	Y	1	2	2	1.5
7	Employee commuting	Y	1	2	2	1.5
8	Upstream leased assets	N				
9	Downstream transportation and distribution	N				
10	Processing of sold products	N				
11	Use of sold products	N				
12	End-of-life treatment of sold products	N				
13	Downstream leased assets	N				
14	Franchises	N				
15	Investments	Y	N/A			

Based on the assessment results, the significant Scope 3 indirect GHG emission source identified was Fuel- and Energy-Related Activities, comprising upstream emissions associated with natural gas, fuel oil, LPG, diesel fuel, gasoline, and purchased electricity

Appendix 2

Calculation of Greenhouse Gas Emissions Based on Estimation

1. Calculation of Greenhouse Gas Emissions from Septic Tanks

Greenhouse gas emissions from septic tanks were calculated in accordance with the methodology prescribed by the **Thailand Greenhouse Gas Management Organization (Public Organization) (TGO)**.

The calculation estimates methane (CH_4) emissions generated from septic tanks based on the number of employees in the organization (**P**) to determine **TOW (Total Organics in Wastewater in the Inventory Year, kg BOD/year)** using **Equation 6.3**.

EQUATION 6.3
TOTAL ORGANICALLY DEGRADABLE MATERIAL IN DOMESTIC WASTEWATER

$$TOW = P \bullet BOD \bullet 0.001 \bullet I \bullet 365$$

Where:

TOW	=	total organics in wastewater in inventory year, kg BOD/yr
P	=	country population in inventory year, (person)
BOD	=	country-specific per capita BOD in inventory year, g/person/day, See Table 6.4.
0.001	=	conversion from grams BOD to kg BOD
I	=	correction factor for additional industrial BOD discharged into sewers (for collected the default is 1.25, for uncollected the default is 1.00.)

The methane **emission factor (kg CH_4/kg BOD)** was then estimated using **Equation 6.2**.

EQUATION 6.2
CH_4 EMISSION FACTOR FOR
EACH DOMESTIC WASTEWATER TREATMENT/DISCHARGE PATHWAY OR SYSTEM

$$EF_j = B_o \bullet MCF_j$$

Where:

EF_j	=	emission factor, kg CH_4/kg BOD
j	=	each treatment/discharge pathway or system
B_o	=	maximum CH_4 producing capacity, kg CH_4/kg BOD
MCF_j	=	methane correction factor (fraction), See Table 6.3.

The values obtained from **Equations 6.3 and 6.2** were then applied to **Equation 6.1** to calculate the amount of methane generated (**kg CH_4**). The calculated methane emissions were subsequently multiplied by the **100-year Global Warming Potential (GWP_{100}) of 28**, based on **IPCC AR5**, and converted to **tonnes of CO_2 equivalent (tCO_2e)**.

EQUATION 6.1
TOTAL CH_4 EMISSIONS FROM DOMESTIC WASTEWATER

$$CH_4\ Emissions = \left[\sum_{i,j}\left(U_i \bullet T_{i,j} \bullet EF_j\right)\right](TOW - S) - R$$

Where:

CH_4 Emissions = CH_4 emissions in inventory year, kg CH_4/yr

TOW = total organics in wastewater in inventory year, kg BOD/yr

S = organic component removed as sludge in inventory year, kg BOD/yr

U_i = fraction of population in income group *i* in inventory year, See Table 6.5.

$T_{i,j}$ = degree of utilisation of treatment/discharge pathway or system, *j*, for each income group fraction *i* in inventory year, See Table 6.5.

i = income group: rural, urban high income and urban low income

j = each treatment/discharge pathway or system

EF_j = emission factor, kg CH_4 / kg BOD

R = amount of CH_4 recovered in inventory year, kg CH_4/yr

1. Calculation of Greenhouse Gas Emissions from Upstream Transportation and Distribution

Greenhouse gas emissions from upstream transportation and distribution are calculated based on **vehicle type, transportation distance, and transported weight**. These data are used to estimate GHG emissions in accordance with the applicable **Emission Factors prescribed by the Thailand Greenhouse Gas Management Organization (TGO)**.

For transportation **into the organization**, emissions are assessed based on **100% loading (tonne-kilometres: tkm)**, while transportation **from the organization** is assessed based on **0% loading (kilometres: km)**.

2. Calculation of Greenhouse Gas Emissions from Employee Commuting

Greenhouse gas emissions from employee commuting are calculated based on **vehicle type, travel distance, and the number of days employees commute between their homes and the workplace**. These data are collected through an **employee commuting survey** developed by the organization.

The collected information is then used to estimate employees' fuel and energy consumption, such as **diesel, gasoline, electricity, CNG, and LPG**. The estimated consumption is subsequently multiplied by the relevant **Emission Factor (EF)** for each fuel or energy type to calculate greenhouse gas emissions and convert the results into **tonnes of CO_2 equivalent (tCO_2e)**.