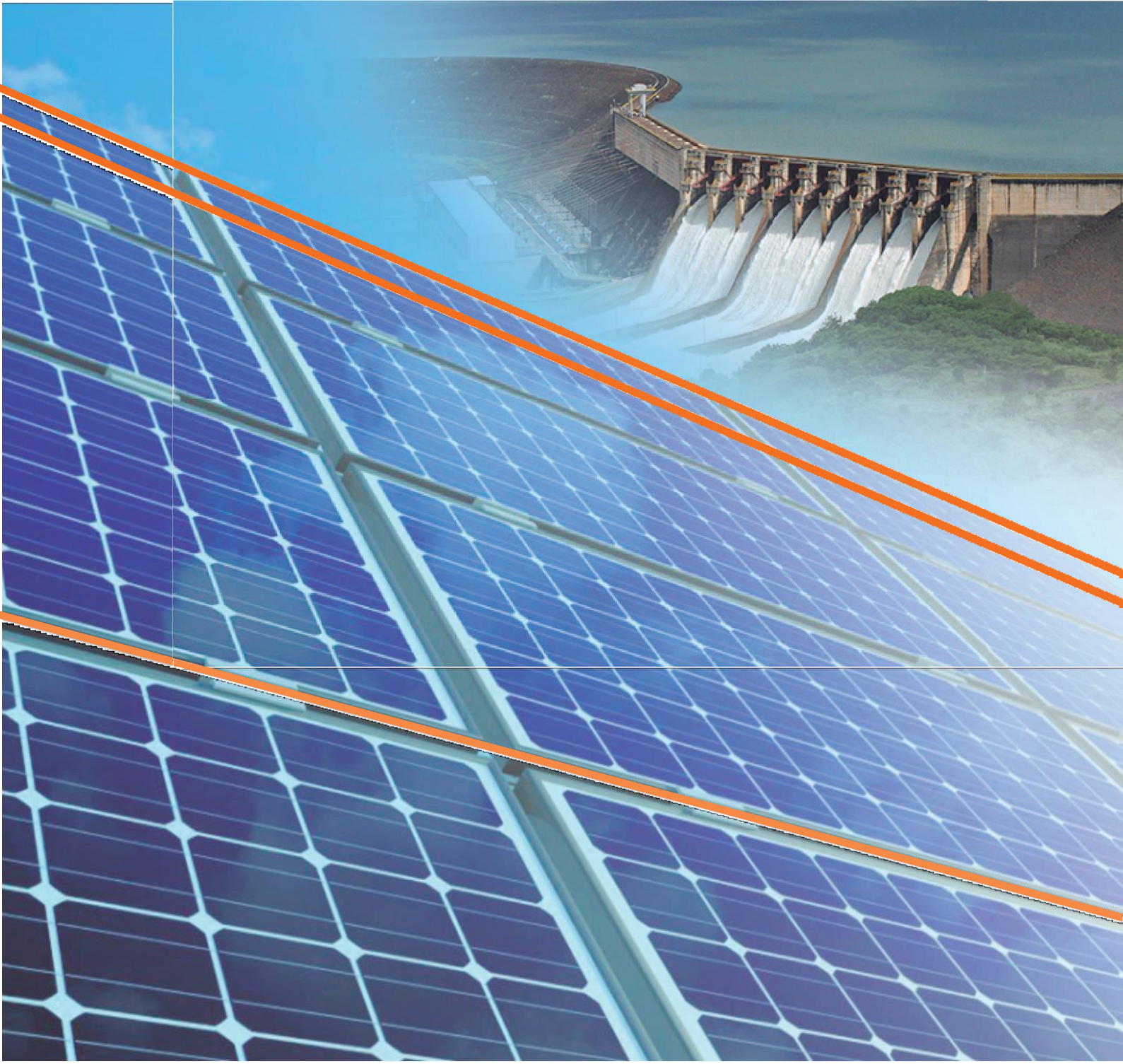


GREENHOUSE GAS INVENTORY VERIFICATION
ENGIE BRASIL ENERGY S.A - 2019

GHG Verification Statement

WHEN YOU NEED TO BE SURE

Statement BR17/9803

Greenhouse Gas Verification Statement

The inventory of Greenhouse Gas emissions in *enter verified Monitoring Period* of ***2019***

Engie Brasil Energia S.A

Rua Paschoal Apostolo Pítsica, nº 5064
Florianópolis – SC – 88025-255 – BR

has been verified in accordance with ISO 14064-3:2007
as meeting the requirements of

ISO 14064-1:2007 and Programa Brasileiro GHG Protocol

For the following activities:

"Operation of electricity generating plants and electric energy trading agent"

Disclosing emissions of **5.288 .046 , 069 (OC)** and **5.293.110,332 (SA)** metric tones of CO2 equivalent

Lead Auditor: Marina Steck Martins Cruz

Authorized by

Vanda Nunes
Director
April 6th, 2020

SGS ICS Certificadora Ltda.
Avenida Andrômeda, 832 – 5º. and
06473-000 – Barueri - SP - Brasil
Fone: 11-3883 8880 / Fax: 11-3883 8899
www.br.sgs.com

This Statement is not valid without the full Greenhouse Gas Assertion and the verification scope, objectives, criteria and findings available on pages 1 to 8 of this Statement.

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SGS has been contracted by Engie Brasil Energia S.A. (hereinafter referred to as “CLIENT”), Rua Paschoal Apóstolo Pítsica, nº 5.064**,** for the verification of direct and indirect Greenhouse Gas in accordance with:

ISO 14064-3: 2007

As provided in the Greenhouse Gas (GHG) Assertion in the form of report covering GHG emissions of the period of 2019.

Roles and responsibilities
The client is responsible for the organization’s GHG information system, the development and maintenance of records and reporting procedures in accordance with that system, including the calculation and determination of GHG emissions information and the reported GHG emissions.

It is SGS’s responsibility to express an independent GHG verification opinion on the GHG emissions as provided in the GHG Assertion.

SGS conducted a third party verification of the provided GHG assertion against the principles of ISO 14064-1: 2007 and ISO 14064-3: 2007 and Brazilian GHG Protocol in the period 2019. The verification was based on the verification scope, objectives and criteria as agreed between CLIENT and SGS on 9th March of 2020.

Level of Assurance
The level of assurance agreed is that of reasonable assurance.

Scope
The client has commissioned an independent verification by SGS ICS Certificadora Ltda of reported GHG emissions to establish conformance with ISO 14064 principles within the scope of the verification as outlined below.
The data and information supporting the GHG assertion were calculated based on monitored and historical data.

This engagement covers verification of emission from anthropogenic sources of greenhouse gases included within the organisation’s boundary and based on ISO 14064-3:2007.

- The organizational boundary was established according to operational control (OC) and shareholding approach (SA)
- Title or description activities: Operation of electricity generating plants and electric energy trading agent.
- Location/boundary of the activities: Location of the company units according to Annex A.
- Physical infrastructure, activities, technologies and processes of the organization:
  - Power Generation Plants and administrative offices.
- GHG sources, sinks and/or reservoirs included:
  Scope 1, Scope 2 and Scope 3 (activities connected with fuel and energy are out of the scope 1 and 2, transport and distribution – downstream and upstream, employee

travelling, business trip and waste arisen from operations and fugitive emissions)

- Types of GHGs included: CO_2; CH_4; N_2O; HFCs; PFCs; SF_6 e NF_3.
- Directed actions: N.A.
- GHG information for the following period was verified: 2019.
- Intended user of the verification statement: Engie Brasil Energia S.A.

Objective

This verification purposes to review the objective evidences and to independently review:

- Whether the GHG emissions are as declared by the organisation's GHG assertion.
- The data reported are accurate, complete, consistent, transparent and free of material error or omission.

Criteria

Criteria against which the verification assessment is undertaken are the principles of ISO 14064 and Brazilian GHG Protocol.

Materiality

The materiality required of the verification was considered by SGS to 5%, based on the needs of the intended user of the GHG Assertion.

Conclusion

The client provided the GHG assertion based on the requirements of ISO14064-1:2007 and GHG Protocol. The GHG information for the period 2019 disclosing emissions of 5.288.046,069 metric tonnes of CO_2 equivalent (operational control) and 5.293.110,332 metric tonnes of CO_2 equivalent (shareholding approach) are verified by SGS to a reasonable level of assurance, consistent with the agreed verification scope, objectives and criteria.

Engie Energia Brasil S.A.´s GHG emissions by gas type and sources

Results Summary - GHG Protocol Program Brazil - Operational Control

Period	Annual

1. Summary of the organization's GHG total emissions

Consolidated emissions of GHGs and scopes

GHG	Emissions in Metric Tonnes			Emissions in Metric Tonnes of CO_2 equivalent (tCO_2e)		
	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3
CO_2	5.210.899,54	12.825,45	14361,40	5.210.899,54	12.825,45	14.361,40
CH_4	420,09		8,31	10.502,26		207,72
N_2O	129,20		0,83	38.501,13		246,28
HFCs	0,20		0,00	411,10		2,28
R-410A	0,1562		0,0011	325,97		2,28
R-404A	0,0125		-	49,02		-
HFC-134a	0,0136		-	19,45		-
R-407C	0,0057		-	10,18		-
R-407A	0,0029		-	6,00		-
R-448A	0,0029		-	0,41		-
R-401A	0,0036		-	0,06		-
R-404A	-		-	-		-
SF6	0,004		-	88,92		-
Total				5.260.402,94	12.825,45	14.817,68

Emissões Totais (tCO_2e)	5.288.046,07

Results Summary - GHG Protocol Program Brazil - Shareholding Approach

Period	Annual

1. Summary of the organization's GHG total emissions

Consolidated emissions of GHGs and scopes

GHG	Emissions in Metric Tonnes			Emissions in Metric Tonnes of CO_2 equivalent (tCO_2e)		
	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3
CO_2	5.210.911,24	12.873,02	14.509,26	5.210.911,24	12.873,02	14.509,26
CH_4	398,11		8,51	9.952,83		212,83
N_2O	126,27		0,84	37.628,51		249,05
HFCs	0,20		-	422,16		2,28
R-410A	0,1615			337,04		2,28
R-404A	0,0025		-	49,02		-
HFC-134a	0,0136		-	19,45		-
R-407C	0,0057			10,18		
R-407A	0,0029			6,00		
R-448A	0,0029			0,41		
R-401A	0,0036			0,06		
R-404A	-			-		
SF6	0,28			6.348,84		
Total				5265.263,89	12.873,02	14.973,42

Emissões Totais (tCO_2e)	5.293.110,33

SGS's approach is risk-based, drawing on an understanding of the risks associated with reporting GHG emissions information and the controls in place to mitigate these. Our examination, based on test, includes relevant evidences assessment related to quantities and the GHG information reported by the organization.

Our verification work is performed to obtain the information, explanations and evidence that we considered necessary to provide a reasonable level of assurance that the GHG emissions for the period 2019 are fairly stated.

We conducted our verification regarding the GHG assertion of Engie Brasil Energia S.A. which included assessment of GHG information system, monitoring and reporting plan/protocol. This assessment includes the provisions of the protocol reference is consistently and appropriately applied.

In SGS's opinion the presented GHG assertion

- is materially correct and is a fair representation of the GHG data and information, and
- is prepared in accordance with ISO14064-1: 2007 on GHG quantification, monitoring and reporting.

This statement shall be interpreted with the GHG assertion of Engie Brasil Energia S.A. as a whole.

Note: This Statement is issued, on behalf of Client, by ***SGS ICS Certificadora Ltda*** ("SGS") under its General Conditions for Green Gas Verification Services available at http://www.sgs.com/terms_and_conditions.htm. The findings recorded hereon are based upon an audit performed by SGS. A full copy of this statement, the findings and the supporting GHG Assertion may be consulted at ***Engie Brasil Energia S.A.***. This Statement does not relieve Client from compliance with any bylaws, federal, national or regional acts and regulations or with any guidelines issued pursuant to such regulations. Stipulations to the contrary are not binding on SGS and SGS shall have no responsibility vis-à-vis parties other than its Client.

Annex A – List of Units included in Scope

Office/Usina	Address
Head office of Engie Brasil Energia S.A HEAD OFFICE	Rua Paschoal Apóstolo Pítsica, 5064 Bairro: Agronômica CEP:88.025-255 Florianópolis – SC
Engie Brasil Energia S.A.´s Office – São Paulo unit OFFICE SP	Av. Engenheiro Luís Carlos Berrini, 716 - 2º andar – Itaim Bibi. CEP: 04571-000 São Paulo – SP
Thermoelectric Complex Jorge Lacerda CTJL	Av. Paulo Santos Mello, 555. Bairro: Centro CEP: 88.745-000. Capivari de Baixo – SC
Ibitiúva Thermoelectric plant UTIB	Fazenda Piratininga, s/nº Bairro: Pitangueiras CEP: 14.750-000 Pitangueiras – SP
Ferrari Thermoelectric plant UTFE	Fazenda da Rocha, s/nº Bairro: Zona Rural CEP: 13.631-301 Pirassununga – SP
Lages cogeneration Unit UCLA	Rua Vivandério Santos do Vale, Bairro: Caroba CEP: 88.516-600 Lages – SC
Itá Hydroelectric power plant UHIT	Volta do Uvá CEP: 99.770-000 Aratiba – RS
Machadinho Hydroelectric power plant UHMA	Linha São Paulo, s/nº CEP: 89.667-000 Piratuba – SC
Salto Santiago Hydroelectric power plant UHSS	Rodovia BR 158, Km 441,5 CEP: 85.568-000 Saudade do Iguaçu – PR
Salto Osório Hydroelectric power plant UHSO	Rodovia PR 475, Km 3 CEP: 85.575-000 São Jorge D'Oeste – PR
Passo Fundo Hydroelectric power plant UHPF	Usina Hidrelétrica Passo Fundo, s/nº CEP: 99.645-000 Entre Rios do Sul – RS
Cana Brava Hydroelectric power plant	Zona Rural

UHCB	Bairro:Cana Brava CEP: 73.790-000 Cavalcante – GO
São Salvador Hydroelectric power plant UHSA	Rod. TO 387 PRN São Salvador Km 40 à Esquerda + 20 Km Bairro: Zona Rural CEP: 77.360-000 Paranã – TO
Estreito Hydroelectric power plant UHET	Rodovia BR 230, Km 8, s/nº Zona Rural CEP: 65.975-000 Estreito – MA
Ponte de Pedra Hydroelectric power plant UHPP	Estrada UHE – Ponte de Pedra, s/nº Zona Rural CEP: 78.790-000 Itiquira – MT
José Gelásio da Rocha Small Hydroelectric power plant PHJG	Rodovia BR 163 Km 102, s/nº Ribeirão de Ponte de Pedra Bairro: Zona Rural CEP: 78.740-275 Rondonópolis – MT
Rondonópolis Small Hydroelectric power plant PHRO	Rodovia BR 163 Km 102, s/nº Ribeirão de Ponte de Pedra Bairro: Zona Rural CEP: 78.740-275 Rondonópolis – MT
Guajirú Central Wind plant UEGU	Sítio Manguinhos, s/nº Bairro: Manguinhos CEP: 62.690-000 Trairi – CE
Mundaú Central Wind plant UEMU	Fazenda Boca da Mata, s/nº Bairro: Zacarias CEP: 62.690-000 Trairi – CE
Fleixeiras I Central Wind plant UEFL	Sítio Canaã, s/nº. Bairro: Canaã CEP: 62.690-000 Trairi – CE
Tubarão Central Wind plant UETB	BR 101, s/nº - Km 329 Bairro: Revoredo CEP: 88704-700 Tubarão – SC
Cidade Azul Photovoltaic plant UFCA	BR 101, s/nº - Km 329 Bairro: Revoredo

	CEP: 88704-700 Tubarão – SC
Pampa Sul Thermoelectric plant UTPS	Estrada do Seival, Km 3 s/nº Seival, CEP: 96495-000 Candiota- RS
Campo Largo wind complex CECL	Lagoa do Angico, s/nº CEP 47350-000 Sento Sé / BA
Umburanas wind complex CEUM	Fazenda Gruna, s/nºDistrito de Minas do Mimoso CEP 44792-000 Sento Sé / BA
Jaguara Hydroelectric power plant UHJA	AC Usina Jaguara, s/nº, Z. Rural CEP 14490-000 Rifaina / SP
Assú V Photovoltaic plant FVAE	Rodovia BR 304, km 99, Sentido Açu Mossoró, Sitio Meladinha CEP 59650-000 Assú / RN
Miranda Hydroelectric power plant UHMI	Rodovia BR 365, km 588, s/nº. Zona Rural CEP 38490-000 Indianópolis / MG
Estrela wind plant EEST	Rodovia CE 163 KM 3,3 – Sitio Estrela Cep: 62690 000- Trairi-CE
Ouro Verde wind plant EOVE	Estrada Trairi a Mundo Novo, KM 03 – Bairro Mundo Novo – CEP 62690 000 – Trairi-CE
Santa Mônica wind plant ESMA	Rodovia CE 163 , KM 01 , S/N – Zona Rural CEP 62690 000 - Trairi - CE
Cacimbas wind plant ECAA	Estrada da Praia de Fleixeiras – S/N – KM 3 Zona Rural – CEP 62690 000 - Trairi - CE

Greenhouse Gas Emissions Report

ENGIE BRASIL ENERGIA S.A

2019



Elaborated by: ECOFINANCE NEGÓCIOS

Florianópolis, March 2020.

Eduardo Baltar de Souza Leão
Director – Ecofinance Negócios

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EXECUTIVE SUMMARY

This document presents the Corporate Inventory of Greenhouse Gas Emissions (GGE) of Engie Brasil Energia S.A. operational power plants (in this report, referred to as Engie) in 2019, by the approaches of operational control and equity share of its companies and ventures.

Engie total greenhouse gas (GHG) emissions were calculated and classified as Scope 1 (direct emissions), Scope 2 (indirect emissions per electricity consumed) and Scope 3 (other indirect emissions).

Considering the operational control approach, the group issued **5,288,046** tons of carbon dioxide equivalent (tCO2e) and considering the equity share approach, the total emissions were **5,293,110** tCO2e, according to table 1.

In both approaches, the group's GHG emissions are concentrated in coal power plants of the group (more than 99%). Jorge Lacerda Thermoelectric Complex (CTJL) represents more than 81% and Thermal Power Plant Pampa Sul (UTPS), more than 18% of the total emissions in 2019. The coal burned in these plants is responsible for more than 98% of the company GHG emissions this year.

Scope 1 and scope 2 emissions were **5,273,228tCO$_2$e** according to operational control approach and **5,278,136 tCO$_2$e** per equity share (more than 99.7% of the grand total).

Scope 01 emissions are concentrated in the coal combustion, as it can be seen in table 2. In scope 02, the business units that provided the most emissions in both approaches due to their higher energy consumption are CTJL (more than 49%), Salto Santiago Hidropower Plant (UHSS) (more than 23%) Passo Fundo Hidropower Plant (UHSS) (more than 12%) and UTPS (more than 9%). They represent more than 94% of this scope in the operational control and equity participation approaches, respectively.

Scope 03 emissions account for 0.28% of the group's emissions in both approaches, being these emissions concentrated in the consumption of diesel in outsourced vehicles for the operation of CTJL, referring to more than 77% of the emissions

scope in both accounting approaches. Air travel are also relevant, being responsible for more than 4% of scope 03 emissions.

The company's total emissions increased slightly more than 21% related to 2018 (more than 920k tCO_2e in both approaches). The main reason for this variation is UTPS operation beginning, where coal combustion added more than 951k tCO_2e in both approaches.

The carbon intensity, by operational control, was 0.1900 tCO2e/net MWh delivered to the grid with and increase of 2.8% related to last year. Using equity approach, carbon intensity was 0,1524 tCO_2e/ net MWh delivered to the grid. 5.1% higher than 2018 values.

According to operational control, Engie delivered 27.8 million MWh to the grid. 68.6% from hydropower plants (HPPs); 12.9% from wind power plants (WPPs); 1.8% from biomass power plants; 0.27% from solar plants and 16.2% from coal power plants. Using equity approach, net electricity supplied to National Interconnected System (SIN) was 34.7 million MWh with 74.9% generated by HPPs; 10.4% from WPPs; 1.5% from biomass plants; 0.21% from solar plants and 13% from fossil fuel plants.

Engie provided 6.1 million tCO2e avoided emissions from clean electricity supplied to the Grid, according operational control approach and 7.9 million tCO2e, using equity approach.

Green area conservation in Permanent Preservation Areas (APPs), remaining areas and planting of trees present a carbon stock of 4 million tCO2e by operational control and 5.5 million tCO2e by equity approach.

The company presented a positive emission balance of 4.881k tCO2e, using operational control, and 8.162 k tCO2e using equity approach. This difference between the approaches is mainly related to the inclusion Itá and Machadinho

Hydropower Power Plants, which produced more than 5.4 million MWh of clean energy[1] for the National Interconnected System (SIN).

Table 01 and 02 presented emissions by entrepeunership, methodological scope and emissions sources, respectively.

[1] Considering ENGIE equity share over the plants.

Table 1 – GHG Emissions per business unit according to Operational Control and Equity Share Approach (tCO_2e /%)

Units	Total Emissions tCO_2e - Operational Control					Total Emission tCO_2e - Equity Share				
	Scope 1	Scope 2	Scope 3	Total	%	Scope 1	Scope 2	Scope 3	Total	%
CTJL	4.282.661,92	6.338,70	12.011,14	**4.301.011,76**	**81,33%**	4.282.661,92	6.338,70	12.011,14	**4.301.011,76**	**81,26%**
UTPS	953.206,43	1.241,23	40,42	**954.488,08**	**18,05%**	953.206,43	1.241,23	40,42	**954.488,08**	**18,03%**
UTFE	14.927,17	78,04	800,46	**15.805,67**	**0,30%**	14.927,17	78,04	800,46	**15.805,67**	**0,30%**
UCLA	4.293,37	115,98	648,05	**5.057,40**	**0,10%**	4.293,37	115,98	648,05	**5.057,40**	**0,10%**
UTIB	4.650,25	31,54	228,75	**4.910,53**	**0,09%**	3.220,76	21,84	158,43	**3.401,03**	**0,06%**
UHSS	62,02	3.022,82	99,05	**3.183,88**	**0,06%**	62,02	3.022,82	99,05	**3.183,88**	**0,06%**
UHPF	13,14	1.622,56	56,79	**1.692,49**	**0,03%**	13,14	1.622,56	56,79	**1.692,49**	**0,03%**
SEDE	282,59	148,00	549,03	**979,62**	**0,02%**	282,59	148,00	549,03	**979,62**	**0,02%**
UHSO	20,00	61,99	153,58	**235,58**	**0,00%**	20,00	61,99	153,58	**235,58**	**0,00%**
PHJG	89,90	0,23	4,87	**94,99**	**0,002%**	89,90	0,23	4,87	**94,99**	**0,002%**
UHPP	10,19	0,18	58,24	**68,61**	**0,001%**	10,19	0,18	58,24	**68,61**	**0,001%**
CECL	31,63	14,48	15,29	**61,40**	**0,001%**	31,63	14,48	15,29	**61,40**	**0,001%**
UETR	37,50	7,23	17,09	**61,82**	**0,001%**	37,50	7,23	17,09	**61,82**	**0,001%**
UHJA	13,42	38,03	18,28	**69,74**	**0,001%**	13,42	38,03	18,28	**69,74**	**0,001%**
UHSA	50,71	-	38,81	**89,53**	**0,002%**	50,71	-	38,81	**89,53**	**0,002%**
CEUM	32,68	18,20	-	**50,89**	**0,001%**	32,68	18,20	-	**50,89**	**0,001%**
FVAE	8,84	39,62	0,32	**48,78**	**0,001%**	8,84	39,62	0,32	**48,78**	**0,001%**
UHMI	5,28	0,03	40,75	**46,05**	**0,001%**	5,28	0,03	40,75	**46,05**	**0,001%**
UHCB	4,00	-	28,89	**32,88**	**0,001%**	4,00	-	28,89	**32,88**	**0,001%**
ESP	1,09	4,53	3,00	**8,62**	**0,000%**	1,09	4,53	3,00	**8,62**	**0,000%**
UEMU	0,09	6,45	-	**6,54**	**0,000%**	0,09	6,45	-	**6,54**	**0,000%**
UEGU	0,09	6,36	-	**6,45**	**0,000%**	0,09	6,36	-	**6,45**	**0,000%**
UEFL	0,09	5,80	-	**5,89**	**0,000%**	0,09	5,80	-	**5,89**	**0,000%**
PHRO	0,54	0,08	4,87	**5,48**	**0,000%**	0,54	0,08	4,87	**5,48**	**0,000%**
UETB	-	5,07	-	**5,07**	**0,000%**	-	5,07	-	**5,07**	**0,000%**
UFCA	-	4,80	-	**4,80**	**0,000%**	-	4,80	-	**4,80**	**0,000%**
EEST	-	4,53	-	**4,53**	**0,000%**	-	4,53	-	**4,53**	**0,000%**
EOVE	-	4,05	-	**4,05**	**0,000%**	-	4,05	-	**4,05**	**0,000%**
ECAA	-	2,48	-	**2,48**	**0,000%**	-	2,48	-	**2,48**	**0,000%**
ESMA	-	2,46	-	**2,46**	**0,000%**	-	2,46	-	**2,46**	**0,000%**
UHIT	-	-	-	-	**0,000%**	5.914,55	47,57	89,38	**6.051,50**	**0,114%**
UHMA	-	-	-	-	**0,000%**	348,47	0,30	17,22	**365,99**	**0,007%**
UHET	-	-	-	-	**0,000%**	27,41	9,40	119,46	**156,27**	**0,003%**
Total	**5.260.402,94**	**12.825,45**	**14.817,68**	**5.288.046,07**	**100,00%**	**5.265.263,89**	**12.873,02**	**14.973,42**	**5.293.110,33**	**100,00%**
%	**99,48%**	**0,24%**	**0,28%**	**100,00%**		**99,47%**	**0,24%**	**0,28%**	**100,00%**	

Table 2: GHG Emissions per Source (tCO2e/ %)

Emission Sources	Operational Control		Equity Share	
	Emissions (tCO2e)	%	Emissions (tCO2e)	%
Scope 1	**5.260.402,94**	**99,48%**	**5.265.263,89**	**99,47%**
Combustão Estacionária	**5.259.387,64**	**99,46%**	**5.257.968,36**	**99,34%**
Coal Steam 4500 kcal / kg	4.261.277,24	80,58%	4.261.277,24	80,51%
Coal Steam 3100 kcal / kg	951.456,25	17,99%	951.456,25	17,98%
Sugarcane Bagasse	19.545,37	0,37%	18.120,25	0,34%
Diesel Oil	13.543,16	0,26%	13.549,00	0,26%
Wood waste	4.093,62	0,08%	4.093,62	0,08%
Fuel Oil	9.464,19	0,18%	9.464,19	0,18%
Acetylen	7,79	0,00%	7,79	0,00%
Gasoline	0,03	0,00%	0,03	0,00%
Fugitives	**530,51**	**0,01%**	**6.803,07**	**0,13%**
HFCs	411,10	0,01%	422,16	0,01%
Sulfur Hexafluoride (SF6)	88,92	0,00%	6.348,84	0,12%
Carbon Dioxide (CO2)	30,49	0,00%	32,07	0,00%
Direct Mobile Combustion	**465,81**	**0,01%**	**470,49**	**0,01%**
Diesel Oil	375,81	0,01%	373,66	0,01%
Gasoline	59,60	0,00%	66,32	0,00%
Liquefied Petroleum Gas	28,42	0,00%	28,42	0,00%
Ethanol	1,98	0,00%	2,10	0,00%
Waste	**14,84**	**0,00%**	**16,09**	**0,00%**
Composting	14,84	0,00%	15,77	0,00%
Landfill	-	0,00%	0,32	0,00%
Agricultural Activities	**4,14**	**0,00%**	**5,88**	**0,00%**
Fertilizers - Organic	2,90	0,00%	3,10	0,00%
Synthetic Fertilizers	1,24	0,00%	2,77	0,00%
Scope 2	**12.825,45**	**0,24%**	**12.873,02**	**0,24%**
Electricity	**12.825,45**	**0,24%**	**12.873,02**	**0,24%**
Electricity	12.825,45	0,24%	12.873,02	0,24%
Scope 3	**14.817,68**	**0,28%**	**14.973,42**	**0,28%**
Transport and Distribution (downstream)	**6.422,95**	**0,12%**	**6.354,17**	**0,12%**
Diesel Oil	6.418,76	0,12%	6.348,74	0,12%
Gasoline	4,01	0,00%	5,24	0,00%
Ethanol	0,19	0,00%	0,19	0,00%
Transporte e Distribuição (upstream)	**6.880,54**	**0,13%**	**6.962,47**	**0,13%**
Diesel Oil	6.712,53	0,13%	6.764,47	0,13%
Gasoline	163,60	0,00%	193,50	0,00%
Liquefied Petroleum Gas	3,68	0,00%	3,68	0,00%
Ethanol	0,72	0,00%	0,81	0,00%
Biodiesel	-	0,00%	-	0,00%
Business Travel	**736,69**	**0,01%**	**801,65**	**0,02%**

Emission Sources	Operational Control		Equity Share	
	Emissions (tCO2e)	%	Emissions (tCO2e)	%
Aviation - Kerosene	655,95	0,01%	720,12	0,01%
Gasoline	79,68	0,00%	80,47	0,00%
Diesel Oil	1,05	0,00%	1,05	0,00%
Ethanol	-	0,00%	0,01	0,00%
Commuting	**321,35**	**0,01%**	**389,85**	**0,01%**
Diesel Oil	298,76	0,01%	364,85	0,01%
Gasoline	22,49	0,00%	24,88	0,00%
Ethanol	0,11	0,00%	0,11	0,00%
Waste	**448,59**	**0,01%**	**457,73**	**0,01%**
Landfill	161,66	0,00%	166,03	0,00%
Incineration	248,92	0,00%	253,22	0,00%
Composting	38,02	0,00%	38,47	0,00%
Fuel and energy related activities not included in scopes 1 and 2	**5,28**	**0,00%**	**5,28**	**0,00%**
Gasoline	5,17	0,00%	5,17	0,00%
Diesel Oil	0,11		0,11	
Fugitives - Indirect	**2,28**	**0,00%**	**2,28**	**0,00%**
HFCs	2,28	0,00%	2,28	0,00%
Total (tCO2e)	**5.288.046,07**	**100%**	**5.293.110,33**	**100%**

1. INTRODUCTION

1.1. Presentation

This report aims to present the inventory of greenhouse gases (GHG) emissions of Engie Brasil Energia S.A operational plants for 2019.

Engie Brasil Energia S.A has been developing its annual inventory of GHG since 2010, in compliance with its climate change policy. The GHG inventory is an important corporate strategic tool in a context of climate change that allows the company to better understand its processes, evaluate and improve its management system with regard, in particular, to GHG emissions.

The inventory contemplates the 31 operational ventures during 2019, distributed in fourteen Brazilian states, as well as its administrative headquarters in Florianópolis (SC) and its Energy Commercialization Office located and in São Paulo (SP), totaling 33 organization units. Construction activities of new plants are not considered in this report.

This inventory was developed based on the concepts and guidelines established by the accounting and quantification specifications of the Brazilian GHG Protocol Program (PBGHGP) and in accordance with ISO 14064-1.

In its constant search for the highest standards of sustainability, Engie inserted the GHG information collection procedure into its Integrated Management System, applying it to all its operational plants and offices.

As in previous years, in order to certify the quality and credibility of its 2019 GHG inventory and its associated information quality management system, through an external audit/verification, Engie hired SGS, a renowned company in the country for GHG Inventory Verification in the Energy Sector and accredited by INMETRO.

The report initially presents aspects of the methodology used in the compilation of the inventory of GHG emissions. Subsequently, the results of the GHG emissions for operational control and equity share are presented. In these sections, the results by plant, methodological scope and greenhouse gas are presented according to each approach. Comparisons are also provided between GHG emissions from 2019 and emissions from previous years. In the following section, a summary of GHG

emissions; avoided emission and removals reached by the company is discussed Information on the management of inventory quality control and the qualitative and quantitative uncertainties of the report are presented. Management GHG emissions indicators are presents at section 7. Finally, opportunities of emissions reductions that have been developed or being considered by Engie are presented.

In the annexes, discussions are presented on the results of each individual venture, in addition to the calculation methodologies, emission factors used and global warming potentials (GWPs).

1.2. ENGIE BRASIL

ENGIE acts in the implantation and operation of electricity generating plants, being also active agent in the commercialization activity. The largest private power generator in Brazil, the Company is headquartered in Florianópolis, Santa Catarina state, and its plants are located in the five regions of the country, more precisely in the states of Rio Grande do Sul, Santa Catarina, Paraná, São Paulo, Minas Gerais, Mato Grosso do Sul, Mato Grosso, Goiás, Tocantins, Maranhão, Piauí, Ceará, Rio Grande do Norte e Bahia.

Engie has its own installed capacity of 8,395 MW[2] and in 2019, the company had 31 (thirty one) plants in operation: 11 (eleven) wind power plants, 11 (eleven) hydropower plants, 2 (two) small hydropower plants, 2 (two) solar plant and 5 (five) thermoelectric plants, with three biomass plants (sugarcane bagasse and wood waste) and two coal thermal plants.

More than 85% of the company installed capacity is generated by renewable sources. In 2019, net electricity delivered to SIN was 83.7% by operational control and 87% by equity approach.

ENGIE Brasil Energia has more than 1,000 employees and its client portfolio is made up of distributors, free customers and traders. Besides selling energy, the Company provides associated services, such as the installation of cogeneration

[2] This number considers Engie equity share over the plants.

facilities, operation and maintenance of energy production equipment and energy quality monitoring.

Its shareholding control is currently held by ENGIE Brasil Participações Ltda., which accounts for 68.71% of the capital stock of ENGIE Brasil Energia. ENGIE Brasil Participações Ltda is controlled by the French-Belgian group ENGIE, the world's largest independent energy producer with an installed capacity of 117.1 GW, operating throughout the energy value chain, from exploration and production to transportation, distribution and commercialization of electricity and gas.

The company has an established environmental code, sustainable management policy and climate change policy. In its climate change policy, among other issues, the company commits to: (I) prioritize renewable sources in the expansion of its energy matrix; (II) periodically conduct its inventory of GHG emissions; (III) develop Clean Development Mechanism (CDM) projects and (IV) invest in research and development (R&D) projects related to environmental conservation, climate change and renewable energy.

In this sense, the company has developed GHG emissions report since 2010 through internationally recognized methodologies, and the results of this work are part of the company's sustainability report.

1.2.1. Responsibilities and Professionals Involved in the Inventory

The main responsibilities of Engie in relation to this report are: (i) to collect and provide the information requested by Ecofinance Negócios, in order to enable GHG emissions measurement; (ii) to adopt new procedures and controls in order to measure their GHG emissions and (iii) to evaluate and implement actions to compensate and reduce its GHG emissions, when applicable.

The following table presents professionals responsible for data collection.

Table 3: Employees responsible for data collection per business unit

Corporative Area	Coordinator- Engie	Job Titlle	Substitute Coordinator.	Job Title
MRS	Ilmar Goltara Gomes	Environmental Technician	José Lourival Magri	Environmental and Social Responsibility Manager
Plant/Office	**Coordinator- Engie**	**Job Titlle**	**Substitute Coordinator.**	**Job Title**
SEDE	Milena Pamplona	Supply Analist	Flavio Silveira	Supply Analist
Escritório de SP	Simone Fretin	Administrative Assistant	Previtalli Jr	Manager CME
UEFL	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
UEGU	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
UEMU	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
UEOV	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
UEES	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
UESM	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
UECA	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
ASSU	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
UETR	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
FVAE	Clecio de Lima Silva	Environmental Technician	Carlos Felipe	Administrative Process Supervisor
CEUM	Aline Carvalho	Safety and Enviromental Engineer	Fernanda Fernandes	Environmental Technician
CECL	Aline Carvalho	Safety and Enviromental Engineer	Fernanda Fernandes	Environmental Technician
UTFE	David Dilson Ferreira Paim	Plant Coordinator	André Gomig	Plant Manager
UCLA	Geovane Soares	Utilities Technician	Jose Luiz dos Santos Dutra	O & M Supervisor

Plant/Office	Coordinator- Engie	Job Titlle	Substitute Coordinator.	Job Title
UTIB	David Dilson Ferreira Paim	Plant Coordinator	André Gomig	Plant Manager
CTJL	Liliana Dutra dos Santos	Chemical Engineering	Eduardo Guedes dos Santos	Utilities Technician
UTPS	Rita Tissot	Chemical Specialist	Simone Guimarães	Utilities Technician
PHJG	Marco Tulio	Environmental Analyst	Claudiano do Amaral Souza	Environmental Analyst
PHRO	Marco Tulio	Environmental Analyst	Claudiano do Amaral Souza	Environmental Analyst
UHPP	Marco Tulio	Environmental Analyst	Claudiano do Amaral Souza	Environmental Analyst
UHCB	Simone Rodrigues Gonçalves	Environmental Analyst	Adriano Diniz Baldissera	Environmental Analyst
UHSA	Adriano Diniz Baldissera	Environmental Analyst	Simone Rodrigues Gonçalves	Environmental Analyst
UHET	Waldemar Neto	Environmental Analyst	Simone Rodrigues Gonçalves	Environmental Analyst
UHSO	Evair Dalmazo	Environmental Technician	Clovis Agripino Tosin da Silva	Environmental Process Cordinator
UHSS	Felipe Costa	Environmental Analyst	Clovis Agripino Tosin da Silva	Environmental Process Cordinator
UHPF	Gilnei Minella	Environmental Technician	Sérgio Luiz Souza	Environmental Process Cordinator
UHIT	Gilnei Minella	Environmental Technician	Sérgio Luiz Souza	Environmental Process Cordinator
UHMA	Gilnei Minella	Environmental Technician	Sérgio Luiz Souza	Environmental Process Cordinator
UFCA	Liliana Dutra dos Santos	Chemical Engineering	Eduardo Guedes dos Santos	Utilities Technician
UETB	Liliana Dutra dos Santos	Chemical Engineering	Eduardo Guedes dos Santos	Utilities Technician
UHJA	Claudiano Souza	Environmental Analyst	Rogério Suematsu	Plant Manager
UHMI	Tulio Pereira	Environmental Analyst	Paulo Henrique Feitosa	Plant Manager

1.3. Ecofinance

Ecofinance Negócios is a company specialized in environmental finance and sustainability which works primarily in the international carbon market, providing carbon credit project development services, issuing emission inventories, and advising on environmental certifications and sustainability reports.

The company is responsible for the development of 22 carbon credit projects, which have already issued more than 3 million carbon credits and has already produced more than 70 corporate emission inventories, as well as advised mitigation strategies of various organizations in the public and private sectors.

The lead consultant responsible for the project at Ecofinance Negócios was Eduardo Baltar, director of Ecofinance Negócios, e-mail eduardo@grupoecofinance.com.br / phone number: 51-3392-1500.

2. INVENTORY

2.1. Covered Period

This inventory covers emissions from activities performed by Engie in 2019, covering all direct and indirect emissions, including all companies that consider all operational plants of the group.

2.2. Base-Year

Engie GHG emissions inventory base year is 2010, when the first GHG emission inventory of the group was held.

2.3. Organizational Boundaries

PBGHGP uses two approaches to consolidate organizational boundaries: operational control and equity share.

The equity approach is one in which companies record their GHG emissions arising from their operations and ventures according to their percentage share in these operations. In this approach, companies must quantify the emissions according to the participation in each enterprise.

In the operational control, 100% of the emissions of sources under its control are included in the inventory, and none of the emissions from sources that are not under its control, regardless of its shareholding in the source.

Establishing organizational boundaries, the company chooses an approach to consolidate GHG emissions and applies this approach to recording and reporting its GHG emissions. In this inventory, results are presented in both approaches.

In Table 4, it is possible to visualize the companies list that composes Engie group and the data on operational control and equity share. This report just considers operational plants. Emission sources related to construction activities of new plants are not accounted in this GHG inventory.

Table 4 –List of Companies of Engie Brazil Energia S.A

Plants/Offices	Initials	Energy Source	State	Installed Capacity (MW)	Institution that has operational Control	Engie Equity Share
Headquarter - Engie (Florianópolis - Office)	SEDE	-	SC	-	Engie	100%
Engie – Office SP	ESP	-	SP	-	Engie	100%
Wind Power Plant Cacimbas	ECAA	Wind	CE	18,9	Engie	100%
Wind Power Plant Campo Largo	CECL	Wind	BA	326,7	Engie	100%
Wind Power Plant Estrela	EEST	Wind	CE	29,7	Engie	100%
Wind Power Plant Fleixeiras I	UEFL	Wind	CE	30	Engie	100%
Wind Power Plant Guajirú	UEGU	Wind	CE	30	Engie	100%
Wind Power Plant Mundaú	UEMU	Wind	CE	30	Engie	100%
Wind Power Plant Ouro Verde	EOVE	Wind	CE	29,7	Engie	100%
Wind Power Plant Santa Mônica	ESMA	Wind	CE	18,9	Engie	100%
Wind Power Plant Tubarão	UETB	Wind	SC	2,1	Engie	100%
Wind Power Plant Umburanas	CEUM	Wind	BA	360	Engie	100%
Wind Power Plant Trairi	UETR	Wind	CE	25	Engie	100%
Photovoltaic Plant Assú V	FVAE	Solar	RN	30	Engie	100%
Photovoltaic Plant Cidade Azul	UFCA	Solar	SC	3	Engie	100%
Small Hydropower Plant José Gelazio da Rocha	PHJG	Hydropower Plant	MT	24	Engie	100%
Small Hydropower Plant Rondonópolis	PHRO	Hydropower Plant	MT	27	Engie	100%
Hydropower Plant Cana Brava	UHCB	Hydropower Plant	GO	450	Engie	100%
Hydropower Plant Estreito	UHET	Hydropower Plant	MA/TO	1.087	Consórcio Estreito	40.07%
Hydropower Plant Itá	UHIT	Hydropower Plant	SC/RS	1.450	Consórcio Itá	68.99%
Hydropower Plant Jaguara	UHJA	Hydropower Plant	SP	424	Engie	100%
Hydropower Plant Machadinho	UHMA	Hydropower Plant	SC/RS	1.140	Consórcio Machadinho	19,29%
Hydropower Plant Miranda	UHMI	Hydropower Plant	MG	404	Engie	100%
Hydropower Plant Passo Fundo	UHPF	Hydropower Plant	RS	226	Engie	100%
Hydropower Plant Ponte de Pedra	UHPP	Hydropower Plant	MT/MS	176	Engie	100%
Hydropower Plant Salto Osório	UHSO	Hydropower Plant	PR	1.078	Engie	100%
Hydropower Plant Salto Santiago	UHSS	Hydropower Plant	PR	1.420	Engie	100%
Hydropower Plant São Salvador	UHSA	Hydropower Plant	TO	243	Engie	100%
Complexo Termelétrico Jorge Lacerda	CTJL	Coal	SC	857	Engie	100%
Thermal Plant Pampa Sul	UTPS	Coal	Coal	345	Engie	
Unidade de Cogeração Lages	UCLA	Wood Waste	SC	28	Engie	100%
Thermal Plant Ferrari	UTFE	Sugarcane Biomass	SP	80,5	Engie	100%
Thermal Plant Ibitiúva	UTIB	Sugarcane Biomass	SP	33	Engie	69.26%

The defined geographical limit is the Brazilian territory, with exceptions for international emissions integrated in the source defined by "air travels" to foreign

countries. There is no possibility of double counting because all Engie Brasil activities are based in Brazil. Therefore, in this case, the PBGHGP methodology itself admits its insertion.

In this report, the results are presented in both approaches.

2.4. Operational Boundaries

After determining their organizational boundaries, the used methodologies recommend that the operational limits of an GHG inventory should be established, which involves identifying the emissions associated with their operations, classifying them as direct or indirect emissions and selecting the scope for accounting and compilation of the emission inventory.

The GHG Protocol methodology establishes the following operational limits for conducting an emission inventory included in this report:

- **Scope 1: Direct GHG emissions** - These are the direct emissions that are owned or controlled by the organization.
- **Scope 2: Indirect GHG** emissions due to electricity consumption - GHG emissions from the acquisition of electric energy consumed by the company, as well as those resulting from energy loss.
- **Scope 3: Other indirect GHG emissions** - optional category - These are emissions that are consequential to the activities of the company but occurring from sources that do not belong to or are not controlled by the organization.
- **Biomass emissions**: biomass emissions are reported here for information purposes only, since they are not added to the total emissions because they do not contribute to the greenhouse effect since CO2 from biomass is part of the natural cycle of the atmosphere.
- **Other Gases**: According to PBGHGP Specifications, emissions of gases not covered by the Kyoto Protocol, such as HCFCs, should not be included in the scopes, but may be reported separately. Therefore, the emissions from these gases were also calculated separately.

For GHG emissions report, the GHG Protocol defines the following emission sources:

Table 5 – GHG emissions sources described by GHG Protocol

Scope	Emission Source	Definition
Scope 1	Stationary Combustion	Stationary combustion for generation of electricity, steam, heat or energy with the use of equipment in a fixed location.
	Mobilie Combustion	Mobile combustion transportation and off-road vehicles, such as those used in construction, agriculture and forestry.
	Fugitive Emissions	Unintended releases of substances such as sulphuric hexafluoride (SF6) in electrical equipment, hydrofluorocarbons (HFCs) during the use of refrigeration and air-conditioning equipment and leak of methane (CH4) in the transport of natural gas.
	Industrial processes	Non-combustion emissions because of physical or chemical processes.
	Agricultural activities	Emissions from agricultural activities such as fertilizer use, burning vegetation and/or agricultural residues.
	Waste	Emissions from waste disposal in landfills, incineration or composting in solid disposal sites controlled by the company.
	Wastewater	Emissions from wastewater anaerobic treatment.
Scope 2	Purchase of electric energy	Emissions resulting from the acquisition of electric energy.
	Purchase of thermal energy	Emissions resulting from the acquisition of thermal energy.
Scope 3	Transport and distribution (upstream)	Emissions from transport and distribution of products purchased or acquired by the Organization, by vehicles hired by organization.
	Waste	Emissions from waste disposal on landfills, composting and/or treatment or incineration solid disposal sites not controlled by the company.
	Wastewater	Emissions from anaerobic wastewater treatment
	Business Travel	Staff transport emissions for activities related to the Organization's Business, such as aircraft, trains, buses, cars and boats.
	Transport and distribution (downstream)	Emissions from transport and distribution of products sold by the Organization through vehicles not hired by the organization.
	Fuel and energy-related activities not included in Scope 1 and 2	Fuel-related emissions that do not fall into the previous categories.
	Commuting	Emissions arising from the displacement of employees between their homes and the workplace.

In the Engie context, the following emission sources have been identified:

Table 6 – GHG Emissions Sources of Engie GHG Report- 2019

Scopes	Emission Sources	
Scope 1	Stationary Combustion	Boilers installed in thermal power plants
		Diesel group of emergencies (emergency generators with diesel engine)
		Instruments for boiler firing
		Forest chipper
		Spillway diesel group
		Acetylene cylinders for welding
	Mobile Combustion	Vehicles owned and controled by Engie (cars and boats)
		Lifting and transportation equipment (Wheel loaders and forklifts)
	Fugitives	Air-conditioners
		SF_6 Equipment
		Fire extinguishers with CO_2/ CO_2 cylinders for cleaning in welding process
	Agricultural activities	Use of fertilizers
	Waste	Composting
		Waste composted or disposed in solid waste disposal site controlled by the company.
Scope 2	Purchased energy	Eletricity consumption from the grid
Scope 3	Fuel and energy related activities not included in Scope 1 and 2	Trimmers/chainsaws
	Transport and distribution (*upstream*)	Vehicles rented or hired under third-party control used to transport people, raw materials and/or products/by products funded by the company (cars, ships and locomotives)
	Air Travel	Air travel Any travel of employees in leased vehicles

Scopes	Emission Sources	
	Waste	Waste disposed, composted or incinerated in solid waste disposal site not controlled by the company.
	Commuting	Vehicles used for commuting transportation
	Transport and distribution (*downstream*)	Rented or hired vehicles used to transport people, raw materials and/or products/by products not funded by the company
	Indirect Fugitive Emissions	Air-conditioners of suppliers installed in the company.
Biomass emission	CO_2 emissions generated in the combustion of biomass	Combustion of biodiesel, ethanol, wood waste and sugar cane bagasse.

2.5. Excluded Sources

In order to define the scope of Engie's emissions, the criteria defined was to account all emission sources of the activities carried out, including some categories of indirect emissions linked to the company's activities (scope 3), even though these are not mandatory according to PBGHGP.

GHG emissions from hydropower reservoirs were not considered. According to ELETROBRÁS (2012), there is no "international scientific consensus on methodology that allows to estimate GHG emissions in these reservoirs and to calculate the balance of emissions (or net emissions) of water bodies".

In the case of gases not listed in the Kyoto Protocol but regulated by the Montreal Protocol, only the use of HCFC-22 (R-22) was identified, which was duly accounted for and reported in a specific section.

2.6. Applied Methodology

The inventory is drawn from the concepts and guidelines established by the following methodologies:

- "The Greenhouse Gas Protocol – a Corporate Accounting and Reporting Standard – Revised Edition" – WRI/WBCSD, 2011;
- "Especificações de Verificação do Programa Brasileiro GHG Protocol – Segunda Edição" – WRI/FGV, 2011;
- "Contabilização, quantificação e publicação de Inventários Corporativos de Emissões de Gases de Efeito Estufa, Primeira edição" – WRI/FGV, 2012;
- "ISO 14.064:2007 - Sistema de Gestão de Gases do Efeito Estufa" – Organização Internacional de Normatização (International Organization Standartization), 2007.

The accounting methodologies are based mainly on the documents published by the Intergovernmental Panel on Climate Change:

- "IPCC Guidelines for National Greenhouse Gas Inventories" - IPCC, 1996;
- "IPCC Guidelines for National Greenhouse Gas Inventories" - IPCC, 2006.

Emission factors of PBGHGP tool, V2020.1, as well as bibliographic references used by PBGHGP, cited in table 07, were used. To calculate emissions, a spreadsheet was developed, considering these emission factors since they use adaptations to the national context.

For stationary fuels, where Lower Calorific Value (LCV) is monitored by Engie, specific emission factors were developed, as presented in Annex I. For the cases where there is no monitoring of fuel emission factors by Engie, the emission factors released by the PBGHGP were used.

The percentage of nitrogen contained in fertilizers was also monitored by UHIT, resulting in 6.0% for organic fertilizers and 9.0% for synthetic fertilizers. For those cases where there was no information on the percentage of nitrogen in organic and/or synthetic fertilizer, the standard value of 1% for organic fertilizers and 45% for synthetic fertilizers was considered as presented in Annex II – Additional Methodologies.

In addition, other GHG accounting methodologies were used for the cases in which PBGHGP calculation tools were not available. The methodologies and assumptions adopted for GHG accounting of emission sources not included in the Program

referring to the use of fertilizer, acetylene use and incineration are presented in Annex II - Additional Methodologies.

In the following table the methodologies and references of the emission factors presented for each source of emission of the inventory can be observed.

Table 7 - Methodological references for the emission factors used in Engie inventory – 2019

Emission Source	Methodology	Reference for Emission Factors
Direct and indirect stationary combustion	- IPCC 2006 – vol. 2 Energy – Cap. 2 Stationary combustion; - PBGHGP tool 2020.1	- National 2019 energy balance (BEN 2019); - IPCC 2006-vol. 2 Energy-Cap. 2 Stationary combustion; - Ministry of Science, Technology, Innovation and Communications. Third National Communication of Brazil to the United Nations Framework Convention on climate change. Brasília, 2016: (MCTIC, 2016). - Lower Calorif Power of Fuel controlled by Engie.
Direct and indirect mobile combustion	- IPCC 2006 – vol. 2 Energy – Cap. 3 Mobile combustion; - PBGHGP tool 2020.1	- National 2019 energy balance (BEN 2019); - - IPCC 2006-vol. 2 Energy-Cap. 2 Stationary combustion; - National Oil and Gas Agency ANP, 2019.
Fugitives	- IPCC 2006 – vol. 2 Energy – Cap. 4 Fugitive emissions; - PBGHGP tool 2020.1	- Climate Change 2007: Working Group I: The Physical Science Basis (IPCC 2007), item 2.10.2 Direct Global Warming Potentials, tabela 2.14; - ASHRAE Standard 34.
Agricultural Activities	- IPCC 2006 – vol. 4 AFOLU – Cap. 11 N2O emissions from managed soils, and CO2 emissions from lime and urea application;	- IPCC 2006 – vol. 4 AFOLU – Cap. 11 N2O emissions from managed soils, and CO2 emissions from lime and urea application; - Climate Change 2007: Working Group I: The Physical Science Basis (IPCC 2007), item 2.10.2 Direct Global Warming Potentials, table 2.14.
Energy purchased	- Ministry of Science, Technology, Innovation and Communications (MCTIC, 2020)	- CO2 emission factors of the SIN for corporate inventories – Ministry of Science, Technology, Innovation and Communications (MCTIC, 2020).

Emission Source	Methodology	Reference for Emission Factors
Business travels	- IPCC 2006 – vol. 2 Energy – Cap. 3 Mobile combustion; - 2019 Government GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors. FINAL. (DEFRA 2019).	- IPCC 2006 – vol. 2 Energy – Cap. 3 Mobile combustion; - 2019 Government GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors. FINAL. (DEFRA 2019).
Solid wastes	- IPCC 2006 – vol. 5 Waste – Cap. 3 Solid waste disposal / Chapter 4 – Biological treatment of solid waste; - PBGHGP tool 2020.1	- IPCC 2006 – vol. 5 Waste – Cap. 3 Solid waste disposal / Cap. 4 – Biological treatment of solid waste.
CO2 emissions generated in the combustion of biomass	- PBGHGP tool 2020.1	- 2019 National energy balance (BEN 2019); - 2019 data from The National Oil and Gas Agency-ANP. - Ministry of Science, Technology, Innovation and Communications. Third National Communication of Brazil to the United Nations Framework Convention on climate change. Brasília, 2016: (MCTIC, 2016).

The methodologies listed above have credibility worldwide and the main purpose of following them is to obtain a global and national comparison report. These standards set out some essential steps for structuring a good report.

The emission factors employed and the calculations that have been performed in this report are from reliable and traceable sources, thus ensuring consistency and transparency for Engie GHG emission inventory.

2.7. Applicable Requirements

The criteria for accounting, quantification, preparation and publication of GHG inventory under the PBGHGP comply with the five principles of GHG accounting presented in the GHG Protocol Corporate Standard and in standard 14.064: 2007

- **Relevance/Applicability:** to ensure that the inventory appropriately reflects the emissions of the company and that meets the needs of decision making;
- **Integrality**: to register and communicate all sources and activities of emission. To demonstrate and justify any specific exclusions;
- **Consistency**: to use technically recognized and consolidated methodologies that allow relevant comparisons of emissions over time. To clearly document any changes;
- **Transparency**: to address all relevant issues in a coherent and factual manner, based on sound and clear audit and reliable sources; and
- **Accuracy**: to ensure that quantification is neither underestimated nor overestimated by the application of actual emission factors or estimation data, allowing minimization of uncertainties.

The analysis of PBGHGP requests and suggestions and their compliance with this inventory are shown in Table 8.

Table 8: PBGHGP requirements

PBGHGP Requirements	Section
Total scopes 1 and 2 emissions regardless GHG changes	**1**
Scope – separated emissions data	**1/3.1**
Contact Person	**1.3**
The inventory period	**2.1**
Base-year and profile of emissions in time it is consistent with its recalculation	**2.2/3.9**
Listo f legal entities included in the inventory	**2.3**
Description of company and inventory limits	**2.3/2.4**
Scheme of chosen organization limits and list of included activities	**2.3/2.4**
Specific exclusions of sources, units or operations	**2.5**
Emission calculation / measurement methodologies with reference to tools	**2.6**
Emissions per operating unit	**1 e 3**
Emissons from its own generation of energy / heat / steam sold or transfered	**3**
Scope 3emissions from which reliable data can be obtained	**3.4**
Direct CO2 emissions of biologically fixed carbon separated from scopes	**3.6**
Emissions of 6 GHG separately (CO2, CH4, N2O, HFCs, PFCs, SF6) in tCO2e	**3.7**
GHG emissions not included in the Kyoto Protocol separated from scopes	**3.8**
Data on GHG sequestration	**6**
Relevant performance indicators expressed as a ratio	**7**

2.8. Methodological Complexity

According to IPCC inventory guide (2006), the level of methodological complexity for inventories is known as tier. Three tier levels are usually use.

- Tier 1: is the basic and most used method, used mainly when there is a limitation in obtaining data.
- Tier 2: is an intermediate method of complexity.
- Tier 3: is the most complex level and requires data demand and other very detailed information, so it is the most accurate and difficult to obtain.

As emphasized by the GHG Protocol, as higher tiers are used, emission calculations become more company-specific, leading to greater accuracy in the determination of emissions. In Tier 3, unit-specific data and process measurements, as well as information on employed technologies are required. In tier 2, the applicable emission factors must be in line with the country's industrial practices and therefore specific to the conditions in Brazil.

This report adopts, when monitored, specific emission factors of the fuels used by the company. Secondly, the emission factors of the PBGHGP and, finally, internationally recognized factors and methodologies applicable to Engie GHG emission sources (IPCC, 2006).

2.9. Greenhouse gases

The inventory includes all gases internationally recognized as greenhouse gases regulated by the Kyoto Treaty:

- Carbon dioxide - CO2
- Methane - CH4
- Nitrous Oxide - N2O
- Sulfur hexafluoride - SF6
- Hydrofluorocarbons - HFCs
- Perfluorocarbons - PFCs
- Nitrogen Trifluoride - NF3

Each GHG has a global warming potential that is used to calculate the equivalent carbon dioxide (CO2e), a unit of measurement internationally used for the quantification of greenhouse gas emissions. GWPs of each GHG are presented in Annex VII.

2.10. Methodological Changes Compared to the 2018 GHG Emissions Report

There were no methodological changes comparing to 2018 GHG report. Emissions factor were updated. In 2019, two wind power plants (CECL and CEUM) and one coal thermal plant (UTPS) started operation and were included in GHG Report. These changes are evidenced in the sections where 2019 GHG emissions are compared to the result of previous years. There were no changes in Engie's shareholding and operational control over the plants.

3. CONSOLIDATED EMISSIONS

3.1. Consolidated Emissions per Scope

In this section, total emissions of Engie consolidated for the year 2019 are presented broken down per scope. In operational control approach, the company emitted the total of **5,288,046**tCO2e, and for equity share approach **5,293.110** tCO2e.

The following figure shows the participation of scopes 1, 2 and 3, explaining the concentration of emissions in scope 01, in both approaches, due to the importance of stationary combustion of coal at CTJL (more tha 98% of total emissions).

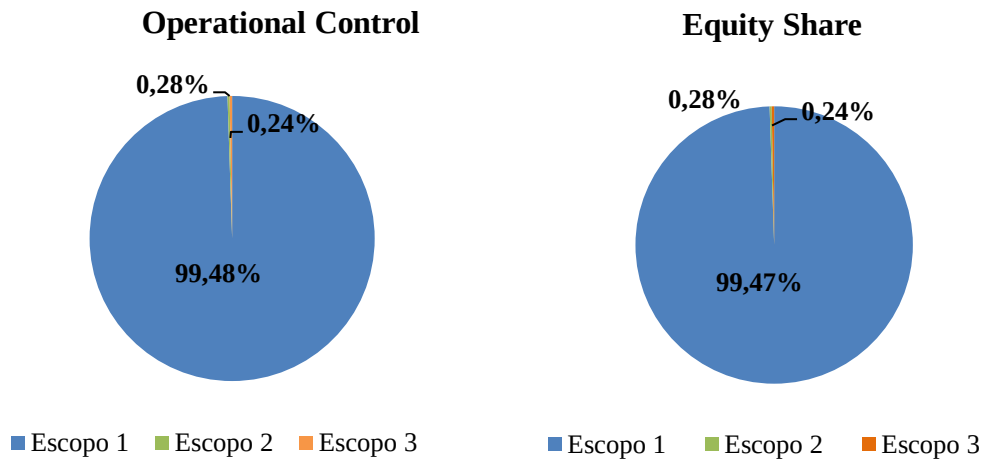


Figure 1 – Consolidated Emissions per scope (%)

3.2. Scope 1 Emissions

Engie's direct emissions totaled **5,260,402 tCO2e** for operating control, and **5,265,263 tCO2e** for Equity Share.

The following tables present the participation of different sources of emissions and of Engie's enterprises in Engie's emissions of Scope 1 in 2019.

Table 9 – Scope 01 emissions per emission source and per approach (tCO_2e /%)

Emission Sources	Operational Control Emissions (tCO2e)	%	Equity Share Emissions (tCO2e)	%
Scope 1	**5.260.402,94**	**99,48%**	**5.265.263,89**	**99,47%**
Combustão Estacionária	**5.259.387,64**	**99,46%**	**5.257.968,36**	**99,34%**
Coal Steam 4500 kcal / kg	4.261.277,24	80,58%	4.261.277,24	80,51%
Coal Steam 3100 kcal / kg	951.456,25	17,99%	951.456,25	17,98%
Sugarcane Bagasse	19.545,37	0,37%	18.120,25	0,34%
Diesel Oil	13.543,16	0,26%	13.549,00	0,26%
Wood waste	9.464,19	0,18%	9.464,19	0,18%
Fuel Oil	4.093,62	0,08%	4.093,62	0,08%
Acetylen	7,79	0,00%	7,79	0,00%
Gasoline	0,03	0,00%	0,03	0,00%
Fugitives	**530,51**	**0,01%**	**6.803,07**	**0,13%**
HFCs	411,10	0,01%	422,16	0,01%
Sulfur Hexafluoride (SF6)	88,92	0,00%	6.348,84	0,12%
Carbon Dioxide (CO2)	30,49	0,00%	32,07	0,00%
Direct Mobile Combustion	**465,81**	**0,01%**	**470,49**	**0,01%**
Diesel Oil	375,81	0,01%	373,66	0,01%
Gasoline	59,60	0,00%	66,32	0,00%
Liquefied Petroleum Gas	28,42	0,00%	28,42	0,00%
Ethanol	1,98	0,00%	2,10	0,00%
Waste	**14,84**	**0,00%**	**16,09**	**0,00%**
Composting	14,84	0,00%	15,77	0,00%
Landfill	-	0,00%	0,32	0,00%
Agricultural Activities	**4,14**	**0,00%**	**5,88**	**0,00%**
Fertilizers - Organic	2,90	0,00%	3,10	0,00%
Synthetic Fertilizers	1,24	0,00%	2,77	0,00%

Table 10 - Scope 01 emissions per enterprise and per approach (tCO_2e /%)

Units	Operational Control		Equity Share	
	Scope 1 (tCO_2e)	%	Scope 1 (tCO_2e)	%
CTJL	4.282.661,92	81,41%	4.282.661,92	81,34%
UTPS	953.206,43	18,12%	953.206,43	18,10%
UTFE	14.927,17	0,28%	14.927,17	0,28%
UTIB	4.650,25	0,09%	3.220,76	0,06%
UCLA	4.293,37	0,08%	4.293,37	0,08%
SEDE	282,59	0,01%	282,59	0,01%
PHJG	89,90	0,00%	89,90	0,00%
UHSS	62,02	0,00%	62,02	0,00%
UHSA	50,71	0,00%	50,71	0,00%
UETR	37,50	0,00%	37,50	0,00%
CEUM	32,68	0,00%	32,68	0,00%
CECL	31,63	0,00%	31,63	0,00%
UHSO	20,00	0,00%	20,00	0,00%
UHJA	13,42	0,00%	13,42	0,00%
UHPF	13,14	0,00%	13,14	0,00%
UHPP	10,19	0,00%	10,19	0,00%
FVAE	8,84	0,00%	8,84	0,00%
UHMI	5,28	0,00%	5,28	0,00%
UHCB	4,00	0,00%	4,00	0,00%
ESP	1,09	0,00%	1,09	0,00%
PHRO	0,54	0,00%	0,54	0,00%
UEMU	0,09	0,00%	0,09	0,00%
UEGU	0,09	0,00%	0,09	0,00%
UEFL	0,09	0,00%	0,09	0,00%
UHIT	-	0,00%	5.914,55	0,11%
UHMA	-	0,00%	348,47	0,01%
UHET	-	0,00%	27,41	0,00%
UETB	-	0,00%	-	0,00%
UFCA	-	0,00%	-	0,00%
EEST	-	0,00%	-	0,00%
EOVE	-	0,00%	-	0,00%
ECAA	-	0,00%	-	0,00%
ESMA	-	0,00%	-	0,00%
Total	**5.260.402,94**	**100%**	**5.265.263,89**	**100%**

The following subsections present a discussion of each emission source of scope 01

3.2.1. Stationary Combustion

Engie Scope 1 emissions are mainly based on the stationary combustion of coal at CTJL and UTPS (more than 99% in both approaches). The following table shows the emissions of stationary combustion per enterprise and fuel.

Table 11: Scope 1 emissions per stationary combustion (tCO_2e)

Units/Fuel	Operational Control		Equity Share	
	Scope 1 (tCO_2e)	%	Scope 1 (tCO_2e)	%
CTJL	**4.282.472,38**	**81,43%**	**4.282.472,38**	**81,45%**
Coal Vapor 4500 kcal / kg	4.261.277,24	81,02%	4.261.277,24	81,04%
Diesel Oil	11.723,26	0,22%	11.723,26	0,22%
Fuel Oil	9.464,19	0,18%	9.464,19	0,18%
Acetylene	7,70	0,00%	7,70	0,00%
UTPS	**953.206,43**	**18,12%**	**953.206,43**	**18,13%**
Coal 3100 kcal / kg	951.456,25	18,09%	951.456,25	18,10%
Diesel Oil	1.750,18	0,03%	1.750,18	0,03%
UTFE	**14.915,10**	**0,28%**	**14.915,10**	**0,28%**
Sugarcane Bagasse - UTFE	14.909,31	0,28%	14.909,31	0,28%
Diesel Oil	5,79	0,00%	5,79	0,00%
UTIB	**4.638,21**	**0,09%**	**3.212,42**	**0,06%**
Sugarcane Bagasse - UTIB	4.636,06	0,09%	3.210,94	0,06%
Diesel Oil	2,14	0,00%	1,48	0,00%
UCLA	**4.098,82**	**0,08%**	**4.098,82**	**0,08%**
Wood Waste	4.093,62	0,08%	4.093,62	0,08%
Diesel Oil	5,11	0,00%	5,11	0,00%
Acetylene	0,09	0,00%	0,09	0,00%
SEDE	**41,88**	**0,00%**	**41,88**	**0,00%**
Diesel Oil	41,88	0,00%	41,88	0,00%
CEUM	**2,98**	**0,00%**	**2,98**	**0,00%**
Diesel Oil	2,98	0,00%	2,98	0,00%
UHSS	**2,37**	**0,00%**	**2,37**	**0,00%**
Diesel Oil	2,37	0,00%	2,37	0,00%
UHSA	**2,37**	**0,00%**	**2,37**	**0,00%**
Diesel Oil	2,37	0,00%	2,37	0,00%
CECL	**1,89**	**0,00%**	**1,89**	**0,00%**
Diesel Oil	1,89	0,00%	1,89	0,00%
UHPP	**1,49**	**0,00%**	**1,49**	**0,00%**
Diesel Oil	1,49	0,00%	1,49	0,00%
UHCB	**1,43**	**0,00%**	**1,43**	**0,00%**
Diesel Oil	1,43	0,00%	1,43	0,00%
UHSO	**1,04**	**0,00%**	**1,04**	**0,00%**
Diesel Oil	1,04	0,00%	1,04	0,00%
PHJG	**0,47**	**0,00%**	**0,47**	**0,00%**
Diesel Oil	0,47	0,00%	0,47	0,00%
PHRO	**0,47**	**0,00%**	**0,47**	**0,00%**
Diesel Oil	0,47	0,00%	0,47	0,00%
UHPF	**0,19**	**0,00%**	**0,19**	**0,00%**
Diesel Oil	0,19	0,00%	0,19	0,00%
UHJA	**0,09**	**0,00%**	**0,09**	**0,00%**
Diesel Oil	0,09	0,00%	0,09	0,00%
UHMI	**0,03**	**0,00%**	**0,03**	**0,00%**
Gasoline	0,03	0,00%	0,03	0,00%
UHET	-	**0,00%**	**6,35**	**0,00%**
Diesel Oil	-	0,00%	6,35	0,00%
UHIT	-	**0,00%**	**0,15**	**0,00%**
Diesel Oil	-	0,00%	0,15	0,00%
Total	**5.259.387,64**	**100%**	**5.257.968,36**	**100%**

3.2.2. Mobile Combustion

Mobile combustion of scope 01 consists of the burning of fossil or renewable fuels in land, sea or air transportation of cargo and people, being the vehicle owned or controlled by the company. Diesel oil consumption predominated in Engie's mobile combustion emissions in 2019, with more than 79% in both accounting approaches, as shown in Figure 2.

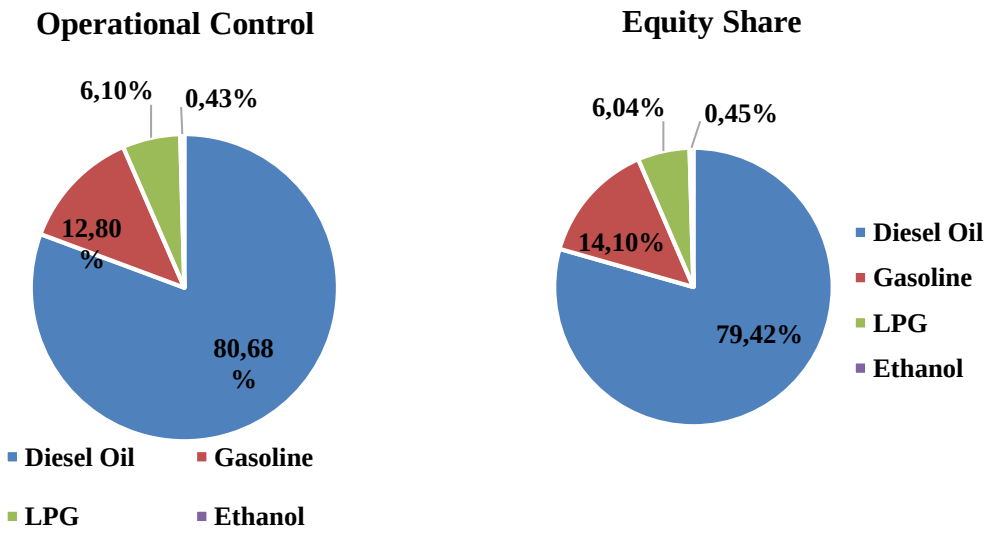


Figure 2 – Mobile Combustion Emission per Fuel (%)

Table 12 below shows that UCLA, CTJL, UETR and UHSA units are the most relevant, being responsible, in both approaches, for more than 69% of the mobile combustion emissions.

Table 12: Scope 01 emissions per mobile combustion (tCO_2e)

Emission Sources	Emissions tCO_2e - Operational Control						Emissions tCO_2e - Equity Share					
	Diesel Oil	Gasoline	LPG	Ethanol	Total	%	Diesel Oil	Gasoline	LPG	Ethanol	Total	%
UCLA	162,60	0,36	-	0,02	162,98	34,99%	162,60	0,36	-	0,02	162,98	34,64%
CTJL	56,28	5,07	28,42	0,28	90,04	19,33%	56,28	5,07	28,42	0,28	90,04	19,14%
UETR	22,65	14,71	-	-	37,36	8,02%	22,65	14,71	-		37,36	7,94%
UHSA	34,79	0,45	-	0,21	35,45	7,61%	34,79	0,45	-	0,21	35,45	7,54%
CECL	16,01	13,65	-	-	29,66	6,37%	16,01	13,65	-	-	29,66	6,30%
CEUM	16,01	13,65	-	-	29,66	6,37%	16,01	13,65	-	-	29,66	6,30%
UHJA	11,82	0,12	-	0,43	12,37	2,65%	11,82	0,12	-	0,43	12,37	2,63%
UHSO	10,86	1,12	-	0,19	12,16	2,61%	10,86	1,12	-	0,19	12,16	2,58%
UTIB	11,98	-	-	0,01	11,99	2,57%	8,30		-	0,00	8,30	1,76%
UHPF	4,43	5,92	-	0,09	10,44	2,24%	4,43	5,92	-	0,09	10,44	2,22%
UHSS	8,54	0,75	-	0,16	9,45	2,03%	8,54	0,75	-	0,16	9,45	2,01%
FVAE	7,88	0,96	-		8,84	1,90%	7,88	0,96	-	-	8,84	1,88%
UHPP	7,79	0,38	-	0,16	8,32	1,79%	7,79	0,38	-	0,16	8,32	1,77%
UHMI	4,19	0,30	-	0,14	4,62	0,99%	4,19	0,30	-	0,14	4,62	0,98%
ESP	-	1,09	-		1,09	0,23%	-	1,09	-	-	1,09	0,23%
UTFE	-	0,71	-	0,03	0,74	0,16%	-	0,71	-	0,03	0,74	0,16%
PHJG	-	0,38	-	0,07	0,45	0,10%	-	0,38	-	0,07	0,45	0,09%
UHCB	-	-	-	0,15	0,15	0,03%	-	-	-	0,15	0,15	0,03%
PHRO	-	-	-	0,06	0,06	0,01%	-	-	-	0,06	0,06	0,01%
UHMA	-	-	-	-	-	0,00%	0,60	0,90	-	0,02	1,52	0,32%
UHIT	-	-	-	-	-	0,00%	0,93	3,63	-	0,05	4,61	0,98%
UHET	-	-	-	-	-	0,00%	-	2,19	-	0,05	2,23	0,47%
Total Geral	375,81	59,60	28,42	1,98	465,81	100%	373,66	66,32	28,42	2,10	470,49	100%
%	80,7%	12,8%	6,1%	0,4%	100,0%		79,4%	14,1%	6,0%	0,4%	100,0%	

3.2.3. Fugitive Emissions

Fugitive emissions consist of the direct escape of GHG in equipment, at the moment of its replacement or recharge. Such escape emissions usually occur in equipment such as circuit breakers, air conditioners and fire extinguishers. R-410A and SF6 emissions are the most relevants for operational control and equity share approaches, mainly in Florianopolis headquarters (45%) and PHJG (16%). Using equity share approach emission from SF6 leak of UHIT are the most significant (86%), as it can be seen in table 13 below.

Table 13: Scope 1 emissions per Fugitive Emissions (tCO_2e)

Emission Sources	Emissions tCO_2e - Operational Control											Emissions tCO_2e - Equity Share										
	R-410A	SF6	R-404A	CO2	HFC-134a	R-407C	R-407A	R-440A	R-401A	Total	%	SF6	R-410A	R-404A	CO2	HFC-134a	R-407C	R-407A	R-440A	R-401A	Total	%
SEDE	238,81	-	-	0,21	-	-	-	-	-	239,02	45,05%	-	238,81	-	0,21	-	-	-	-	-	239,02	3,51%
PHJG	-	88,92	-	-	-	-	-	-	-	88,92	16,76%	88,92	-	-	0,00	-	-	-	-	-	88,92	1,31%
CTJL	38,63	-	31,37	6,91	-	10,18	-	-	-	87,10	16,42%	-	38,63	31,37	6,91	-	10,18	-	-	-	87,10	1,28%
UHSS	-	-	17,65	12,86	19,45	-	-	-	-	49,95	9,42%	-	-	17,65	12,86	19,45	-	-	-	-	49,95	0,73%
UCLA	31,31	-	-	0,26	-	-	-	-	-	31,57	5,95%	-	31,31	-	0,26	-	-	-	-	-	31,57	0,46%
UHSA	5,95	-	-	0,09	-	-	6,00	0,41	0,05	12,50	2,36%	-	5,95	-	0,09	-	-	6,00	0,41	0,05	12,50	0,18%
UTFE	11,27	-	-	0,05	-	-	-	-	-	11,33	2,14%	-	11,27	-	0,05	-	-	-	-	-	11,33	0,17%
UHSO	-	-	-	6,68	-	-	-	-	-	6,68	1,26%	-	-	-	6,68	-	-	-	-	-	6,68	0,10%
UHPF	-	-	-	1,44	-	-	-	-	0,01	1,45	0,27%	-	-	-	1,44	-	-	-	-	0,01	1,45	0,02%
UHJA	-	-	-	0,96	-	-	-	-	-	0,96	0,18%	-	-	-	0,96	-	-	-	-	-	0,96	0,01%
UHMI	-	-	-	0,42	-	-	-	-	-	0,42	0,08%	-	-	-	0,42	-	-	-	-	-	0,42	0,01%
UETR	-	-	-	0,14	-	-	-	-	-	0,14	0,03%	-	-	-	0,14	-	-	-	-	-	0,14	0,00%
UEGU	-	-	-	0,09	-	-	-	-	-	0,09	0,02%	-	-	-	0,09	-	-	-	-	-	0,09	0,00%
UEMU	-	-	-	0,09	-	-	-	-	-	0,09	0,02%	-	-	-	0,09	-	-	-	-	-	0,09	0,00%
UEFL	-	-	-	0,09	-	-	-	-	-	0,09	0,02%	-	-	-	0,09	-	-	-	-	-	0,09	0,00%
CECL	-	-	-	0,08	-	-	-	-	-	0,08	0,02%	-	-	-	0,08	-	-	-	-	-	0,08	0,00%
UTIB	-	-	-	0,06	-	-	-	-	-	0,06	0,01%	-	-	-	0,04	-	-	-	-	-	0,04	0,00%
CEUM	-	-	-	0,04	-	-	-	-	-	0,04	0,01%	-	-	-	0,04	-	-	-	-	-	0,04	0,00%
UHCB	-	-	-	0,01	-	-	-	-	-	0,01	0,00%	-	-	-	0,01	-	-	-	-	-	0,01	0,00%
UHIT	-	-	-	-	-	-	-	-	-	-	0,00%	5.898,65	10,23	-	0,00	-	-	-	-	-	5.908,87	86,86%
UHMA	-	-	-	-	-	-	-	-	-	-	0,00%	346,66	-	-	0,00	-	-	-	-	-	346,66	5,10%
UHET	-	-	-	-	-	-	-	-	-	-	0,00%	14,62	0,84	-	1,59	-	-	-	-	-	17,04	0,25%
TOTAL	325,97	88,92	49,02	30,49	19,45	10,18	6,00	0,41	0,06	530,51	100,00%	6.348,84	337,04	49,02	32,07	19,45	10,18	6,00	0,41	0,06	6.803,07	100,00%
%	61,45%	16,76%	9,24%	5,75%	3,67%	1,92%	1,13%	0,08%	0,01%	100,00%		93,32%	4,95%	0,72%	0,47%	0,29%	0,15%	0,09%	0,01%	0,00%	100,00%	

3.2.4. Emissions per Agricultural Activities

Emissions from agricultural activities are associated with the generation of nitrous oxide (N2O) in the use of fertilizers, whether synthetic or organic. The following table shows the emissions (in tCO2e) per business unit and accounting approach. UHCB and CTJL (Equity Control) concentrate emissions by fertilizers in both approaches.

Table 14: Scope 1 emissions per Agricultural Activities (tCO_2e)

Emission Sources	Operational Control		Equity Share	
	tCO_2e	%	tCO_2e	%
UHCB	1,94	46,96%	1,94	33,06%
CTJL	1,36	32,99%	1,36	23,22%
UHPF	0,45	10,87%	0,45	7,65%
UHSS	0,25	6,06%	0,25	4,26%
UHSO	0,13	3,12%	0,13	2,20%
UHMA	-	0,00%	0,05	0,83%
UHET	-	0,00%	1,18	20,13%
UHIT	-	0,00%	0,51	8,63%
Total	**4,14**	**100,00%**	**5,88**	**100,00%**

3.2.5. Emissions per Waste

Waste emissions classified in scope 01 are associated with wastes that are treated in environment which is controlled by the company itself. Table 15 shows the emissions of waste per business unit and per type of treatment applied to the waste.

Composting process is more relevant for both approaches, with concentration of emissions at CTJL. UHET reported waste disposed at landfills.

Table 15: Scope 1 emissions per waste (tCO_2e)

Emission Sources	Emissions tCO_2e - Controle Operacional				Emissions tCO_2e - Equity Share			
	Composting	Landfill	Total	%	Composting	Landfill	Total	%
CTJL	11,04	-	11,04	74,35%	11,04	-	11,04	68,59%
SEDE	1,69	-	1,69	11,38%	1,69	-	1,69	10,50%
UHPF	0,61	-	0,61	4,13%	0,61	-	0,61	3,81%
UHCB	0,46	-	0,46	3,12%	0,46	-	0,46	2,87%
UHSA	0,39	-	0,39	2,62%	0,39	-	0,39	2,42%
UHPP	0,38	-	0,38	2,56%	0,38	-	0,38	2,36%
UHMI	0,21	-	0,21	1,39%	0,21	-	0,21	1,28%
PHJG	0,06	-	0,06	0,39%	0,06	-	0,06	0,36%
PHRO	0,01	-	0,01	0,06%	0,01	-	0,01	0,06%
UHET	-	-	-	0,00%	0,28	0,32	0,60	3,72%
UHIT	-	-	-	0,00%	0,42	-	0,42	2,59%
UHMA	-	-	-	0,00%	0,23	-	0,23	1,44%
Total	14,84	-	14,84	100,00%	15,77	0,32	16,09	100,00%
%	100%	0%	100%		98%	2%	100%	

3.3. Scope 2 Emissions

Scope 2 emissions, according to the GHG Protocol methodology, are constituted by the acquisition and consumption of electric energy used in the company's operations, which generates indirect emissions for the business units.

GHG emissions from electricity consumption are mainly associated with the ancillary services rendered by Engie to the SIN and CTJL operation. Besides that, to a lesser extent, the consumption of its offices in Florianópolis (headquarters) and São Paulo, of facilities and/or equipment located inside or outside the plants eventually used as support for the operation of some plants.

Ancillary services are the additional services provided by generation agents comprising the primary and secondary power controls, their power reserves, standby reserve, reactive support and the self-reestablishment of generating units, as regulated by Resolution of ANEEL nº 265/2003.

The ancillary services guarantee the quality and safety of the generated energy, contributing to the reliability of the NIS. They are carried out according to the Agreement for the Provision of Ancillary Services (CPSA) established between the generation agent and the National Electric System Operator (ONS), which sets forth the terms and conditions for providing reactive support to the SIN, through generating units operating as synchronous compensators connected to the SIN.

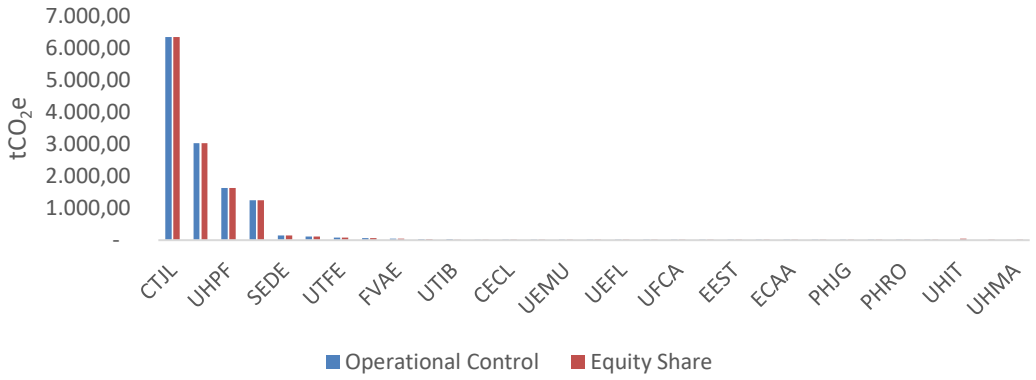
CTJL, UTPS and ancillary services of the plants are the main source of energy consumption and, consequently, of CO2 emissions from Engie.

Scope 02 emissions follows location based approach, using emisison fator of National Interconnected System (SIN), published by MCTIC. The calculation of emissions from electricity is carried out taking into account the monthly emission factors of the National Interconnected System and the monthly consumption reported by the enterprises.

Engie's total scope 2 emissions in 2019 was **12,825** tCO2e per operating control, and **12,873** tCO2e per sequity share approach.

The following figure shows emissions per energy consumption per enterprise and approach, showing the concentration of emissions at CTJL, UHSS, UHPF and UTPS.

Figure 3: Scope 2 emissions per enterprise and approach (tCO2e)



The following table shows the emissions per approach and business unit and the total MWh consumed by the units.

Table 16: Scope 2 emissions and consumption per business unit and approach (tCO_2e / MWh)

Emission Sources	Operational Control			Equity Share		
	tCO_2e	MWh	%	tCO_2e	MWh	%
CTJL	6.338,70	78.888,20	49,42%	6.338,70	78.888,20	49,24%
UHSS	3.022,82	41.151,56	23,57%	3.022,82	41.151,56	23,48%
UHPF	1.622,56	23.645,06	12,65%	1.622,56	23.645,06	12,60%
UTPS	1.241,23	17.775,87	9,68%	1.241,23	17.775,87	9,64%
SEDE	148,00	2.014,48	1,15%	148,00	2.014,48	1,15%
UCLA	115,98	1.519,39	0,90%	115,98	1.519,39	0,90%
UTFE	78,04	1.284,74	0,61%	78,04	1.284,74	0,61%
UHSO	61,99	769,72	0,48%	61,99	769,72	0,48%
FVAE	39,62	530,40	0,31%	39,62	530,40	0,31%
UHJA	38,03	503,39	0,30%	38,03	503,39	0,30%
UTIB	31,54	543,28	0,25%	21,84	376,28	0,17%
CEUM	18,20	243,85	0,14%	18,20	243,85	0,14%
CECL	14,48	194,80	0,11%	14,48	194,80	0,11%
UETR	7,23	121,69	0,06%	7,23	121,69	0,06%
UEMU	6,45	114,71	0,05%	6,45	114,71	0,05%
UEGU	6,36	114,71	0,05%	6,36	114,71	0,05%
UEFL	5,80	105,34	0,05%	5,80	105,34	0,05%
UETB	5,07	60,24	0,04%	5,07	60,24	0,04%
UFCA	4,80	63,82	0,04%	4,80	63,82	0,04%
ESP	4,53	56,29	0,04%	4,53	56,29	0,04%
EEST	4,53	82,23	0,04%	4,53	82,23	0,04%
EOVE	4,05	73,21	0,03%	4,05	73,21	0,03%
ECAA	2,48	44,98	0,02%	2,48	44,98	0,02%
ESMA	2,46	44,74	0,02%	2,46	44,74	0,02%
PHJG	0,23	3,20	0,00%	0,23	3,20	0,00%
UHPP	0,18	3,33	0,00%	0,18	3,33	0,00%
PHRO	0,08	1,41	0,00%	0,08	1,41	0,00%
UHMI	0,03	0,30	0,00%	0,03	0,30	0,00%
UHIT	-	-	0,00%	47,57	580,81	0,37%
UHET	-	-	0,00%	9,40	119,55	0,07%
UHMA	-	-	0,00%	0,30	3,15	0,00%
Total	**12.825,45**	**169.954,96**	**100,00%**	**12.873,02**	**170.491,47**	**100%**

In the operational control approach, emissions of scope 02 are strongly concentrated at CTJL (more than 49%), UHSS (more than 23%) and UHPF (more than 12%) and UTPS (More than 9%), totalizing more than 94% of scope 02 emissions.

3.4. Scope 03 Emissions

Engie's indirect emissions totaled 14,817 tCO2e for operational control, and 14,973 tCO2e for equity share approach. The following tables present the participation of various sources of emissions and of Engie's enterprises in Engie's Scope 3 emissions in 2019.

Table 17 – Scope 03 emissions per emission source and approach (tCO_2e /%)

Emission Sources	Operational Control		Equity Share	
	Emissions (tCO2e)	%	Emissions (tCO2e)	%
Scope 3	**14.817,68**	**100,00%**	**14.973,42**	**100,00%**
Transport and Distribution (downstream)	**6.880,54**	**46,43%**	**6.962,47**	**46,50%**
Diesel Oil	6.712,53	45,30%	6.764,47	45,18%
Gasoline	163,60	1,10%	193,50	1,29%
Ethanol	3,68	0,02%	3,68	0,02%
Transporte e Distribuição (upstream)	0,72	0,00%	0,81	0,01%
Diesel Oil	-	0,00%	-	0,00%
Gasoline	**6.422,95**	**43,35%**	**6.354,17**	**42,44%**
Liquefied Petroleum Gas	6.418,76	43,32%	6.348,74	42,40%
Ethanol	4,01	0,03%	5,24	0,04%
Biodiesel	0,19	0,00%	0,19	0,00%
Business Travel	**736,69**	**4,97%**	**801,65**	**5,35%**
Aviation - Kerosene	655,95	4,43%	720,12	4,81%
Gasoline	79,68	0,54%	80,47	0,54%
Diesel Oil	1,05	0,01%	1,05	0,01%
Ethanol	-	0,00%	0,01	0,00%
Commuting	**448,59**	**3,03%**	**457,73**	**3,06%**
Diesel Oil	248,92	1,68%	253,22	1,69%
Gasoline	161,66	1,09%	166,03	1,11%
Ethanol	38,02	0,26%	38,47	0,26%
Waste	**321,35**	**2,17%**	**389,85**	**2,60%**
Landfill	298,76	2,02%	364,85	2,44%
Incineration	22,49	0,15%	24,88	0,17%
Composting	0,11	0,00%	0,11	0,00%
Fuel and energy related activities not included in scopes 1 and 2	**5,28**	**0,04%**	**5,28**	**0,04%**
Gasoline	5,17	0,03%	5,17	0,03%
Diesel Oil	0,11	0,00%	0,11	0,00%
Fugitives - Indirect	**2,28**	**0,02%**	**2,28**	**0,02%**
HFCs	2,28	0,02%	2,28	0,02%

Table 18 – Scope 03 emissions per enterprise (tCO_2e /%)

Units	Operational Control		Equity Share	
	Scope 3 (tCO_2e)	%	Scope 3 (tCO_2e)	%
CTJL	12.011,14	81,06%	12.011,14	80,22%
UTFE	800,46	5,40%	800,46	5,35%
UCLA	648,05	4,37%	648,05	4,33%
SEDE	549,03	3,71%	549,03	3,67%
UTIB	228,75	1,54%	158,43	1,06%
UHSO	153,58	1,04%	153,58	1,03%
UHSS	99,05	0,67%	99,05	0,66%
UHPP	58,24	0,39%	58,24	0,39%
UHPF	56,79	0,38%	56,79	0,38%
UHMI	40,75	0,27%	40,75	0,27%
UTPS	40,42	0,27%	40,42	0,27%
UHSA	38,81	0,26%	38,81	0,26%
UHCB	28,89	0,19%	28,89	0,19%
UHJA	18,28	0,12%	18,28	0,12%
UETR	17,09	0,12%	17,09	0,11%
CECL	15,29	0,10%	15,29	0,10%
PHJG	4,87	0,03%	4,87	0,03%
PHRO	4,87	0,03%	4,87	0,03%
ESP	3,00	0,02%	3,00	0,02%
FVAE	0,32	0,00%	0,32	0,00%
UHET	-	0,00%	119,46	0,80%
UHIT	-	0,00%	89,38	0,60%
UHMA	-	0,00%	17,22	0,12%
CEUM	-	0,00%	-	0,00%
UEMU	-	0,00%	-	0,00%
UEGU	-	0,00%	-	0,00%
UEFL	-	0,00%	-	0,00%
UETB	-	0,00%	-	0,00%
UFCA	-	0,00%	-	0,00%
EEST	-	0,00%	-	0,00%
EOVE	-	0,00%	-	0,00%
ECAA	-	0,00%	-	0,00%
ESMA	-	0,00%	-	0,00%
Total	**14.817,68**	**100%**	**14.973,42**	**100%**

Scope 03 emissions are mainly concentrated in the transportation of inputs and wastes and outsourced vehicles to CTJL thermoelectric plants (more than 80% in both approaches). The following subsections present a discussion of each scope 03 emission. source.

3.4.1. Transport and Distribution (upstream)

Upstream transport and distribution emissions are concentrated in the consumption of diesel for suppliers of inputs transport (coal, oil, etc.) of CTJL and biomass transport to UTFE and UCLA.

Tabela 19: Scope 3 emissions per transport and distribution (upstream) in tCO_2e

Emission Sources	Emissions tCO_2e - Operational Control						Emissions tCO_2e - Equity Share					
	Diesel Oil	Gasoline	LPG	Ethanol	Total	%	Diesel Oil	Gasoline	LPG	Ethanol	Total	%
CTJL	5.271,47	58,38	2,60	-	5.332,45	77,50%	5.271,47	58,38	2,60	-	5.332,45	76,59%
UTFE	800,46	-	-	-	800,46	11,63%	800,46	-	-	-	800,46	11,50%
UCLA	565,07	-	-	-	565,07	8,21%	565,07	-	-	-	565,07	8,12%
UHPP	22,78	14,66	-	0,02	37,46	0,54%	22,78	14,66	-	0,02	37,46	0,54%
UHSO	16,03	19,02	1,08	0,27	36,40	0,53%	16,03	19,02	1,08	0,27	36,40	0,52%
UHSS	10,89	22,50	-	0,02	33,41	0,49%	10,89	22,50	-	0,02	33,41	0,48%
UHMI	3,12	18,99	-	0,13	22,24	0,32%	3,12	18,99	-	0,13	22,24	0,32%
UHPF	3,62	14,69	-	-	18,31	0,27%	3,62	14,69	-	-	18,31	0,26%
UHSA	4,36	12,37	-	0,20	16,93	0,25%	4,36	12,37	-	0,20	16,93	0,24%
UHJA	6,24	1,76	-	0,08	8,08	0,12%	6,24	1,76	-	0,08	8,08	0,12%
PHJG	4,24	0,62	-	0,00	4,87	0,07%	4,24	0,62	-	0,00	4,87	0,07%
PHRO	4,24	0,62	-	0,00	4,87	0,07%	4,24	0,62	-	0,00	4,87	0,07%
UHMA	-	-	-	-	-	0,00%	1,31	0,83	-	-	2,14	0,03%
UHET	-	-	-	-	-	0,00%	45,08	16,46	-	0,09	61,63	0,89%
UHIT	-	-	-	-	-	0,00%	5,55	12,61	-	-	18,16	0,26%
TOTAL	6.712,53	163,60	3,68	0,72	6.880,54	100,00%	6.764,47	193,50	3,68	0,81	6.962,47	100,00%
%	97,56%	2,38%	0,05%	0,01%	100,00%		97,16%	2,78%	0,05%	0,01%	100,00%	

3.4.2. Transport and Distribution (Downstream)

This category includes emissions from transport and distribution of products (excluding fuels and energy products) in vehicles and plants which are neither owned nor operated by the organization when there is no relationship of purchase or acquisition of these services by the inventory organization in the inventory year, as well as other outsourced transportation and distribution services (including both inbound and outbound logistics). For Engie, this cathegory includes transport of employees, inputs and products/sub-products not paid by the company.

Downstream emissions are concentrated in diesel consumption in outsourced transportation, mainly for ashes transportation at CTJL.

Table 20: Scope 3 emissions per transport and distribution (downstream) in tCO_2e

Emission Sources	Emissions tCO_2e - Operational Control					Emissions tCO_2e - Equity Share				
	Diesel Oil	Gasoline	Ethanol	Total	%	Diesel Oil	Gasoline	Ethanol	Total	%
CTJL	6.142,39			6.142,39	95,63%	6.142,39			6.142,39	96,67%
UTIB	227,76			227,76	3,55%	157,74			157,74	2,48%
UCLA	43,66			43,66	0,68%	43,66			43,66	0,69%
UHCB	4,96	4,01	0,19	9,15	0,14%	4,96	4,01	0,19	9,15	0,14%
UHET		-	-	-	0,00%		1,23	0,00	1,23	
TOTAL	6.418,76	4,01	0,19	6.422,95	100%	6.348,74	5,24	0,19	6.354,17	100%
%	99,93%	0,06%	0,00%	100,00%		99,91%	0,08%	0,00%	100,00%	

3.4.3. Commuting

This category includes emissions derived from Engie's outsourced fleets used for daily terrestrial transportation of employees on their commuting journey. Emissions from displacement of employees are concentrated in the consumption of diesel (more than 92%) and distributed among the units, as shown in the following table.

Table 21: Scope 3 emissions per Commuting in tCO_2e

Emission Sources	Emissions tCO_2e - Operational Control					Emissions tCO_2e - Equity Share				
	Diesel Oil	Gasoline	Ethanol	Total	%	Diesel Oil	Gasoline	Ethanol	Total	%
UHSO	88,73	7,59	-	**96,31**	**29,97%**	88,73	7,59	-	**96,31**	**24,71%**
CTJL	56,30	-	-	**56,30**	**17,52%**	56,30	-	-	**56,30**	**14,44%**
UHSS	43,13	3,60	0,11	**46,84**	**14,58%**	43,13	3,60	0,11	**46,84**	**12,02%**
UHPF	36,23	-	-	**36,23**	**11,27%**	36,23	-	-	**36,23**	**9,29%**
UCLA	18,96	11,29	-	**30,25**	**9,41%**	18,96	11,29	-	**30,25**	**7,76%**
UHSA	19,88	-	-	**19,88**	**6,19%**	19,88	-	-	**19,88**	**5,10%**
UHMI	14,01	-	-	**14,01**	**4,36%**	14,01	-	-	**14,01**	**3,59%**
UHPP	12,05	-	-	**12,05**	**3,75%**	12,05	-	-	**12,05**	**3,09%**
UHCB	9,47	-	-	**9,47**	**2,95%**	9,47	-	-	**9,47**	**2,43%**
UHMA	-	-	-	-	**0,00%**	14,55	-	-	**14,55**	**3,73%**
UHIT	-	-	-	-	**0,00%**	46,38	-	-	**46,38**	**11,90%**
UHET	-	-	-	-	**0,00%**	5,17	2,40	-	**7,56**	**1,94%**
TOTAL	**298,76**	**22,49**	**0,11**	**321,35**	**100,00%**	**364,85**	**24,88**	**0,11**	**389,85**	**100,00%**
%	**92,97%**	**7,00%**	**0,04%**	**100,00%**		**93,59%**	**6,38%**	**0,03%**	**100,00%**	

3.4.4. Waste

The GHG emissions provided by waste in their decomposition are accounted as waste of scope 03 when the final disposal takes place in places not controlled by the company.

The following table presents emissions per waste, final destination, enterprise and accounting approach. CTJL Waste incinerated (more than 55%) and waste sent to landfills (more than 36%) are responsible for more than 91% of the waste emissions. CTJL is most important plant. Chemical waste and wood sent to incineration and common waste and Sludge from wastewater treatment stations are the most relevant.

Table 22: Scope 3 emissions per waste generated in the operations (tCO_2e)

Emission Sources	Emissions tCO_2e - Operational Control					Emissions tCO_2e - Equity Share				
	Incineration	Landfill	Composting	Total	%	Incineration	Landfill	Composting	Total	%
CTJL	248,92	131,05	37,83	**417,80**	**93,14%**	248,92	131,05	37,83	**417,80**	**91,28%**
UHSO	-	9,32	-	**9,32**	**2,08%**	-	9,32	-	**9,32**	**2,04%**
UCLA	-	6,47	0,18	**6,65**	**1,48%**	-	6,47	0,18	**6,65**	**1,45%**
UHSS	-	5,29	-	**5,29**	**1,18%**	-	5,29	-	**5,29**	**1,16%**
CECL	-	3,00	-	**3,00**	**0,67%**	-	3,00	-	**3,00**	**0,66%**
UHJA	-	2,44	-	**2,44**	**0,54%**	-	2,44	-	**2,44**	**0,53%**
UHCB	-	1,26	-	**1,26**	**0,28%**	-	1,26	-	**1,26**	**0,27%**
UTIB	-	0,99	-	**0,99**	**0,22%**	-	0,69	-	**0,69**	**0,15%**
UHPF	-	0,64	-	**0,64**	**0,14%**	-	0,64	-	**0,64**	**0,14%**
UHSA	-	0,55	-	**0,55**	**0,12%**	-	0,55	-	**0,55**	**0,12%**
SEDE	-	0,34	-	**0,34**	**0,08%**	-	0,34	-	**0,34**	**0,08%**
FVAE	-	0,32	-	**0,32**	**0,07%**	-	0,32	-	**0,32**	**0,07%**
UHIT	-	-	-	-	**0,00%**	-	4,46	0,46	**4,91**	**1,07%**
UHET	-	-	-	-	**0,00%**	4,31	-	-	**4,31**	**0,94%**
UHMA	-	-	-	-	**0,00%**	-	0,22	-	**0,22**	**0,05%**
TOTAL	**248,92**	**161,66**	**38,02**	**448,59**	**100%**	**253,22**	**166,03**	**38,47**	**457,73**	**100%**
%	**55,49%**	**36,04%**	**8,48%**	**100,00%**		**55,32%**	**36,27%**	**8,41%**	**100,00%**	

3.4.5. Business Travel

This category includes emissions from air and terrestrial transportation produced by Engie employees at work. These emissions are provided by burning fossil or renewable fuels in a third-party fleet.

The calculation of emissions per air travel was developed by PBGHGP tool. The journeys taken by the company were converted into distance from the calculation tool available in the PBGHGP.

Emissions are concentrated on business trips by air travel, mainly performed by headquarters staff (66% by operational control and 61% by equity share)

Table 23: Scope 3 emissions per business travel (tCO_2e)

Emission Sources	Emissions tCO_2e - Operational Controle					Emissions tCO_2e - Equity Share					
	Aviation - Kerosene	Gasoline	Diesel Oil	Total	%	Aviation - Kerosene	Gasolina	Diesel	Ethanol	Total	%
SEDE	486,54	62,15	-	548,68	74,48%	486,54	62,15	-	-	548,68	68,44%
CTJL	53,79	8,42	-	62,21	8,44%	53,79	8,42	-	-	62,21	7,76%
UTPS	40,42	-	-	40,42	5,49%	40,42	-	-	-	40,42	5,04%
UETR	17,09	-	-	17,09	2,32%	17,09	-	-	-	17,09	2,13%
CECL	12,29	-	-	12,29	1,67%	12,29	-	-	-	12,29	1,53%
UHSS	5,26	4,93	-	10,19	1,38%	5,26	4,93	-	-	10,19	1,27%
UHCB	7,77	0,19	1,05	9,01	1,22%	7,77	0,19	1,05	-	9,01	1,12%
UHPP	7,76	0,97	-	8,72	1,18%	7,76	0,97	-	-	8,72	1,09%
UHJA	7,36	0,41	-	7,77	1,05%	7,36	0,41	-	-	7,77	0,97%
UHSO	6,41	0,90	-	7,32	0,99%	6,41	0,90	-	-	7,32	0,91%
UHMI	4,06	0,43	-	4,49	0,61%	4,06	0,43	-	-	4,49	0,56%
ESP	2,22	0,78	-	3,00	0,41%	2,22	0,78	-	-	3,00	0,37%
UCLA	2,08	0,34	-	2,43	0,33%	2,08	0,34	-	-	2,43	0,30%
UHSA	1,45	-	-	1,45	0,20%	1,45	-	-	-	1,45	0,18%
UHPF	1,44	-	-	1,44	0,20%	1,44	-	-	-	1,44	0,18%
UHPF	-	0,17	-	0,17	0,02%	-	0,17	-	-	0,17	0,02%
UHET	-	-	-	-	0,00%	44,71	-	-	0,01	44,72	5,58%
UHIT	-	-	-	-	0,00%	19,14	0,79	-	-	19,93	2,49%
UHMA	-	-	-	-	0,00%	0,31	-	-	-	0,31	0,04%
TOTAL	655,95	79,68	1,05	736,69	100%	720,12	80,47	1,05	0,01	801,65	1,00
%	89,04%	10,82%	0,14%	100,00%		89,83%	10,04%	0,13%	0,00%	100,00%	

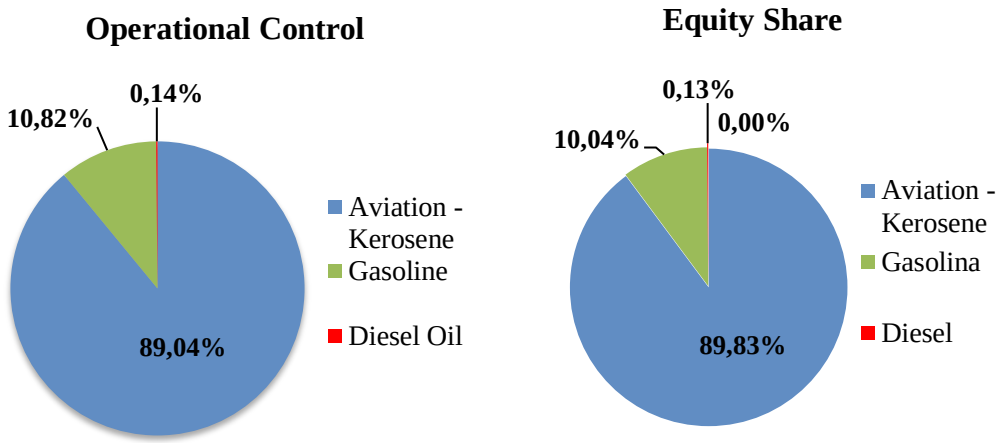


Figure 4: Business travel emissions (%)

3.4.6. Fuel and energy related activities not included in scopes 1 and 2

Emissions of 5.28 tCO2e were provided by fuel and energy related activities not included in scopes 01 and 02. All these emissions were provided by UHSS and UHSO (62.8% and 37.2%, respectively) in fuel consuming activities in trimmers, chainsaws and sprayers.

3.5. Emissions Sources

The following tables present the share of each emission source in the consolidated total and the emissions per company of the group during the year 2019, providing an overview of Engie Energia emissions during the year.

Table 24: Total Emissions by Engie per Emission Source (tCO_2e)

Emission Sources	Operational Control Emissions (tCO2e)	%	Equity Share Emissions (tCO2e)	%
Scope 1	**5.260.402,94**	**99,48%**	**5.265.263,89**	**99,47%**
Combustão Estacionária	**5.259.387,64**	**99,46%**	**5.257.968,36**	**99,34%**
Coal Steam 4500 kcal / kg	4.261.277,24	80,58%	4.261.277,24	80,51%
Coal Steam 3100 kcal / kg	951.456,25	17,99%	951.456,25	17,98%
Sugarcane Bagasse	19.545,37	0,37%	18.120,25	0,34%
Diesel Oil	13.543,16	0,26%	13.549,00	0,26%
Wood waste	4.093,62	0,08%	4.093,62	0,08%
Fuel Oil	9.464,19	0,18%	9.464,19	0,18%
Acetylen	7,79	0,00%	7,79	0,00%
Gasoline	0,03	0,00%	0,03	0,00%
Fugitives	**530,51**	**0,01%**	**6.803,07**	**0,13%**
HFCs	411,10	0,01%	422,16	0,01%
Sulfur Hexafluoride (SF6)	88,92	0,00%	6.348,84	0,12%
Carbon Dioxide (CO2)	30,49	0,00%	32,07	0,00%
Direct Mobile Combustion	**465,81**	**0,01%**	**470,49**	**0,01%**
Diesel Oil	375,81	0,01%	373,66	0,01%
Gasoline	59,60	0,00%	66,32	0,00%
Liquefied Petroleum Gas	28,42	0,00%	28,42	0,00%
Ethanol	1,98	0,00%	2,10	0,00%
Waste	**14,84**	**0,00%**	**16,09**	**0,00%**
Composting	14,84	0,00%	15,77	0,00%
Landfill	-	0,00%	0,32	0,00%
Agricultural Activities	**4,14**	**0,00%**	**5,88**	**0,00%**
Fertilizers - Organic	2,90	0,00%	3,10	0,00%
Synthetic Fertilizers	1,24	0,00%	2,77	0,00%
Scope 2	**12.825,45**	**0,24%**	**12.873,02**	**0,24%**
Electricity	**12.825,45**	**0,24%**	**12.873,02**	**0,24%**
Electricity	12.825,45	0,24%	12.873,02	0,24%
Scope 3	**14.817,68**	**0,28%**	**14.973,42**	**0,28%**
Transport and Distribution (downstream)	**6.422,95**	**0,12%**	**6.354,17**	**0,12%**
Diesel Oil	6.418,76	0,12%	6.348,74	0,12%
Gasoline	4,01	0,00%	5,24	0,00%
Ethanol	0,19	0,00%	0,19	0,00%
Transporte e Distribuição (upstream)	**6.880,54**	**0,13%**	**6.962,47**	**0,13%**
Diesel Oil	6.712,53	0,13%	6.764,47	0,13%
Gasoline	163,60	0,00%	193,50	0,00%
Liquefied Petroleum Gas	3,68	0,00%	3,68	0,00%
Ethanol	0,72	0,00%	0,81	0,00%
Biodiesel	-	0,00%	-	0,00%
Business Travel	**736,69**	**0,01%**	**801,65**	**0,02%**
Aviation - Kerosene	655,95	0,01%	720,12	0,01%
Gasoline	79,68	0,00%	80,47	0,00%
Diesel Oil	1,05	0,00%	1,05	0,00%
Ethanol	-	0,00%	0,01	0,00%
Commuting	**321,35**	**0,01%**	**389,85**	**0,01%**
Diesel Oil	298,76	0,01%	364,85	0,01%
Gasoline	22,49	0,00%	24,88	0,00%
Ethanol	0,11	0,00%	0,11	0,00%
Waste	**448,59**	**0,01%**	**457,73**	**0,01%**
Landfill	161,66	0,00%	166,03	0,00%
Incineration	248,92	0,00%	253,22	0,00%
Composting	38,02	0,00%	38,47	0,00%
Fuel and energy related activities not included in scopes 1 and 2	**5,28**	**0,00%**	**5,28**	**0,00%**
Gasoline	5,17	0,00%	5,17	0,00%
Diesel Oil	0,11		0,11	
Fugitives - Indirect	**2,28**	**0,00%**	**2,28**	**0,00%**
HFCs	2,28	0,00%	2,28	0,00%
Total (tCO2e)	**5.288.046,07**	**100%**	**5.293.110,33**	**100%**

Table 25 – GHG consolidated emissions by Operacional Control and Equity Share per business unit (tCO_2e/ %)

Units	Total Emissions tCO_2e - Operational Control					Total Emission tCO_2e - Equity Share				
	Scope 1	Scope 2	Scope 3	Total	%	Scope 1	Scope 2	Scope 3	Total	%
CTJL	4.282.661,92	6.338,70	12.011,14	**4.301.011,76**	**81,33%**	4.282.661,92	6.338,70	12.011,14	**4.301.011,76**	**81,26%**
UTPS	953.206,43	1.241,23	40,42	**954.488,08**	**18,05%**	953.206,43	1.241,23	40,42	**954.488,08**	**18,03%**
UTFE	14.927,17	78,04	800,46	**15.805,67**	**0,30%**	14.927,17	78,04	800,46	**15.805,67**	**0,30%**
UCLA	4.293,37	115,98	648,05	**5.057,40**	**0,10%**	4.293,37	115,98	648,05	**5.057,40**	**0,10%**
UTIB	4.650,25	31,54	228,75	**4.910,53**	**0,09%**	3.220,76	21,84	158,43	**3.401,03**	**0,06%**
UHSS	62,02	3.022,82	99,05	**3.183,88**	**0,06%**	62,02	3.022,82	99,05	**3.183,88**	**0,06%**
UHPF	13,14	1.622,56	56,79	**1.692,49**	**0,03%**	13,14	1.622,56	56,79	**1.692,49**	**0,03%**
SEDE	282,59	148,00	549,03	**979,62**	**0,02%**	282,59	148,00	549,03	**979,62**	**0,02%**
UHSO	20,00	61,99	153,58	**235,58**	**0,00%**	20,00	61,99	153,58	**235,58**	**0,00%**
PHJG	89,90	0,23	4,87	**94,99**	**0,002%**	89,90	0,23	4,87	**94,99**	**0,002%**
UHPP	10,19	0,18	58,24	**68,61**	**0,001%**	10,19	0,18	58,24	**68,61**	**0,001%**
CECL	31,63	14,48	15,29	**61,40**	**0,001%**	31,63	14,48	15,29	**61,40**	**0,001%**
UETR	37,50	7,23	17,09	**61,82**	**0,001%**	37,50	7,23	17,09	**61,82**	**0,001%**
UHJA	13,42	38,03	18,28	**69,74**	**0,001%**	13,42	38,03	18,28	**69,74**	**0,001%**
UHSA	50,71	-	38,81	**89,53**	**0,002%**	50,71	-	38,81	**89,53**	**0,002%**
CEUM	32,68	18,20	-	**50,89**	**0,001%**	32,68	18,20	-	**50,89**	**0,001%**
FVAE	8,84	39,62	0,32	**48,78**	**0,001%**	8,84	39,62	0,32	**48,78**	**0,001%**
UHMI	5,28	0,03	40,75	**46,05**	**0,001%**	5,28	0,03	40,75	**46,05**	**0,001%**
UHCB	4,00	-	28,89	**32,88**	**0,001%**	4,00	-	28,89	**32,88**	**0,001%**
ESP	1,09	4,53	3,00	**8,62**	**0,000%**	1,09	4,53	3,00	**8,62**	**0,000%**
UEMU	0,09	6,45	-	**6,54**	**0,000%**	0,09	6,45	-	**6,54**	**0,000%**
UEGU	0,09	6,36	-	**6,45**	**0,000%**	0,09	6,36	-	**6,45**	**0,000%**
UEFL	0,09	5,80	-	**5,89**	**0,000%**	0,09	5,80	-	**5,89**	**0,000%**
PHRO	0,54	0,08	4,87	**5,48**	**0,000%**	0,54	0,08	4,87	**5,48**	**0,000%**
UETB	-	5,07	-	**5,07**	**0,000%**	-	5,07	-	**5,07**	**0,000%**
UFCA	-	4,80	-	**4,80**	**0,000%**	-	4,80	-	**4,80**	**0,000%**
EEST	-	4,53	-	**4,53**	**0,000%**	-	4,53	-	**4,53**	**0,000%**
EOVE	-	4,05	-	**4,05**	**0,000%**	-	4,05	-	**4,05**	**0,000%**
ECAA	-	2,48	-	**2,48**	**0,000%**	-	2,48	-	**2,48**	**0,000%**
ESMA	-	2,46	-	**2,46**	**0,000%**	-	2,46	-	**2,46**	**0,000%**
UHIT	-	-	-	-	**0,000%**	5.914,55	47,57	89,38	**6.051,50**	**0,114%**
UHMA	-	-	-	-	**0,000%**	348,47	0,30	17,22	**365,99**	**0,007%**
UHET	-	-	-	-	**0,000%**	27,41	9,40	119,46	**156,27**	**0,003%**
Total	**5.260.402,94**	**12.825,45**	**14.817,68**	**5.288.046,07**	**100,00%**	**5.265.263,89**	**12.873,02**	**14.973,42**	**5.293.110,33**	**100,00%**
%	**99,48%**	**0,24%**	**0,28%**	**100,00%**		**99,47%**	**0,24%**	**0,28%**	**100,00%**	

3.6. Biomass Emissions

These are CO2 emissions from burning biomass or renewable fuels from plant biomass. This scope includes emissions from the burning of non-fossil fuels, such as sugarcane bagasse and ethanol, for example. In addition, since all diesel sold in Brazil has a fraction of biodiesel (Law no. 11.097 from 01/13/2005) and all Brazilian gasoline also has an ethanol fraction, the emissions related to these percentages are included in this section.

It is important to note that both the GHG Protocol and the IPCC recommend that CO2 emissions from biomass burning be reported separately. The CH4 and N2O emissions must be quantified in all cases, since the plants do not reabsorb these compounds during their growth.

The following table shows that almost all the biomass emissions (more than 99% in both approaches) are due to the activities of the biomass power plants, since the biomass fuel (wood residue and sugarcane bagasse) is considered CO2 neutral.

Table 26 – Biomass Emissions (tCO_2e)

Units	Operational Control				Equity Share			
	Scope 1	Scope 3	Total	%	Scope 1	Scope 3	Total	%
UTFE	768.501,75	84,64	**768.586,39**	**62,87%**	768.501,75	84,64	**768.586,39**	**66,88%**
UTIB	238.967,16	24,08	**238.991,25**	**19,55%**	165.508,66	16,68	**165.525,34**	**14,40%**
UCLA	211.797,45	69,21	**211.866,66**	**17,33%**	211.797,45	69,21	**211.866,66**	**18,44%**
CTJL	1.293,84	1.229,18	**2.523,03**	**0,21%**	1.293,84	1.229,18	**2.523,03**	**0,22%**
UTPS	187,57	-	**187,57**	**0,02%**	187,57	-	**187,57**	**0,02%**
UHSO	21,98	47,08	**69,05**	**0,01%**	21,98	47,08	**69,05**	**0,01%**
UHSA	27,27	27,64	**54,91**	**0,00%**	27,27	27,64	**54,91**	**0,00%**
UHSS	18,94	28,90	**47,84**	**0,00%**	18,94	28,90	**47,84**	**0,00%**
UHJA	47,62	9,65	**57,27**	**0,00%**	47,62	9,65	**57,27**	**0,00%**
UHMI	15,50	20,28	**35,78**	**0,00%**	15,50	20,28	**35,78**	**0,00%**
UHPP	18,50	9,58	**28,08**	**0,00%**	18,50	9,58	**28,08**	**0,00%**
SEDE	4,49	15,17	**19,66**	**0,00%**	4,49	15,17	**19,66**	**0,00%**
UHPF	11,47	7,84	**19,31**	**0,00%**	11,47	7,84	**19,31**	**0,00%**
UHCB	16,36	22,91	**39,26**	**0,00%**	16,36	22,91	**39,26**	**0,00%**
PHJG	7,24	0,88	**8,12**	**0,00%**	7,24	0,88	**8,12**	**0,00%**
PHRO	6,15	0,88	**7,02**	**0,00%**	6,15	0,88	**7,02**	**0,00%**
UETR	5,98	-	**5,98**	**0,00%**	5,98	-	**5,98**	**0,00%**
CEUM	5,34	-	**5,34**	**0,00%**	5,34	-	**5,34**	**0,00%**
CECL	5,23	-	**5,23**	**0,00%**	5,23	-	**5,23**	**0,00%**
FVAE	1,07	-	**1,07**	**0,00%**	1,07	-	**1,07**	**0,00%**
ESP	0,27	0,19	**0,45**	**0,00%**	0,27	0,19	**0,45**	**0,00%**
UHET	-	-	-	**0,00%**	6,60	21,21	**27,80**	**0,00%**
UHIT	-	-	-	**0,00%**	6,12	8,76	**14,88**	**0,00%**
UHMA	-	-	-	**0,00%**	2,71	1,88	**4,59**	**0,00%**
ECAA	-	-	-	**0,00%**	-	-	-	**0,00%**
EEST	-	-	-	**0,00%**	-	-	-	**0,00%**
EOVE	-	-	-	**0,00%**	-	-	-	**0,00%**
ESMA	-	-	-	**0,00%**	-	-	-	**0,00%**
UEFL	-	-	-	**0,00%**	-	-	-	**0,00%**
UEGU	-	-	-	**0,00%**	-	-	-	**0,00%**
UEMU	-	-	-	**0,00%**	-	-	-	**0,00%**
UETB	-	-	-	**0,00%**	-	-	-	**0,00%**
UFCA	-	-	-	**0,00%**	-	-	-	**0,00%**
Total (tCO_2e)	**1.220.961,17**	**1.598,11**	**1.222.559,28**	**100,00%**	**1.147.518,10**	**1.622,55**	**1.149.140,65**	**100,00%**
%	**99,87%**	**0,13%**	**100,00%**		**99,86%**	**0,14%**	**100,00%**	

The following graphic presents the emissions for each Engie biomass enterprise.

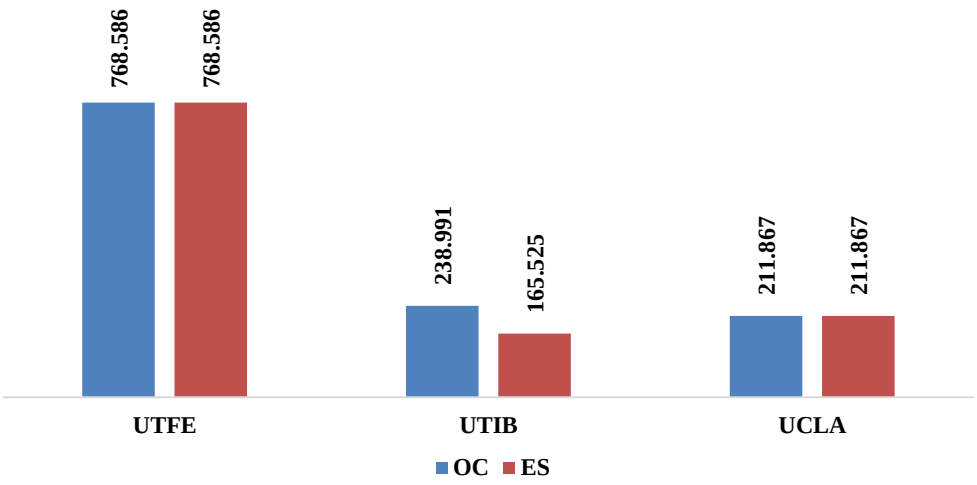


Figura 5: Biomass Emissions – UTEF, UTIB and UCLA (tCO2e)

3.7. Emissions per GHG

By convention, greenhouse gas emissions are quantified in tones of CO2 equivalent (tCO2e), each gas being associated with its respective global warming potential. Tables 27 to 30 present the emissions of Engie by GHG and scope in tCO2e and in tGEE.

Table 27 – Emissions per GHG, Enterprise and Scope - Operacional Control (tCO_2e)

Units	Scope 1 (tCO_2e)					Scope 2 (tCO_2e)	Scope 3 (tCO_2e)				Total (tCO2e)
	CO_2	CH_4	N_2O	SF_6	Total	CO_2	CO_2	CH_4	N_2O	Total	
CTJL	4.261.737,68	1.132,61	19.791,63	-	4.282.661,92	6.338,70	11.637,96	170,87	202,31	12.011,14	4.301.011,76
UTPS	948.782,79	235,91	4.187,73	-	953.206,43	1.241,23	40,03	0,01	0,38	40,42	954.488,08
UTFE	17,77	5.758,01	9.151,39	-	14.927,17	78,04	786,45	1,34	12,68	800,46	15.805,67
UCLA	196,85	1.581,25	2.515,27	-	4.293,37	115,98	629,89	7,72	10,44	648,05	5.057,40
UTIB	13,96	1.790,47	2.845,81	-	4.650,25	31,54	223,77	1,37	3,61	228,75	4.910,53
UHSS	61,42	0,14	0,46	-	62,02	3.022,82	91,26	5,78	2,01	99,05	3.183,88
UHPF	11,65	0,45	1,04	-	13,14	1.622,56	54,79	0,85	1,15	56,79	1.692,49
SEDE	280,74	0,94	0,91	-	282,59	148,00	541,30	1,08	6,65	549,03	979,62
UHSO	19,44	0,16	0,40	-	20,00	61,99	140,87	9,98	2,74	153,58	235,58
PHJG	0,84	0,08	0,06	88,92	89,90	0,23	4,76	0,01	0,09	4,87	94,99
UHPP	9,49	0,33	0,36	-	10,19	0,18	56,86	0,22	1,16	58,24	68,61
CECL	30,75	0,16	0,72	-	31,63	14,48	12,18	3,00	0,11	15,29	61,40
UETR	36,46	0,18	0,86	-	37,50	7,23	16,93	0,00	0,16	17,09	61,82
UHJA	12,78	0,33	0,31	-	13,42	38,03	15,50	2,52	0,26	18,28	69,74
UHSA	49,47	0,42	0,82	-	50,71	-	37,08	0,86	0,88	38,81	89,53
CEUM	31,80	0,16	0,72	-	32,68	18,20	-	-	-	-	50,89
FVAE	8,66	0,02	0,16	-	8,84	39,62	-	0,32	-	0,32	48,78
UHMI	4,85	0,22	0,21	-	5,28	0,03	39,44	0,31	1,00	40,75	46,05
UHCB	1,44	0,35	2,21	-	4,00	-	26,92	1,46	0,51	28,89	32,88
ESP	1,04	0,01	0,04	-	1,09	4,53	2,94	0,01	0,05	3,00	8,62
UEMU	0,09	-	-	-	0,09	6,45	-	-	-	-	6,54
UEGU	0,09	-	-	-	0,09	6,36	-	-	-	-	6,45
UEFL	0,09	-	-	-	0,09	5,80	-	-	-	-	5,89
PHRO	0,47	0,05	0,02	-	0,54	0,08	4,76	0,01	0,09	4,87	5,48
UETB	-	-	-	-	-	5,07	-	-	-	-	5,07
UFCA	-	-	-	-	-	4,80	-	-	-	-	4,80
EEST	-	-	-	-	-	4,53	-	-	-	-	4,53
EOVE	-	-	-	-	-	4,05	-	-	-	-	4,05
ECAA	-	-	-	-	-	2,48	-	-	-	-	2,48
ESMA	-	-	-	-	-	2,46	-	-	-	-	2,46
UHIT	-	-	-	-	-	-	-	-	-	-	-
UHMA	-	-	-	-	-	-	-	-	-	-	-
UHET	-	-	-	-	-	-	-	-	-	-	-
TOTAL (tCO_2e)	5.211.310,64	10.502,26	38.501,13	88,92	5.260.402,94	12.825,45	14.363,67	207,72	246,28	14.817,68	5.288.046,07

Table 28 – Emissions per GHG, Enterprise and Scope (tGEE) – Operational Control

Units	Scope 1 (tGEE)				Scope 2 (tGEE)	Scope 3 (tGEE)		
	CO_2	CH_4	N_2O	SF_6	CO_2	CO_2	CH_4	N_2O
CTJL	4.261.737,68	45,30	66,41	-	6.338,70	11.637,96	6,83	0,68
UTPS	948.782,79	9,44	14,05	-	1.241,23	40,03	0,00	0,00
UTFE	17,77	230,32	30,71	-	78,04	786,45	0,05	0,04
UCLA	196,85	63,25	8,44	-	115,98	629,89	0,31	0,04
UTIB	13,96	71,62	9,55	-	31,54	223,77	0,05	0,01
UHSS	61,42	0,01	0,00	-	3.022,82	91,26	0,23	0,01
UHPF	11,65	0,02	0,00	-	1.622,56	54,79	0,03	0,00
SEDE	280,74	0,04	0,00	-	148,00	541,30	0,04	0,02
UHSO	19,44	0,01	0,00	-	61,99	140,87	0,40	0,01
PHJG	0,84	0,00	0,00	0,00	0,23	4,76	0,00	0,00
UHPP	9,49	0,01	0,00	-	0,18	56,86	0,01	0,00
CECL	30,75	0,01	0,00	-	14,48	12,18	0,12	0,00
UETR	36,46	0,01	0,00	-	7,23	16,93	0,00	0,00
UHJA	12,78	0,01	0,00	-	38,03	15,50	0,10	0,00
UHSA	49,47	0,02	0,00	-	-	37,08	0,03	0,00
CEUM	31,80	0,01	0,00	-	18,20	-	-	-
FVAE	8,66	0,00	0,00	-	39,62	-	0,01	-
UHMI	4,85	0,01	0,00	-	0,03	39,44	0,01	0,00
UHCB	1,44	0,01	0,01	-	-	26,92	0,06	0,00
ESP	1,04	0,00	0,00	-	4,53	2,94	0,00	0,00
UEMU	0,09	-	-	-	6,45	-	-	-
UEGU	0,09	-	-	-	6,36	-	-	-
UEFL	0,09	-	-	-	5,80	-	-	-
PHRO	0,47	0,00	0,00	-	0,08	4,76	0,00	0,00
UETB	-	-	-	-	5,07	-	-	-
UFCA	-	-	-	-	4,80	-	-	-
EEST	-	-	-	-	4,53	-	-	-
EOVE	-	-	-	-	4,05	-	-	-
ECAA	-	-	-	-	2,48	-	-	-
ESMA	-	-	-	-	2,46	-	-	-
UHIT	-	-	-	-	-	-	-	-
UHMA	-	-	-	-	-	-	-	-
UHET	-	-	-	-	-	-	-	-
TOTAL (tGEE)	**5.211.310,64**	**420,09**	**129,20**	**0,004**	**12.825,45**	**14.363,67**	**8,31**	**0,83**

Table 29 – Emissions per GHG, Enterprise and Scope (tCO_2e) – Equity Share

Units	Scope 1 (tCO_2e)					Scope 2 (tCO_2e)	Scope 3 (tCO_2e)				Total (tCO_2e)
	CO_2	CH_4	N_2O	SF_6	Total	CO_2	CO_2	CH_4	N_2O	Total	
CTJL	4.261.737,68	1.132,61	19.791,63	-	4.282.661,92	6.338,70	11.637,96	170,87	202,31	12.011,14	4.301.011,76
UTPS	948.782,79	235,91	4.187,73	-	953.206,43	1.241,23	40,03	0,01	0,38	40,42	954.488,08
UTFE	17,77	5.758,01	9.151,39	-	14.927,17	78,04	786,45	1,34	12,68	800,46	15.805,67
UCLA	196,85	1.581,25	2.515,27	-	4.293,37	115,98	629,89	7,72	10,44	648,05	5.057,40
UHIT	14,76	0,29	0,86	5.898,65	5.914,55	47,57	82,79	4,92	1,67	89,38	6.051,50
UTIB	9,67	1.240,08	1.971,01	-	3.220,76	21,84	154,98	0,95	2,50	158,43	3.401,03
UHSS	61,42	0,14	0,46	-	62,02	3.022,82	91,26	5,78	2,01	99,05	3.183,88
UHPF	11,65	0,45	1,04	-	13,14	1.622,56	54,79	0,85	1,15	56,79	1.692,49
SEDE	280,74	0,94	0,91	-	282,59	148,00	541,30	1,08	6,65	549,03	979,62
UHMA	1,46	0,15	0,20	346,66	348,47	0,30	16,68	0,26	0,28	17,22	365,99
UHSO	19,44	0,16	0,40	-	20,00	61,99	140,87	9,98	2,74	153,58	235,58
UHET	10,84	0,53	1,42	14,62	27,41	9,40	117,18	0,36	1,92	119,46	156,27
PHJG	0,84	0,08	0,06	88,92	89,90	0,23	4,76	0,01	0,09	4,87	94,99
UHPP	9,49	0,33	0,36	-	10,19	0,18	56,86	0,22	1,16	58,24	68,61
CECL	30,75	0,16	0,72	-	31,63	14,48	12,18	3,00	0,11	15,29	61,40
UETR	36,46	0,18	0,86	-	37,50	7,23	16,93	0,00	0,16	17,09	61,82
UHJA	12,78	0,33	0,31	-	13,42	38,03	15,50	2,52	0,26	18,28	69,74
UHSA	49,47	0,42	0,82	-	50,71	-	37,08	0,86	0,88	38,81	89,53
CEUM	31,80	0,16	0,72	-	32,68	18,20	-	-	-	-	50,89
FVAE	8,66	0,02	0,16	-	8,84	39,62	-	0,32	-	0,32	48,78
UHMI	4,85	0,22	0,21	-	5,28	0,03	39,44	0,31	1,00	40,75	46,05
UHCB	1,44	0,35	2,21	-	4,00	-	26,92	1,46	0,51	28,89	32,88
ESP	1,04	0,01	0,04	-	1,09	4,53	2,94	0,01	0,05	3,00	8,62
UEMU	0,09	-	-	-	0,09	6,45	-	-	-	-	6,54
UEGU	0,09	-	-	-	0,09	6,36	-	-	-	-	6,45
UEFL	0,09	-	-	-	0,09	5,80	-	-	-	-	5,89
PHRO	0,47	0,05	0,02	-	0,54	0,08	4,76	0,01	0,09	4,87	5,48
UETB	-	-	-	-	-	5,07	-	-	-	-	5,07
UFCA	-	-	-	-	-	4,80	-	-	-	-	4,80
EEST	-	-	-	-	-	4,53	-	-	-	-	4,53
EOVE	-	-	-	-	-	4,05	-	-	-	-	4,05
ECAA	-	-	-	-	-	2,48	-	-	-	-	2,48
ESMA	-	-	-	-	-	2,46	-	-	-	-	2,46
TOTAL (tCO_2e)	**5.211.333,40**	**9.952,83**	**37.628,81**	**6.348,84**	**5.265.263,89**	**12.873,02**	**14.511,54**	**212,83**	**249,05**	**14.973,42**	**5.293.110,33**

Table 30 – Emission per GHG, Enterprise and Scope (tGHG) – Equity Share

Units	Scope 1 (tGEE)				Scope 2 (tGEE)	Scope 3 (tGEE)		
	CO_2	CH_4	N_2O	SF_6	CO_2	CO_2	CH_4	N_2O
CTJL	4.261.737,68	45,30	66,41	-	6.338,70	11.637,959	6,835	0,679
UTPS	948.782,79	9,44	14,05	-	1.241,23	40,030	0,000	0,001
UTFE	17,77	230,32	30,71	-	78,04	786,447	0,053	0,043
UCLA	196,85	63,25	8,44	-	115,98	629,887	0,309	0,035
UHIT	14,76	0,01	0,00	0,26	47,57	82,789	0,197	0,006
UTIB	9,67	49,60	6,61	-	21,84	154,982	0,038	0,008
UHSS	61,42	0,01	0,00	-	3.022,82	91,256	0,231	0,007
UHPF	11,65	0,02	0,00	-	1.622,56	54,793	0,034	0,004
SEDE	280,74	0,04	0,00	-	148,00	541,297	0,043	0,022
UHMA	1,46	0,01	0,00	0,02	0,30	16,683	0,010	0,001
UHSO	19,44	0,01	0,00	-	61,99	140,870	0,399	0,009
UHET	10,84	0,02	0,00	0,00	9,40	117,181	0,014	0,006
PHJG	0,84	0,00	0,00	0,00	0,23	4,762	0,001	0,000
UHPP	9,49	0,01	0,00	-	0,18	56,859	0,009	0,004
CECL	30,75	0,01	0,00	-	14,48	12,177	0,120	0,000
UETR	36,46	0,01	0,00	-	7,23	16,929	0,000	0,001
UHJA	12,78	0,01	0,00	-	38,03	15,497	0,101	0,001
UHSA	49,47	0,02	0,00	-	-	37,080	0,034	0,003
CEUM	31,80	0,01	0,00	-	18,20	-	-	-
FVAE	8,66	0,00	0,00	-	39,62	-	0,013	-
UHMI	4,85	0,01	0,00	-	0,03	39,435	0,012	0,003
UHCB	1,44	0,01	0,01	-	-	26,918	0,058	0,002
ESP	1,04	0,00	0,00	-	4,53	2,945	0,000	0,000
UEMU	0,09	-	-	-	6,45	-	-	-
UEGU	0,09	-	-	-	6,36	-	-	-
UEFL	0,09	-	-	-	5,80	-	-	-
PHRO	0,47	0,00	0,00	-	0,08	4,762	0,001	0,000
UETB	-	-	-	-	5,07	-	-	-
UFCA	-	-	-	-	4,80	-	-	-
EEST	-	-	-	-	4,53	-	-	-
EOVE	-	-	-	-	4,05	-	-	-
ECAA	-	-	-	-	2,48	-	-	-
ESMA	-	-	-	-	2,46	-	-	-
TOTAL (tGEE)	**5.211.333,40**	**398,11**	**126,27**	**0,28**	**12.873,02**	**14.511,54**	**8,51**	**0,84**

In 2019, Engie did not provide emissions of Perfluorocarbons (PFCs) and Nitrogen Trifluoride (NF3). HFCs were shown in Tables 27 to 30 converted to tCO2e.

3.8. Non-GHG Emissions

Leakage includes direct GHG escape in air conditioners, in this case HCFC-22 (R-22). Theses gases are not included in the Kyoto Protocol. So according to the methodology, Engie chooses to calculate these emissions separately for comparison purposes.

During 2019, Engie fugitive emissions were **324.27 tCO2e** according to operational control approach and **382.56 tCO2e** for the equity share, related to HCFC-22 (R-22), mainly concentrated at UHCB, CTJL and UHSA.

Table 31 – Non GHG-Emissions (tCO_2e)

Units	Operational Control		Equity Share	
	tCO_2e	%	tCO_2e	%
UHCB	115,98	35,77%	115,98	30,32%
CTJL	87,29	26,92%	87,29	22,82%
UHSA	30,84	9,51%	30,84	8,06%
UHSS	27,69	8,54%	27,69	7,24%
UETR	21,36	6,59%	21,36	5,58%
UHPP	13,18	4,06%	13,18	3,44%
FVAE	7,42	2,29%	7,42	1,94%
UHSO	6,84	2,11%	6,84	1,79%
UTFE	5,43	1,67%	5,43	1,42%
UEGU	2,35	0,73%	2,35	0,62%
ECAA	2,17	0,67%	2,17	0,57%
EOVE	1,45	0,45%	1,45	0,38%
UEMU	1,45	0,45%	1,45	0,38%
PHRO	0,81	0,25%	0,81	0,21%
UHET	-	0,00%	53,38	13,95%
UHMA	-	0,00%	4,54	1,19%
UHIT	-	0,00%	0,37	0,10%
Total	**324,27**	**100,00%**	**382,56**	**100,00%**

3.9. GHG Emissions – Comparison of Total Emissions

The following graphs show an evolution of emissions from Engie's emission inventory base year (2010) until 2019. There is a reduction of 17% in relation to the base and an 21% increase related to 2018, using both approaches.

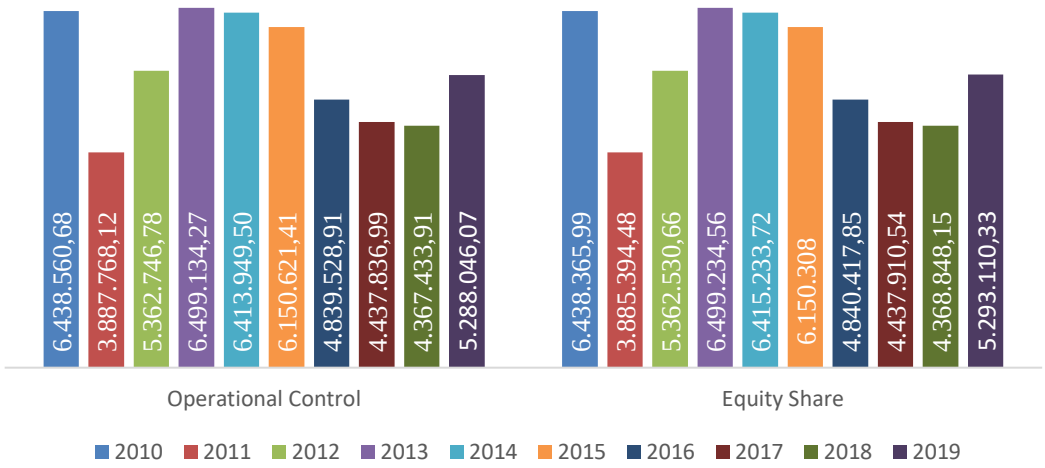


Figure 6: Evolution of the Group total emissions from 2010 to 2019 (tCO2e), according to operational control and equity share approaches

The following figures show the evolution of emissions by scope since the base year of the inventory.

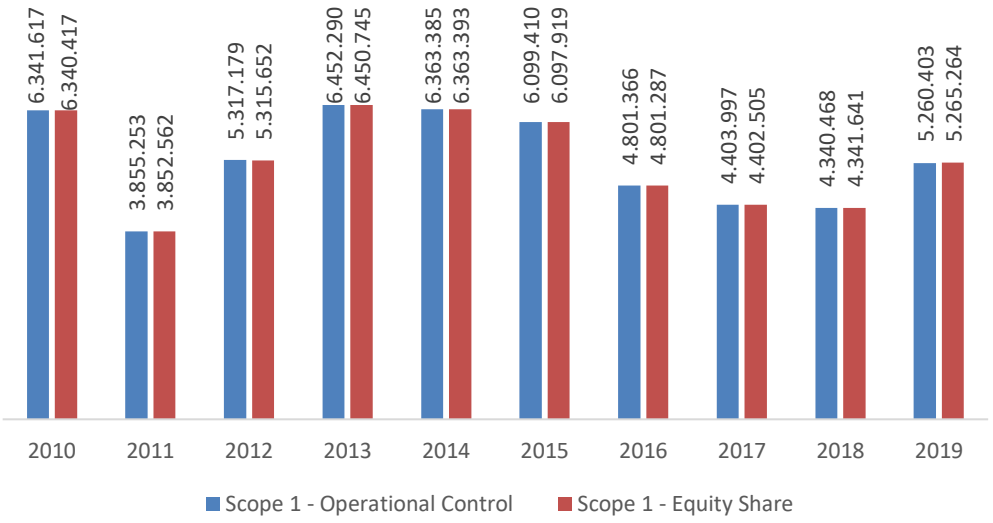


Figure 7: Evolution of the scope 1 emissions from 2010 to 2019 (tCO2e), according to operational control and equity share approaches

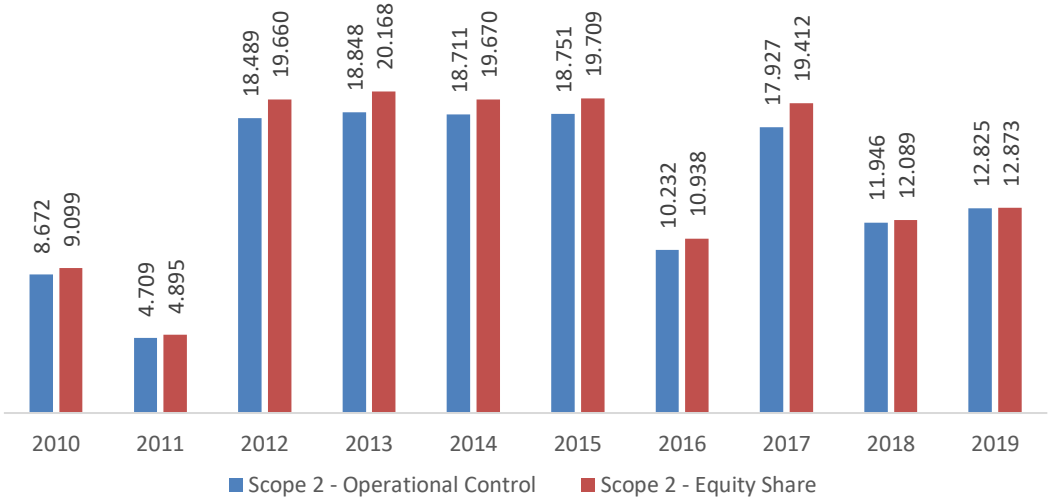


Figure 8: Evolution of scope 2 emissions from 2010 to 2019 (tCO2e), according to operational control and equity share approaches

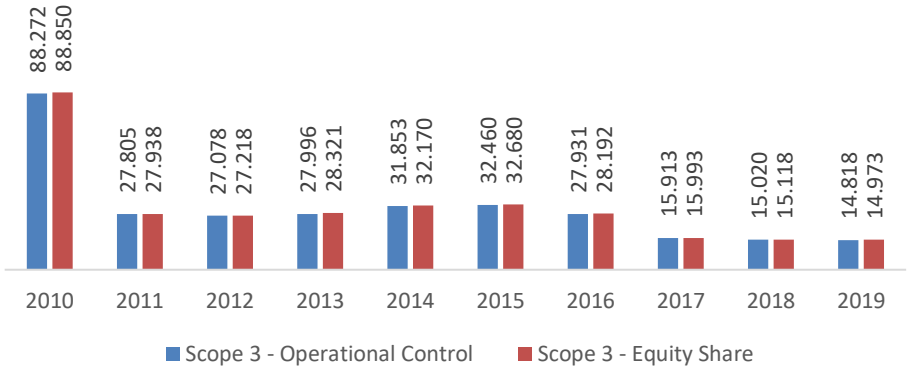


Figure 9: Evolution of scope 3 emissions from 2010 to 2019 (tCO2e), according to operational control and equity share approaches

Variations in Engie's main source of emission, the coal consumption in the thermoelectric power plants, have a major impact on the company's total emissions. These enterprises operate on standby to guarantee the safety of the SIN and are activated with greater intensity in critical hydrological scenarios, where the reduction of the volume of water in the reservoirs of hydropower plants can entail risks of supplying energy to the country.

This scenario happened between 2013 and 2015 with a greater need for the activation of thermoelectric plants by the National System Operator (ONS), increasing the demand for energy and coal burning at CTJL and UTCH and raising the emissions of the company and, specially, the scope 01 emissions.

Following a strategic decision, UTCH and UTWA was deactivated and new renewable energy plant were built with consequent emission reductions of the company in 2017 and 2018.

In 2019, UTPS started its operation, a new coal plant, adding 954 k tCO2e to the total emission of company.

Analyzing specifically the variation between 2019 and 2018, table 32 shows the source-to-source emissions variations. In 2019, there was an increase of 920k tCO2e by operational control approach and 924k tCO2e using equity share approach. Main cause for higher emission were related to coal use at UTPS, where just startionary combustion added 951k tCO2e to the company.

Scope 02 emissions, in addition to being associated with the energy consumption of the company's grid, are directly impacted by the variations of the SIN emission factor, which is directly associated to the country's energy matrix in the year. Scope 02 emissions increased 7.3% and 6.5% using operational control and equity share, respectively. The SIN emission factor in 2019 did not present significant variation, increasing 1.4% in 2019 related to 2018.

The electricity consumption of the group increased 7.4% using operational control approach and by 6.5% using equity share approach. The main increase happened at CTJL (14%) with the inclusion of electricity consumption at UTPS, which added 1,241 tCO2e.

In Scope 03, the emission reduction of 1.3% is based mainly on air travel at Florianopolis headquarters (-26%), biomass and waste outsourced transport at UCLA (-23%) and UTIB (-32%), balanced by an emission increase by commuting at UHSO (53 tCO2e) and UHMI (14 tCO2e) which had not reported this source in 2018.

Table 32 – Variation in GHG emissions by emission source between 2019 and 2018 (tCO_2e)

Emission Sources	Operational Control				Equity Share			
	Emissions (tCO_2e) - 2019	Emissions (tCO_2e) - 2018	Variation (tCO_2e)	Variation (%)	Emissions (tCO_2e) - 2019	Emissions (tCO_2e) - 2018	Variation (tCO_2e)	Variation (%)
Scope 1	**5.260.402,94**	**4.340.467,59**	**919.935,36**	**21,19%**	**5.265.263,89**	**4.341.640,86**	**923.623,03**	**21,27%**
Stationary Combustion	5.259.387,64	4.339.686,00	919.701,64	21,19%	5.257.968,36	4.338.187,06	919.781,30	21,20%
Direct Mobile Combustion	465,81	401,60	64,21	15,99%	470,49	413,11	57,39	13,89%
Fugitives	530,51	321,13	209,37	65,20%	6.803,07	2.973,33	3.829,74	128,80%
Waste	14,84	51,07	(36,22)	-70,93%	16,09	52,60	(36,51)	-69,41%
Agricultural Activities	4,14	7,79	(3,65)	-46,88%	5,88	14,77	(8,89)	-60,21%
Scope 2	**12.825,45**	**11.945,92**	**879,53**	**7,36%**	**12.873,02**	**12.089,20**	**783,82**	**6,48%**
Electricity	12.825,45	11.945,92	879,53	7,36%	12.873,02	12.089,20	783,82	6,48%
Scope 3	**14.817,68**	**15.020,40**	**(202,72)**	**-1,35%**	**14.973,42**	**15.118,09**	**(144,66)**	**-0,96%**
Transport and Distribution (upstream)	6.880,54	7.037,66	(157,13)	-2,23%	6.962,47	7.107,15	(144,68)	-2,04%
Transport and Distribution (downstream)	6.422,95	6.519,05	(96,10)	-1,47%	6.354,17	6.415,72	(61,54)	-0,96%
Business Travel	736,69	951,49	(214,81)	-22,58%	801,65	1.008,14	(206,48)	-20,48%
Commuting	321,35	250,39	70,97	28,34%	389,85	318,25	71,60	22,50%
Waste	448,59	253,47	195,12	76,98%	457,73	260,51	197,22	75,71%
Fuel and energy related activities not included in scopes 1 and 2	5,28	5,96	(0,68)	-11,46%	5,28	5,96	(0,68)	-11,46%
Fugitives - Indirect	2,28	2,37	(0,10)	-4,02%	2,28	2,37	(0,10)	-4,02%
Total (tCO2e)	**5.288.046,07**	**4.367.433,91**	**920.612,16**	**21,08%**	**5.293.110,33**	**4.368.848,15**	**924.262,19**	**21,16%**

4. EMISSIONS BALANCE

This section provides an analysis of the relationship between the emissions provided by Engie in 2019 and the actions taken by Engie that reduce or avoid GHG emissions. The avoided emissions are the result of activities that would cause GHG emissions if they were not carried out. GHG removal activities are those that absorb these gases.

Engie carries out removals through the planting of seedlings and forests and avoids emissions through renewable generation of hydropower, wind, solar and biomass enterprises supplied to the grid. The accounting methodologies are presented in annex IV. The following figure shows the comparison between emissions, removals and avoided emissions. The following tables detail this result per enterprise in both approaches.

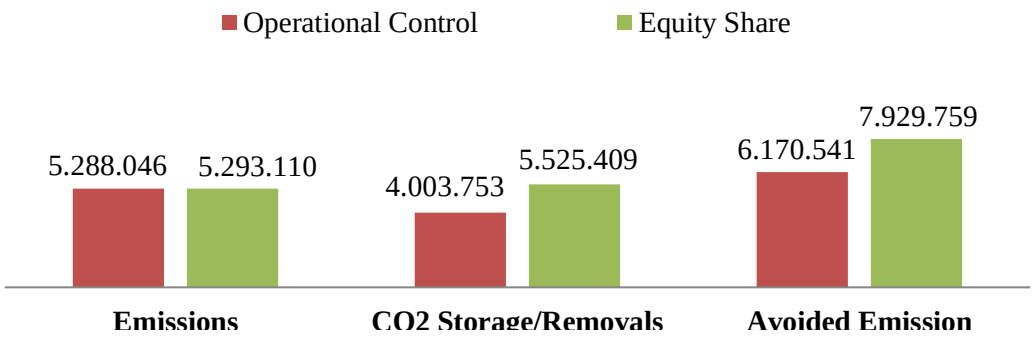


Figure 10: Comparison of emissions, removals and avoided emissions - 2019 (tCO_2e)

Table 33 – Emission balance by the operational control approach (tCO_2e)

Avoided Emission and Carbon Storage - Operational Control (tCO2e)				
Units	Emissions (tCO2e)	Planting, APPs and Remaining Areas (tCO2e)	Renewable Energy (tCO2e)	Total Balance (tCO2e)
CTJL	4.301.011,76	-	-	4.301.011,76
UTPS	954.488,08	-	-	954.488,08
UTFE	15.805,67	-	91.722,43	(75.916,76)
UCLA	5.057,40	-	41.202,89	(36.145,48)
UHIT	-	-	-	-
UTIB	4.910,53	-	53.911,84	(49.001,31)
UHSS	3.183,88	271.072,04	1.494.210,63	(1.762.098,79)
UHPF	1.692,49	404.708,63	-	(403.016,14)
SEDE	979,62	-	-	979,62
UHMA	-	635.393,00	-	(635.393,00)
UHSO	235,58	85.363,55	1.451.576,17	(1.536.704,14)
UHET	-	-	-	-
PHJG	94,99	38.020,18	28.537,27	(66.462,46)
UHPP	68,61	441.001,00	394.821,53	(835.753,93)
CECL	61,40	-	580.476,60	(580.415,20)
UETR	61,82	-	36.515,24	(36.453,42)
UHJA	69,74	-	658.759,83	(658.690,09)
UHSA	89,53	1.299.611,34	-	(1.299.521,81)
CEUM	50,89	-	643.291,76	(643.240,87)
FVAE	48,78	-	30.539,96	(30.491,18)
UHMI	46,05	-	364.794,33	(364.748,28)
UHCB	32,88	825.537,85	-	(825.504,96)
ESP	8,62	-	-	8,62
UEMU	6,54	-	33.952,46	(33.945,92)
UEGU	6,45	-	47.342,42	(47.335,98)
UEFL	5,89	-	40.393,78	(40.387,89)
PHRO	5,48	3.045,13	31.956,36	(34.996,00)
UETB	5,07	-	753,43	(748,36)
UFCA	4,80	-	840,41	(835,61)
EEST	4,53	-	43.569,40	(43.564,87)
EOVE	4,05	-	39.541,90	(39.537,85)
ECAA	2,48	-	32.240,61	(32.238,13)
ESMA	2,46	-	29.590,17	(29.587,70)
Total	5.288.046,07	4.003.752,71	6.170.541,42	(4.886.248,07)

Table 34 – Emission balance by the equity share approach (tCO_2e)

Avoided Emission and Carbon Storage - Equity Share (tCO2e)				
Units	Emissions (tCO2e)	Planting, APPs and Remaining Areas (tCO2e)	Renewable Energy (tCO2e)	Total Balance (tCO2e)
CTJL	4.301.011,76	-	-	4.301.011,76
UTPS	954.488,08	-	-	954.488,08
UTFE	15.805,67	-	91.722,43	(75.916,76)
UCLA	5.057,40	-	41.202,89	(36.145,48)
UHIT	6.051,50	504.378,61	1.488.848,37	(1.987.175,48)
UTIB	3.401,03	-	37.339,34	(33.938,31)
UHSS	3.183,88	271.072,04	1.494.210,63	(1.762.098,79)
UHPF	1.692,49	404.708,63	-	(403.016,14)
SEDE	979,62	-	-	979,62
UHMA	365,99	343.318,12	286.941,39	(629.893,52)
UHSO	235,58	85.363,55	1.451.576,17	(1.536.704,14)
UHET	156,27	1.309.352,29	-	(1.309.196,01)
PHJG	94,99	38.020,18	28.537,27	(66.462,46)
UHPP	68,61	441.001,00	394.821,53	(835.753,93)
CECL	61,40	-	580.476,60	(580.415,20)
UETR	61,82	-	36.515,24	(36.453,42)
UHJA	69,74	-	658.759,83	(658.690,09)
UHSA	89,53	1.299.611,34	-	(1.299.521,81)
CEUM	50,89	-	643.291,76	(643.240,87)
FVAE	48,78	-	30.539,96	(30.491,18)
UHMI	46,05	-	364.794,33	(364.748,28)
UHCB	32,88	825.537,85	-	(825.504,96)
ESP	8,62	-	-	8,62
UEMU	6,54	-	33.952,46	(33.945,92)
UEGU	6,45	-	47.342,42	(47.335,98)
UEFL	5,89	-	40.393,78	(40.387,89)
PHRO	5,48	3.045,13	31.956,36	(34.996,00)
UETB	5,07	-	753,43	(748,36)
UFCA	4,80	-	840,41	(835,61)
EEST	4,53	-	43.569,40	(43.564,87)
EOVE	4,05	-	39.541,90	(39.537,85)
ECAA	2,48	-	32.240,61	(32.238,13)
ESMA	2,46	-	29.590,17	(29.587,70)
Total	5.293.110,33	5.525.408,72	7.929.758,69	(8.162.057,08)

Emission reductions and CO2 storage exceeded emissions by 4.886k tCO_2e in the operational control and 8.162k by equity share approach.

These differences between the approaches are mainly related to the inclusion of Itá and Machadinho Hydropower Plants, which produced more than 5.4 million MWh[3] of clean energy for the National Interconnected System (SIN).

Other fact is the higher APP and remaining areas of these enterprises. The following table present carbon storage promoted by each plant.

[3] It was considered Engie equity share over these plants.

Table 35 – Carbon Storage by conservation areas and tree planting per unit (tCO_2e)

Units	Carbon Storage (tCO2e) – Operational Control				Total (tCO2e) – Operational Control	Carbon Storage (tCO2e) – Equity Share				Total (tCO2e) – Equity Share
	APP Area	Remaining Area	Mandatory Planting	Voluntary Planting		APP Area	Remaining Area	Mandatory Planting	Voluntary Planting	
UHSA	972.994,00	321.553,32		5.064,02	**1.299.611,34**	972.994,00	321.553,32		5.064,02	**1.299.611,34**
UHCB	526.047,50	299.490,35			**825.537,85**	526.047,50	299.490,35			**825.537,85**
UHMA	-	635.393,00	-		**635.393,00**	220.700,94	122.567,31	49,86		**343.318,12**
UHPP	215.097,85	225.670,50	232,65		**441.001,00**	215.097,85	225.670,50	232,65		**441.001,00**
UHPF	286.314,60	117.359,00	1.035,03		**404.708,63**	286.314,60	117.359,00	1.035,03		**404.708,63**
UHSS	199.562,00		71.510,04		**271.072,04**	199.562,00		71.510,04		**271.072,04**
UHSO	67.592,58	16.244,14	1.526,83		**85.363,55**	67.592,58	16.244,14	1.526,83		**85.363,55**
PHJG	37.741,00		279,18		**38.020,18**	37.741,00		279,18		**38.020,18**
PHRO	2.765,95		279,18		**3.045,13**	2.765,95		279,18		**3.045,13**
UHIT	-	-	-		-	277.495,72	226.490,72	392,17		**504.378,61**
UHET	-		-		-	1.305.119,97		4.232,32		**1.309.352,29**
Total (tCO2e)	**2.308.115,48**	**1.615.710,31**	**74.862,91**	**5.064,02**	**4.003.752,71**	**4.111.432,11**	**1.329.375,34**	**79.537,26**	**5.064,02**	**5.525.408,72**

The avoided emission value is calculated for demonstration purposes only. Verified or certified emission reductions are likely to be sold in the carbon credit market. However, the emission reductions that were not certified by international organizations reflect, according to internationally accepted methodologies, the contribution of the enterprises to the reduction of greenhouse gases.

5. INDICATORS

From the GHG inventory, the company can better manage its emissions and direct actions to reduce them. Engie has been monitoring GHG emissions indicators that allow the company to evaluate performance over time in a relative way, in order to provide metrics for better management decision-making regarding climate issues.

In the following tables, emission indicators are presented per generation of net and gross electricity and per scope.

Table 36 shows the indicators for the enterprises that the company has operational control and 100% of equity share and in table 37 only enterprises that the company has an equity share other than 100%.

Table 36 – tCO2e/ electricity generation - Operational Control (tCO_2e)

Units	tCO2e/Net MWh (DEL)				tCO2e/Net MWh (DEL-REC)				tCO2e/Gross MWh			
	Scope 1	Scope 2	Scope 3	Total	Scope 1	Scope 2	Scope 3	Total	Scope 1	Scope 2	Scope 3	Total
CTJL	1,1497	0,0017	0,0032	1,1546	1,1746	0,0017	0,0033	1,1796	1,0459	0,0015	0,0029	1,0504
UTPS	1,0825	0,0014	0,0000	1,0840	1,0982	0,0014	0,0000	1,0996	0,9958	0,0013	0,0000	0,9972
UTFE	0,0531	0,0003	0,0028	0,0562	0,0533	0,0003	0,0029	0,0564	0,0375	0,0002	0,0020	0,0397
UCLA	0,0339	0,0009	0,0051	0,0400	0,0341	0,0009	0,0052	0,0402	0,0305	0,0008	0,0046	0,0359
UTIB	0,0407	0,0003	0,0020	0,0430	0,0408	0,0003	0,0020	0,0431	0,0390	0,0003	0,0019	0,0412
UHSS	0,0000	0,0005	0,0000	0,0005	0,0000	0,0005	0,0000	0,0005	0,0000	0,0005	0,0000	0,0005
UHPF	0,0000	0,0014	0,0000	0,0015	0,0000	0,0014	0,0000	0,0015	0,0000	0,0014	0,0000	0,0014
SEDE	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
UHSO	0,0000	0,0000	0,0000	0,0001	0,0000	0,0000	0,0000	0,0001	0,0000	0,0000	0,0000	0,0001
PHJG	0,0010	0,0000	0,0001	0,0011	0,0010	0,0000	0,0001	0,0011	0,0010	0,0000	0,0001	0,0011
UHPP	0,0000	0,0000	0,0000	0,0001	0,0000	0,0000	0,0000	0,0001	0,0000	0,0000	0,0000	0,0001
CECL	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
UETR	0,0004	0,0001	0,0002	0,0007	0,0004	0,0001	0,0002	0,0007	0,0004	0,0001	0,0002	0,0007
UHJA	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
UHSA	0,0001	-	0,0000	0,0001	0,0001	-	0,0000	0,0001	0,0001	-	0,0000	0,0001
CEUM	0,0000	0,0000	-	0,0000	0,0000	0,0000	-	0,0000	0,0000	0,0000	-	0,0000
FVAE	0,0001	0,0005	0,0000	0,0007	0,0001	0,0005	0,0000	0,0007	0,0001	0,0005	0,0000	0,0007
UHMI	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
UHCB	0,0000	-	0,0000	0,0000	0,0000	-	0,0000	0,0000	0,0000	-	0,0000	0,0000
ESP	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
UEMU	0,0000	0,0001	-	0,0001	0,0000	0,0001	-	0,0001	0,0000	0,0001	-	0,0001
UEGU	0,0000	0,0001	-	0,0001	0,0000	0,0001	-	0,0001	0,0000	0,0001	-	0,0001
UEFL	0,0000	0,0001	-	0,0001	0,0000	0,0001	-	0,0001	0,0000	0,0001	-	0,0001
PHRO	0,0000	0,0000	0,0000	0,0001	0,0000	0,0000	0,0000	0,0001	0,0000	0,0000	0,0000	0,0001
UETB	-	0,0028	-	0,0028	-	0,0028	-	0,0028	-	0,0028	-	0,0028
UFCA	-	0,0023	-	0,0023	-	0,0024	-	0,0024	-	0,0023	-	0,0023
EEST	-	0,0000	-	0,0000	-	0,0000	-	0,0000	-	0,0000	-	0,0000
EOVE	-	0,0000	-	0,0000	-	0,0000	-	0,0000	-	0,0000	-	0,0000
ECAA	-	0,0000	-	0,0000	-	0,0000	-	0,0000	-	0,0000	-	0,0000
ESMA	-	0,0000	-	0,0000	-	0,0000	-	0,0000	-	0,0000	-	0,0000
UHIT	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
UHMA	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
UHET	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Total	**0,1874**	**0,0005**	**0,0005**	**0,1883**	**0,1890**	**0,0005**	**0,0005**	**0,1900**	**0,1819**	**0,0004**	**0,0005**	**0,1828**

Tabela 37 – tCO2e/electricity generation - Enterprises with Equity share other than 100% (tCO_2e)[4]

Units	tCO2e/Net MWh (DEL)				tCO2e/Net MWh (DEL-REC)				tCO2e/Gross MWh			
	Scope 1	Scope 2	Scope 3	Total	Scope 1	Scope 2	Scope 3	Total	Scope 1	Scope 2	Scope 3	Total
UTIB	0,0282	0,0002	0,0014	0,0298	0,0283	0,0002	0,0014	0,0298	0,0270	0,0002	0,0013	0,0286
UHIT	0,0013	0,0000	0,0000	0,0013	0,0013	0,0000	0,0000	0,0013	0,0013	0,0000	0,0000	0,0013
UHET	0,0000	0,0000	0,0001	0,0001	0,0000	0,0000	0,0001	0,0001	0,0000	0,0000	0,0001	0,0001
UHMA	0,0004	0,0000	0,0000	0,0004	0,0004	0,0000	0,0000	0,0004	0,0004	0,0000	0,0000	0,0004
Total	**0,1505**	**0,0004**	**0,0004**	**0,1513**	**0,1516**	**0,0004**	**0,0004**	**0,1524**	**0,1465**	**0,0004**	**0,0004**	**0,1472**

[4] In the tables 36 and 37, the acronym “DEL” means electricity delivered to the Grid less losses. “DEL-REC” means electricity supplied to the grid less losses and internal consumption.

The following figure shows the evolution of the emission corporate indicator (tCO2e) by net energy generation (DEL-REC). In 2019, the indicator increased 3% in the operational control approach and 5% in the equity share approach, compared to 2018.

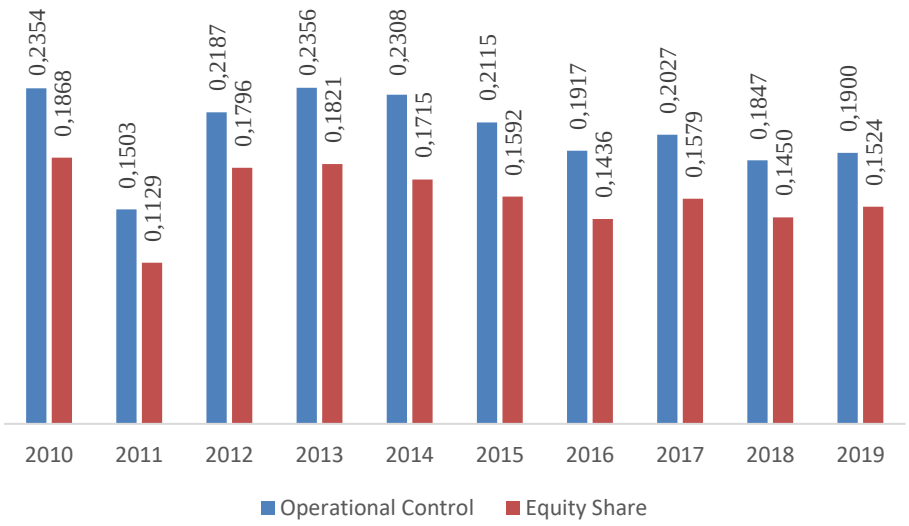


Figure 11: Evolution of the emission corporate indicator (tCO2e) / net energy generation (DEL-REC) (tCO2e)

The indicators for stationary combustion of CTJL and UTPS were also calculated, according to the table below, considering their significant share in the company's emissions. CTJL indicator presented the same value of 2018.

Table 38 – Indicators of GHG emissions from stationary combustion for fossil fuel thermoelectric [5]

Units	tCO2e/NET MWh (DEL - REC)	tCO2e/ NET MWh (DEL)	tCO2e/ GROSS MWh
CTJL	1,14	1,17	1,04
UTPS	1,08	1,10	0,99

[5] Boiler emissions were considered.

6. QUALITY MANAGEMENT OF GHG INVENTORY

According to ABNT NBR ISO 14064-1: 2007, the inventory quality management includes procedures related to the management of GHG information and to document retention and record keeping.

Engie has a Working Instruction - Environment - IT-MA-GE-006 which establishes a system of data collection based on documentary evidence that guarantees the quality of Engie's GHG emission inventory. For each plant/office responsibilities, representatives and data collection procedures are defined, as well as the frequency of such data collection. This Instruction is in accordance with the emission sources recommended by relevant methodologies.

The Local Technical Manager (RC) collects the data used from the GHG emission sources identified in accordance with Work Instruction IT-MA-GE-006, filling in the form "FR-Inventory Data Collection".

After filling in the form, the RC sends the form to the Environment and Social Responsibility (MRS). After evaluation, MRS sends the collection worksheets of all the plants and offices to the consultancy contracted to carry out the calculations and report of the inventory.

For the reporting of emissions in 2019, Engie was suported by Ecofinance Negócios, which was responsible for critically analyzing the information, performing the emission calculations, consolidating the data and preparing the emission report. The emission inventory will be audited/verified by an external entity, accredited by competent bodies.

7. UNCERTAINTY ANALYSIS

The development of an emissions inventory involves the use of various calculation tools that use standard forecasts, parameters and pattern emission factors. The use of these tools entails certain levels of uncertainty in the inventory calculations.

To minimize such uncertainties, values based on official sources, such as the consulted methodologies or market standards, were used whenever possible, always considering the principles of conservatism, accuracy and transparency.

In addition, all references for parameters were archived for further analysis and verification by an External Entity.

Details about the applied methodology can be observed in Annex V. The result of the uncertainty analysis for each of Engie's plants and offices in 2019 is presented in the following table.

Table 39 – Consolidated uncertainty Assessment (tCO_2e)

Units	Indirect Measurement	Direct Measurement	Agregate Uncertainty	Uncertainty Assessment
UHSA	+-/1,2%	+/-3,4%	+/-1,1%	*High*
UCLA	+/-1,3%	+/-5,0%	+/-1,3%	*High*
CTJL	+/-1,5%	+/-24,8%	+/- 1,5%	*High*
UHMI	+/-2,1%	+/-15,0%	+/-2,1%	*High*
UHSO	+/-2,3%	+/-22,6%	+/-2,3%	*High*
UHMA	+/-2,7%	+/-40,0%	+/-2,7%	*High*
PHJG	+/-2,8%	+/-0,0%	+/-2,8%	*High*
UHPP	+/-3,0%	+/-0,0%	+/-3,0%	*High*
PHRO	+/-3,1%	+/-0,0%	+/-3,1%	*High*
UHIT	+/-3,6%	+/-5,0%	+/-3,4%	*High*
UHJA	+/-4,4%	+/-15,0%	+/-4,3%	*High*
UHCB	+/-4,4%	+/-15,0%	+/-4,4%	*High*
CECL	+/-4,6%	+/- 30,0%	+/-4,6%	*High*
UTFE	+/-4,9%	+/-14,9%	+/-4,9%	*High*
UETR	+/-5,4%	+/-5,0%	+/-5,3%	*Good*
CEUM	+/-5,6%	+/-30,0%	+/-5,6%	*Good*
FVAE	+/-5,7%	+/-0,0%	+/-5,7%	*Good*
UHET	+/-5,8%	+/-6,1%	+/-5,7%	*Good*
ESP	+/-5,8%	+/-0,0%	+/-5,8%	*Good*
UEFL	+/-6,8%	+/-5,0%	+/-6,7%	*Good*
UEGU	+/-6,8%	+/-5,0%	+/-6,7%	*Good*
UEMU	+/-6,8%	+/-5,0%	+/-6,7%	*Good*
UHPF	+/-6,7%	+/-5,0%	+/-6,7%	*Good*
UHSS	+/-6,8%	+/-23,4%	+/-6,7%	*Good*
EEST	+/-6,9%	+/-0,0%	+/-6,9%	*Good*
EOVE	+/-7,0%	+/-0,0%	+/-7,0%	*Good*
ESMA	+/-7,0%	+/-0,0%	+/-7,0%	*Good*
ECAA	+/-7,0%	+/-0,0%	+/-7,0%	*Good*
UETB	+/-7,0%	+/-0,0%	+/-7,0%	*Good*
UFCA	+/-7,0%	+/-0,0%	+/-7,0%	*Good*
SEDE	+/-11,7%	+/-15,0%	+/-10,2%	*Good*
UTPS	+/-11,2%	+/-0,0%	+/-11,2%	*Good*
UTIB	+/-13,1%	+/-40,0%	+/-13,1%	*Good*
TOTAL	**+/ - 2,4%**	**+/ -9,5%**	**+/ - 2,4%**	***High***

8. EMISSION REDUCTIONS OPPORTUNITIES

Much of the installed capacity of Engie's generating plant is already coming from renewable energies (more than 85%). The company also plans to increase its participation by prioritizing investments in more renewable energy projects, such as wind farms, hydropower plants and biomass plants, as recommended by its corporate policy on climate change.

In 2016, the Company created ENGIE Geração Distribuída, with a focus on solar generation in a decentralized way, in homes and companies, entering the distributed solar generation market.

Excerpt from the Company's 2016 sustainability report shows the company's commitment to the development of renewable energy sources in Brazil: "(...) The investment in complementary sources reaffirms the commitment of ENGIE Brasil Energia to the energy transition, fundamental to sustainable development - especially for combating climate change and, consequently, the need for decarbonization. The decision of the group not to build new coal-fired power plants follows global awareness of the need to produce even more energy, while reducing carbon emissions".

ENGIE's commitment to sustainable development is reflected in socio-environmental practices. The ENGIE Brazil Energy Policy on Climate Change provides for the adoption of measures to reduce the consumption of fossil fuels. These measures include the preferential use of bi-fuel automobiles, the contracting of collective transportation services for employees of most power plants, and the frequent use of tele- and videoconferences to avoid travels.

The correct final waste disposal is the premise of the waste management carried out by ENGIE Brasil Energia in all its units. Accordingly, the Company requires that companies contracted to collect and dispose of waste comply with applicable environmental legislation, in particular Law No. 12,305 of 2010, which regulates the National Policy on Solid Waste

As part of the commitments assumed in the Climate Change Policy, the Company assigns the light ashes, emitted by the coal-fired thermoelectric plants, for the manufacture of cement. In addition, ashes from the biomass plants are destined to be used in agricultural activities. The heavy ash can be used as a base for asphalt paving and, because of its high pH, as neutralizing the soil acidity in the recovery of deposits of coal tailings.

Regardless of the company's commitment and its efforts to pursue a sustainable and less carbon-intensive performance, improvements are always possible.

The continuity of studies for the replacement of the fossil fuel used in thermal plants by biomass is encouraged. In addition, the continuity of investment in improving the efficiency of boilers used to reduce fuel consumption can be an environmentally and economically attractive alternative.

Other important action is the conservation of APPs and remaining areas as forest, besides tree planting promoted by the plants. These green areas conserved by the company are GHG sinks, capturing CO_2.

Considering the other less representative emission sources, some initiatives to reduce emissions can be considered. In the case of commuting, raw materials and waste, an alternative would be the use of biofuels, such as ethanol and biodiesel instead of using gasoline or diesel. In the case of transportation of employees and directors, the teleconferencing system should be maintained to reduce the number of air travel, which is also a possibility of cost reduction and management and efficiency improvement.

Another important point is to educate and raise awareness of employees and suppliers regarding emission reduction initiatives. It is proposed the development of sustainability training, emission reduction actions and the requirement for the report on emissions to important suppliers.

ANNEX I. EMISSION FACTORS

Annex Table 1 – Stationary Combustion Emission Factors

Fuel	Units	Emission Factors				Reference
		CO2 (kg/un.)	CO2 - Biomass (kg/un.)	CH4 (kg/un.)	N2O (kg/un.)	
Acetylene	kg	3,38	-	-	-	FISPQ/Programa Brasileiro GHG Protocol
Coal 3100 kcal / kg	t	1.295,90	-	0,01281	0,01921	BEN 2019/PCI Engie
Coal 4500 kcal/kg -	t	1.751,51	-	0,01823	0,02735	BEN 2019/PCI Engie
Gasoline	Liters (L)	2,24	1,58	0,00010	0,00002	ANP 2012/ Programa Brasileiro GHG Protocol
Fuel Oil	L	3,08	-	0,00012	0,00002	BEN 2019/PCI Engie
Diesel Oil	L	2,63	2,46	0,00011	0,00002	ANP 2012/ Programa Brasileiro GHG Protocol
Anidro Ethanol	L	-	1,58	0,00007	0,00001	ANP 2012/ Programa Brasileiro GHG Protocol
Sugarcane Biomass - UTIB	t		733,42	0,21981	0,02931	BEN 2019/PCI Engie
Sugarcane Biomass - UTFE	t		713,31	0,21378	0,02850	BEN 2019/PCI Engie
Wood Waste - UCLA	t		717,18	0,21415	0,02855	MCT 2010/PCI Engie
Biodiesel	t		2,46	0,00010	0,00002	ANP 2012/ Programa Brasileiro GHG Protocol

Annex Table 2 – Mobile Combustion - Emission Factors

Fuel	Unit	Emission Factor (kgGEE/un.)				Reference
		CO2	CH4	N2O	tCO2e	
Gasoline	liter	2,212	0,000808	0,00026	2,212	BEN 2019
Diesel Oil	liter	2,603	0,000139	0,000139	2,603	BEN 2019
Vehicle Natural Gas	m³	1,999	0,003390	0,00011	1,999	BEN 2019
Ethanol	liter	2,52	0,000018	0,00007	2,52	BEN 2019
Biodiesel	liter	1,457	0,000384	0,00001	1,457	BEN 2019
Anidro Ethanol	liter	2,431	0,000331	0,00001	2,431	BEN 2019

*CO2 from ethanol, Anidro ethanol, biodiesel is not accounted as GHG emissions, but biomass emissions

Annex Table 3 – Air Travel emission factors

Distance	FE de CO2 (kg CO2 / passageiro*km)	FE de CH4 (kgCH4 / passageiro*km)	FE de N2O (kgN2O / passageiro*km)	kg CO2e/passageiro*km	Reference
Long-distance (d ≥ 3.700 km)	0,09485	0,0000004	0,0000030	0,0957593	DEFRA - UK Government conversion factors for Company Reporting. Ano: 2019.
Medium-distance (500 ≤ d <3.700 km)	0,07677	0,0000004	0,0000024	0,0775000	DEFRA - UK Government conversion factors for Company Reporting. Ano: 2019.
Short-distance (d < 500 km)	0,12356	0,0000044	0,0000039	0,1248426	DEFRA - UK Government conversion factors for Company Reporting. Ano: 2019.

Annex Table 4 – SIN Electricity Emission Factors[6]

Month	tCO2/MWh
Jan	0,0355
Feb	0,0667
Mar	0,0530
Apr	0,0514
May	0,0482
Jun	0,0426
Jul	0,0906
Aug	0,1070
Sept	0,1024
Oct	0,1040
Nov	0,1078
Dec	0,0913
Annual Average	**0,0750**

[6] Source: http://www.mctic.gov.br/mctic/opencms/ciencia/SEPED/clima/textogeral/emissao_corporativos.html

Annex Table 5 – Lower Calorific Value monitored by Engie

Plants	Fuel	GJ/t
UTFE	Sugarcane Bagasse	7,1
UTIB	Commercial Diesel Oil	42,3
	Sugarcane Bagasse	7,3
CTJL	Coal 4500 kcal / kg	18,2
	Fuel Oil	39,8
	Commercial Diesel Oil	42,3
UTPS	Coal 3100 kcal / kg	12,8
	Commercial Diesel Oil	42,3
UCLA	Commercial Diesel Oil	35,5
	Wood Biomass	7,1

Annex Table 6 – Evolution of Biodiesel added to Diesel Oil and Ethanol added to Gasoline (2012-2019)

Fuel	2012	2013	2014	2015	2016	2017	2018	2019
% Ethanol on Gasoline	20%	23%	25%	26,6%	27%	27%	27%	27%
% biodiesel on Diesel Oil	5%	5%	5,67%	7,0%	7%	7,83%	9,67%	10,33%

ANNEX II. ADDITIONAL METHODOLOGIES

(a) Use of fertilizers

Methodology used to estimate N2O emission from agricultural soil follows IPCC (2006). Direct emissions of N2O from agricultural soils, according to the more general method ("Tier 1"), are calculated by the following formula[7]:

$$N_2O_{Direct}\text{-}N = N_2O - N_{Ninputs} + N_2O\text{-}N_{OS} + N_2O\text{-}N_{PRP}$$

Where:

$N_2O_{Direct}\text{-}N$ = Annual direct emissions of N2O from agricultural soils, in kg N-N2O yr^{-1}

$N_2O - N_{Ninputs}$ = Annual direct emissions of N-N2O-N of N applied as fertilizer to the soil, in kg N-N2O- yr^{-1}

$N_2O\text{-}N_{OS}$ = Annual direct emissions of N-N2O organic soil grown in kg N-N2O yr^{-1}

$N_2O\text{-}N_{PRP}$ = Annual direct emissions of N-N2O of manure intentionally applied to the soil, in kg N-N2O yr^{-1}

Assuming no application of manures and, either growing in organic soils, only the portion of N applied as fertilizer to the soil will be considered.

$$N_2O - N_{Ninputs} = (F_{SN} + F_{ON} + F_{CR} + F_{SOM}) \times EF_1$$

Where:

F_{SN} = Annual amount of N in synthetic fertilizer nitrogen applied to the soil, in kg N yr^{-1}

F_{ON} = Annual quantity of N in manures, compost, sewage sludge and other additions of organic N applied to the soil, in kg N yr^{-1}

F_{CR} = Quantity of N in crop residues that return annually to the soil, in kg N yr^{-1}

F_{SOM} = Quantity of N in mineral soil that is mineralized, in kg N yr^{-1}

EF_1 = Direct N2O emission factor applied to the quantities of N added to

[7] $N_2O = N\text{-}N_2O \times 44 \div 28$

soils,in kg N yr^{-1}

The amounts of nutrients and fertilizers specifications in Brazil follow the requirements of the Normative Statement of the Ministério da Agricultura, Pecuária e Abastecimento number 5 of February 23, 2007 (reviewed by IN-MAP 21/2008), with significant variations depending on the type of fertilizer used. For example, bone flour autoclaved (1%), ammonium sulphate (20%), urea (45%), anhydrous ammonia (82%), etc.

To calculate FSN and FON, the percentage of nitrogen present in fertilizer provided by Engie was considered, and when the information was not available, the inventory of 2010 and 2011 was used to provide it, i.e. 1% for organic fertilizers, as normative instruction of the Ministry of Agriculture, Livestock and Supply no. 25, July 2009, and 45% for synthetic fertilizers considering the concentration of urea nitrogen, the most used synthetic fertilizer in Brazil.

For EF1 (2006), according to IPCC (2006), when there is an absence of a local emission factor, the standardized value of 0.01 must be used. For Engie inventory, it is reasonable to assume that FCR = FSOM = 0; therefore direct emissions related to the use of fertilizers are directly proportional to the amount of N applied as fertilizer to the soil.

For the conversion of emissions of N2O-N to N2O emissions the following equation is considered:

$$N2O_{emissions} = N2O\text{-}N \times 44/28$$

(b) Use of Acetylene

Acetylene (C2H2) is commonly used for welding due to the low cost and power, and its combustion emits CO2. Whereas some plants of Engie use acetylene for welding due to equipment maintenance, that source should be considered for GHG emissions inventory.

The balanced equation of combustion process of acetylene is presented below:

$$C2H2 + 5/2\ O2 \longrightarrow 2CO2 + H2O$$

In this way, for the combustion of 1 (one) acetylene binding, 2 (two) molecules of CO2 are emitted, i.e. for every 26g C2H2 burnt, 88g CO2 are emitted. Thus, the emission factor considered for the use of acetylene is 88gCO2/26gC2H2 = 3.385 gCO2/gC2H2.

(c) Incineration

Waste incineration is defined as the controlled combustion of solid and liquid waste within facilities. According to the IPCC (2006), during the incineration and open burning of waste, CO2, CH4 and N2O are emitted. The quantities issued to each gas depends on the type of waste, burning temperature, type of incineration/technology, management practices, among others.

Generally, CO2 is emitted in greater quantity for both incineration and burning out in the open. CH4 is emitted from the incomplete burning of the waste combustion/and is relevant in the case of open burning. N2O is emitted between temperatures ranging between 500 and 950ºC. So, regarding incineration emissions are calculated according to the equation below:

$$Emissions_{res} = CO_{2Emissions} + CH_{4Emissions} + N_2O_{Emissions}$$

According to a more general method (Tier 1), CO2 emissions can be estimated according to the equation below.

$$CO_{2Emissions} = \Sigma(SW_i \times dm_i \times CF_i \times FCF_i \times OF_i) \times 44/12$$

Where:

$CO_{2Emissions}$ =	Annual CO2 emissions, Gg/year
SW_i =	Total amount of solid waste type i (wet weight) incinerated or burnt in the open (fraction)
dm_i =	Dry matter content in the waste (wet weight) incinerated or burnt in the open (fraction)
CF_i =	Carbon fraction in dry matter (total carbon content) (fraction)
FCF_i =	Fraction of fossil carbon in the total carbon (fraction)
OF_i =	Oxidation factor (fraction)
$44/12$ =	Conversion factor from C to CO2
i =	Type of waste incinerated/burnt out in the open: urban solid waste, industrial waste, sewage sludge, hazardous waste, clinical waste, other (must be specified).

Waste incinerated in 2019 were chemical waste and wood from CTJL and chemical waste and rubber from UHET. They were classified as industrial waste, according to IPCC (2006). IPCC default data (2016) were considered as follows.

Annex Table 7 – Parameters for waste incineration emission reductions calculation

Parameter	Default Value- IPCC
i	**Industrial waste**
dm_i	90%
CFi	Not applicable.
FCF_i	90%
OF_i	100%

Source: IPCC (2006)

In the case of the calculation of emissions of CH4 and N2O, values of aggregated CH4 and N2O in the residue and, therefore, the detailing of the type of technology used (solid incineration, semi continuous, and fluidized bed incineration plants). As there is no detailed information about the type of technology used, emissions of these gases were accounted as 0 (zero) in this inventory.

ANEXO III. UNCERTAINTY ASSESSMENT METHODOLOGY

The evaluation of uncertainty of the 2019 GHG inventory of Engie was held for each of its plants/offices. To this end, we used the tool provided by the GHG Protocol "ghg uncertainty.xls" (GHG Protocol, 2003) which considers the Gaussian method, which requires that the distribution of measurement data converges-to a normal distribution and that the individual uncertainties are less than 60% of the expected average. The classification of uncertainties is divided into 2 (two) categories:

- Direct Measurements: based on the amount of GHG monitored;
- Medições indiretas: based on data of the monitored activity and emission factor.

Direct measurements identified for Engie refer to fugitive emissions, i.e. SF leakage, CO2 fire extinguishers or gases used in refrigeration and air conditioning equipment. The other emissions were classified as indirect measurements, since there is no monitoring or direct verification of greenhouse gases.

For the classification of uncertainty of emission factors, the "GHG Protocol Guidance on Uncertainty Assessment in GHG Inventories and Calculating Statistical Parameter Uncertainty" and IPCC (1996) were used, as shown in the table below.

Annex Table 8 – Values and references for emission factors uncertainty

Emission Sources (Direct measurement)	Level of emission fator uncertainty	References
Stationary combustion	+/- 5,0%	GHG Protocol (2003)
Mobile combustion	+/- 5,0%	GHG Protocol (2003)
Electricity consumption	+/- 7,0%	IPCC (1996)
Air travel	+/- 9,0%	DEFRA (2012)
Waste (landfill/compost/incineration)	+/- 30,0%	GHG Protocol (2003)
Use of fertilisers (organic/synthetic)	+/- 30,0%	IPCC (2006)

In the case of the uncertainty of the activity data, the GHG Protocol table below was used as a reference.

Annex Table 9 – Uncertainty level for activity data[8]

Assessment	Uncertainty level
High	≤ 5%
Good	≤ 15%
Fair	≤ 30%
Poor	> 30%

As the statement of Work "Environment – IT-MA-GE-006" established by Engie for the collection of data, the nature of the "evidence" is one of the data to be included. Based on the nature of the evidence of the data provided by Engie, the following classification was established.

Annex Table 10 – Uncertainty level for activity data - Engie[9]

Evidence	Given uncertainty	Uncertainty Assessment	Reference
SME-power measurement system	+/- 0,20%	High	ONS (2011). 12.2 Check submodule. 2.0/2011. Accuracy class of energy meters.
SCO-fuel system (bagasse)	+/- 0,50%	High	Operations manual Bextra. Average balance of error UTIB..
SCO-fuel system (coal)	+/- 1,00%	High	IT-CO-JL-025. Measurement of Garner Balances of CTJL
SCO-fuel system (fuel oil)	+/- 1,00	High	It was considered the largest uncertainty among the ones reported to the SCO.
SCO-fuel system (diesel oil)	+/- 1,00	High	It was considered the largest uncertainty among the ones reported to the SCO.
SCO-fuel system (wood)	+/- 1,00%	High	Certificate of conformity of UCLA scale issued by Toledo of Brazil
Other reports of the information system of Engie	+/- 5,00%	High	GHG Protocol (2003)
Purchase invoice	+/- 5,0%	High	GHG Protocol (2003)
Waste disposal certificate (with the quantities intended for) or weighing tickets	+/- 5,00%	High	GHG Protocol (2003)
Supplier report	+/- 15,0%	Good	GHG Protocol (2003)
Internal Control sheet (signed by the responsible manager)	+/- 30,0%	Fair	GHG Protocol (2003)
Internal Estimate	+/- 40,0%	Poor	GHG Protocol (2003)
Other evidence*	+/- 40,0%	Poor	GHG Protocol (2003)

[8] Fonte: GHG Protocol (2003)
[9] Fonte: GHG Protocol (2003)

ANNEX IV. EMISSION REDUCTIONS CALCULATIONS

a) Renewable Energy Generation

Wind, hydropower and biomass power plants, when in operation, provide reductions in greenhouse gas emissions through the supply of clean, renewable energy to the National Interconnected System (SIN).

The methodology used to calculate GHG emission reductions for renewable electricity generation is based on the methodology ACM0002 "Consolidated Methodology for grid-connected electricity generation from renewable sources" (UNFCCC). In this way, the plants were placed within the minimum criteria of applicability of this methodology, based on renewable energy generation and reservoir area of hydropower plants.

This methodology has been made available by the Executive Board for the Clean Development Mechanism (CDM) of the Kyoto Protocol, in which emission reductions of projects that generate renewable electricity and are connected to the grid can be accounted for from the determination of a baseline. In General, we can use the equation summarized below.

$$ER_y = BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where:

ER_y = Emission reductions in year y (tCO_2e/year)

BE_y = Baseline emissions in year y (tCO_2e/year)

$EG_{PJ,y}$ = Net electricity supplied to the grid in year y (MWh/year)

$EF_{grid,CM,y}$ = Combined margin CO2 emission factor electricity generation supplied to the grid in year y (tCO_2e/year)

EFgrid,CM,y calculation is carried out as equation below:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} + w_{BM}$$

where:

$EF_{grid,OM,y}$ = Operating Margin CO_2 Emission factor in year y (tCO_2e/year)

w_{OM} = Weighting of operating margin emission factor (%)

$EF_{grid,BM,y}$ = Build Margin CO_2 Emission factor in year y (tCO_2e/year)

W_{BM} = Weighting of build margin emission factor (%)

The operating and build margin CO2 emission factors of the national interconnected system are published by the Inter-ministerial global climate change Commission (ICGCC) and, thus, the data provided by this institution was used. For operating margin, the average monthly factor for year 2019 was considered.

However, whereas the build margin for the year 2019 had not been published until the time of preparation of this report, the build margin of 2018 was used.

For weighting of the emission factors, the methodology ACM0002 factors were considered, i.e. 50% of operating margin and construction for hydroelectric projects and 75% operating margin and 25% for wind and photovoltaic projects. So, it was considered the CO2 emission factors of the grid, as below.

Wind and Solar Projects

0,1370 × 25% + 0,5181[10] × 75% = 0,4228 tCO_2/MWh

Hidro and Biomass Projects

0,1370 × 50% + 0,5181× 50% = 0,3275 tCO_2/MWh

In addition, the methodology ACM0002 provides for methane emissions, depending on the size of the reservoir of hydroelectric projects. So, for projects at power density greater than 4W/m2, and less than or equal to 10W/m2, methane emissions for reservoirs must follow the equation below:

$$PE_{HP,y} = \frac{EF_{Res} \times TEG_y}{1000}$$

Onde:

$PE_{HP,y}$ = Project emissions from water reservoirs of hydroelectric plants in a year (tCO_2e) (tCO_2e);

[10] Média anual do fator de emissão de CO_2 da margem de operação do SIN disponibilizado pelo MCTI.

EF_{Res} =	Default emission factor for emissions from reservoirs-default value as the methodology is 90Kg CO2e/MWh;
TEG_y =	Total electricity produced by the activity of the project, including the electricity supplied to the network and the electricity supplied at internal loads, in a year (MWh) – gross electricity.

Considering the net electricity generation data provided by Engie and the SIN CO2 emission factor provided by MCTI, as well as the plants within the minimum power density criteria set out in the methodology[11], it was possible to calculate GHG emission reductions as presented on item 04 of this report.

It is important to mention that the methodology for calculation of GHG emission reduction considered above was used only to enable the accounting of emission reductions. However, the calculations do not indicate and/or demonstrate compliance of eligibility criteria and additionality for obtaining carbon credits under the CDM. Some specific Projects already have its registration under CDM ((UETR, UEGU, UEFL, UEMU and UCLA).

b) Sinks by Forest Planting

Removals of CO2 by sinks or CO2 sequestration, are estimated in general from the formulas below[12].

$$\Delta C_G = \sum_{i,j} \left(A_{i,j} \cdot G_{TOTALi,j} \cdot CF_{i,j} \right)$$

$$G_{TOTAL} = \sum \left\{ G_W \cdot (1+R) \right\}$$

Onde:

ΔC_G =	Biomass Stock, t_C
$A_{i,j}$ =	Area, ha
$G_{TOTALi,j}$ =	Average Increment, $t_{dry\ matter}$/ha/year
$CF_{i,j}$ =	Carbon fraction in dry matter, t_C/ $t_{dry\ matter}$(default value[13]= 0,47)

[11] Hydropower plants are considered eligible for power density (installed capacity divided by the area of reservoir) above 4 W/m2. Hydroelectric projects that have power density greater than 4W/m2, and less than or equal to 10W/m2, must redeem methane emissions from the reservoir in the total emissions reductions from renewable electricity generation.

[12] IPCC (2006). Guidelines for National Greenhouse Gas Inventories - Volume 4 – Agriculture, Forestry and Other Land Use.

[13] IPCC (2003). Good Practice Guidance for Land Use, Land-Use Change and Forestry.

G_w = Average increment on above-ground biomass $t_{dry\ matter}$/ha

R = Shoot/root ratio, tdry matter on biomass below ground/dry t-matter on above-ground biomass.

For simplification and conservatism, R is assumed to be equal to zero (only the aboveground biomass carbon fixing). For the determination of carbon stocks in the areas of planted forests it is necessary to know which type of forest cover is being parsed (native forest, planted forest, pasture, field, etc), in addition to the knowledge of the time of planting of each area.

Whereas planting activities conducted by Engie are performed with native trees (forestry and fruit) and creeping vegetation cover, the calculations of CO2 sequestration was calculated based on the IPCC default data (2006) [14] of 150 tonnes of dry matter/ha and 0.47 tonnes of carbon/dry matter.

Thus, CO2 storage is estimated according equation the following equation

$$\Delta C_G = A \times 150 \times 0{,}47 \times 44/12 = A \times 258{,}5\ tCO_2$$

Considering the acreage data, provided by Engie, it was possible to calculate GHG emission reductions as described on item 04 of this report. This year, it was considered tree planting, conservation of APPs and remaining areas.

[14] IPCC (2006). Guidelines for National Greenhouse Gas Inventories - Volume 4 – Agriculture, Forestry and Other Land Use. Capítulo 4, página 4.63.

ANNEX V. EMISSION ANALYSIS PER PLANT/OFFICE

Annex V presents specific GHG emission for each Engie Plant, according to operational control and equity share approach. This annex groups the plants per source of energy (Wind, Hidro, Thermal, Photovoltaic plants and offices).

For plants that Engie has operational control and 100% of equity share, the results are the same. Therefore, they are presented together.

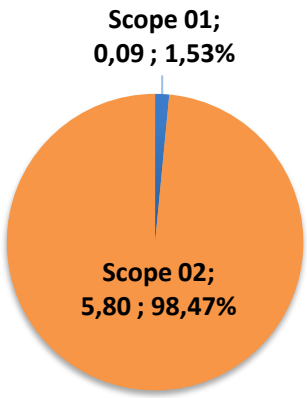
1. Wind Power Plants

Engie has 100% of equity share over all wind power plants. Therefore, GHG emissions of these plants are the same for equity share and operational control approach.

a) Fleixeiras I Wind Power Plant – UEFL

UEFL emitted 5.89 tCO_2e during 2019. Scope 02 emissions was responsible for 98%, as presented

Annex figure 01 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



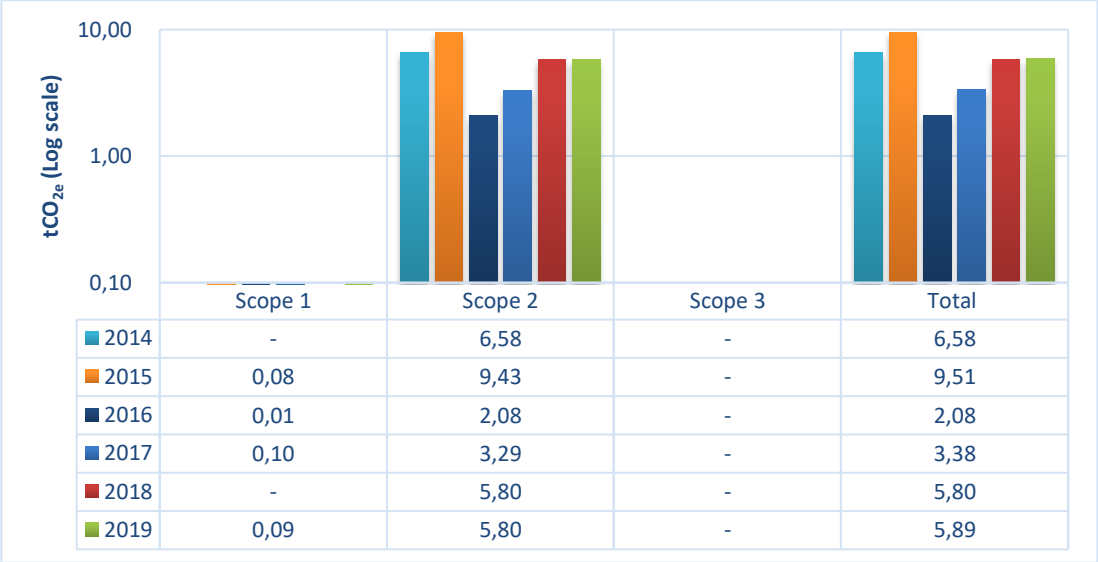
Emissios per GHG is presented in the following table:

Annex Table 11 – UEFL emission per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**0,09**	-	-	-	**0,09**	-
Fugitive emissions	0,09	-	-	-	0,09	-
Scope 02	**5,80**	-	-	-	**5,80**	-
Electricity	5,80	-	-	-	5,80	-
Total	**5,89**	-	-	-	**5,89**	-

The following figure shows UEFL GHG emissions from 2014 to 2019.

Annex figure 02 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



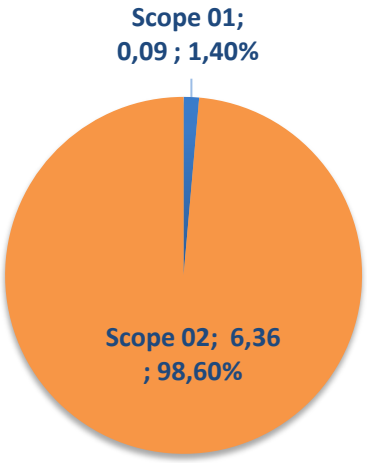
	Scope 1	Scope 2	Scope 3	Total
2014	-	6,58	-	6,58
2015	0,08	9,43	-	9,51
2016	0,01	2,08	-	2,08
2017	0,10	3,29	-	3,38
2018	-	5,80	-	5,80
2019	0,09	5,80	-	5,89

In 2019, UEFL increased 26.8% of their emissions compared to 2018, due to higher electricity consumption.

b) Guajirú Wind Power Plant – UEGU

UEGU emitted 6.45 tCO2e during 2019, as presented in the following figure.

Annex figure 03 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity



Share

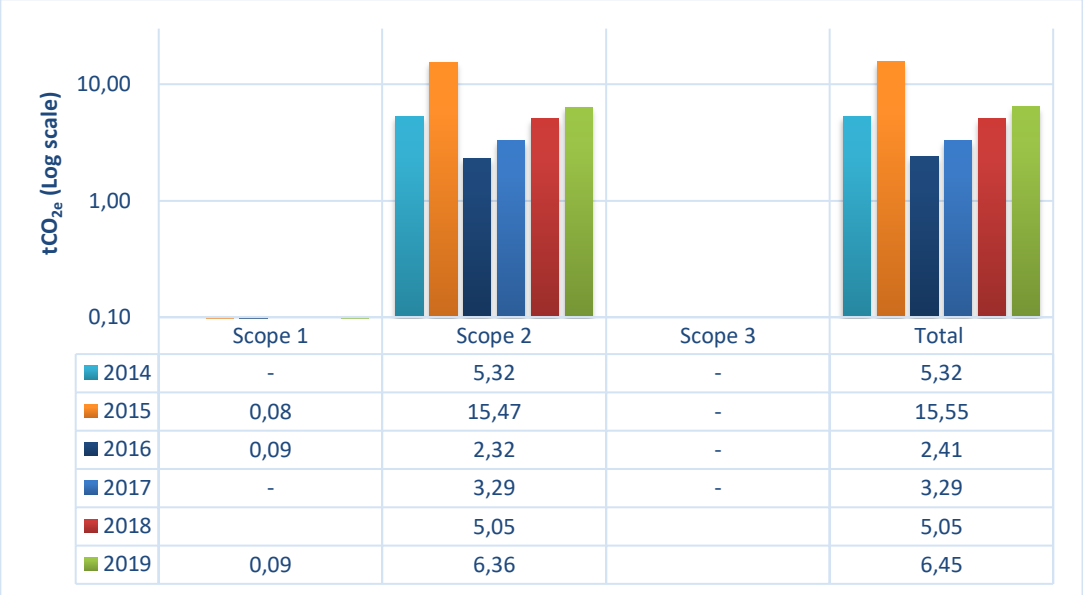
Emissios per GHG are presented at the table below.

Annex Table 12 –UEGU emission per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**0,09**	-	-	-	**0,09**	-
Fugitive Emissions	0,09	-	-	-	0,09	-
Scope 02	**6,36**	-	-	-	**6,36**	-
Electricity	6,36	-	-	-	6,36	-
Total	**6,45**	-	-	-	**6,45**	-

The figure below presente UEGU GHG emissions from 2014 to 2019.

Annex figure 04 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



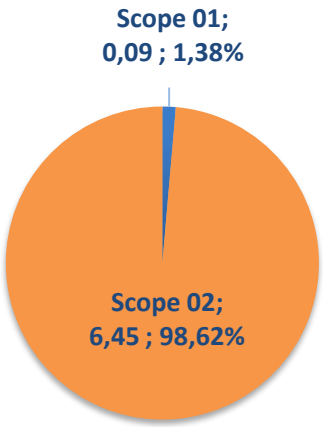
	Scope 1	Scope 2	Scope 3	Total
2014	-	5,32	-	5,32
2015	0,08	15,47	-	15,55
2016	0,09	2,32	-	2,41
2017	-	3,29	-	3,29
2018		5,05		5,05
2019	0,09	6,36		6,45

UEGU increased 27.7% of their emission compared to 2018. This increase is related to higher scope 02 emissions.

c) Mundaú Wind Power Plant– UEMU

UEMU emitted 6.54 tCO_2e during 2019. Only electricity and fugitive emissions were reported, as presented in the following figure.

Annex figure 05 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



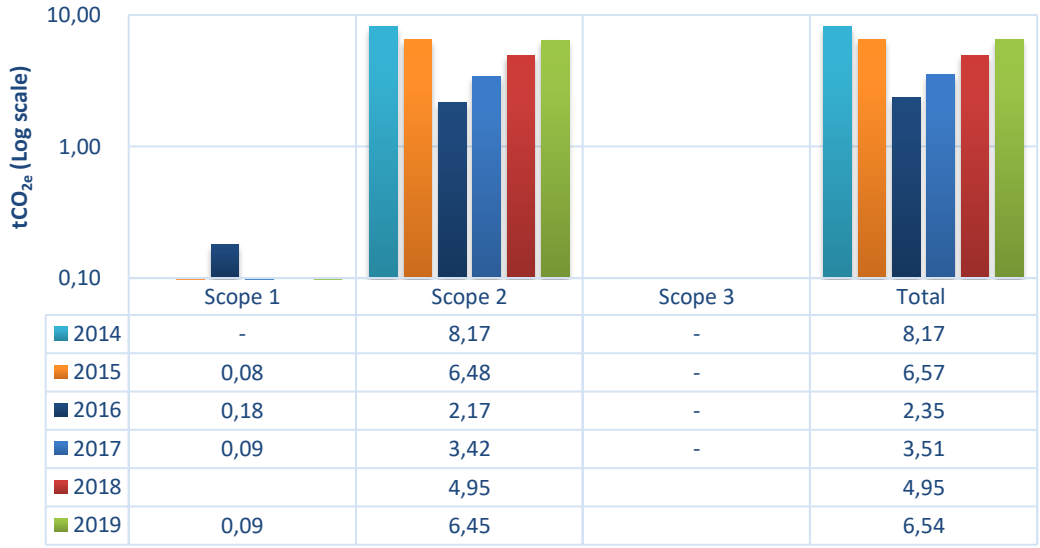
Emissions per GHG are presented on the annex tabel below.

Annex Table 13 – UEMU Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**0,09**	-	-	-	**0,09**	-
Fugitive	0,09	-	-	-	0,09	-
Scope 02	**6,45**	-	-	-	**6,45**	-
Electricity	6,45	-	-	-	6,45	-
Total	**6,54**	-	-	-	**6,54**	-

The folowing graph shows UEMU GHG emissions from 2014 to 2019.

Annex figure 06 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



	Scope 1	Scope 2	Scope 3	Total
2014	-	8,17	-	8,17
2015	0,08	6,48	-	6,57
2016	0,18	2,17	-	2,35
2017	0,09	3,42	-	3,51
2018		4,95		4,95
2019	0,09	6,45		6,54

UEMU increased 32.2% of their emission compared to 2018, due to higher electricity consumption from the grid.

d) Tubarão Wind Power Plant – UETB

UETB emitted 5.07 tCO_2e in 2019, having electricity – scope 2 as unique emission source, as presented in the following figure.

Annex figure 07 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



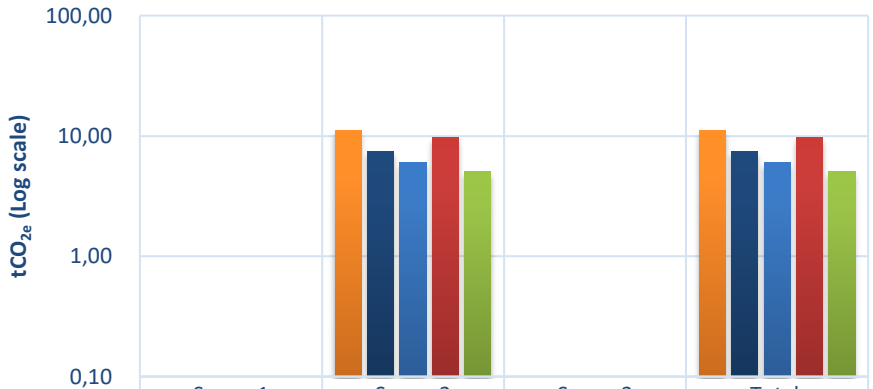
Emissions per GHG are presented in the following table.

Annex Table 14 –UETB GHG Emissions– 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 2	**5,07**	-	-	-	**5,07**	-
Electricity	5,07	-	-	-	5,07	-
Total	**5,07**	-	-	-	**5,07**	-

The figure below shows UETB GHG emissions from 2015 to 2019.

Annex figure 08 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



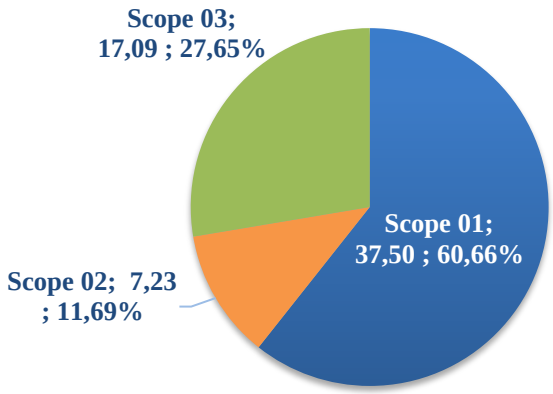
	Scope 1	Scope 2	Scope 3	Total
2015	-	11,20	-	11,20
2016	-	7,44	-	7,44
2017	-	6,04	-	6,04
2018		9,63		9,63
2019		5,07		5,07

In 2019, UETB reduced 47.4% related to 2018, due to minor electricity consumption.

e) Trairi Wind Power Plant – UETR

UETR emitted 61.82 tCO_2e during 2019, among scopes 1, 2 and 3 as presented below.

Annex figure 09 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



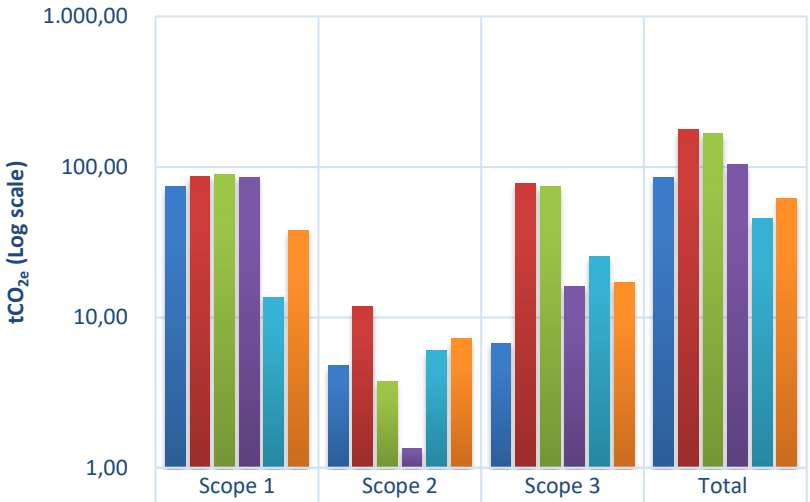
Emissions per GHG are detailed in the table below.

Annex Table 15 – UETR Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**36,46**	**0,18**	**0,86**	-	**37,50**	**5,98**
Mobile Combustion	36,32	0,18	0,86	-	37,36	5,98
Fugitive emission	0,14	-	-	-	0,14	-
Scope 02	**7,23**	-	-	-	**7,23**	-
Electricity	7,23	-	-	-	7,23	-
Scope 03	**16,93**	**0,00**	**0,16**	-	**17,09**	-
Business Travel	16,93	0,00	0,16	-	17,09	-
Total	**60,62**	**0,18**	**1,02**	-	**61,82**	**5,98**

The following figure presents UETR GHG emissions from 2014 to 2019.

Annex figure 10 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



	Scope 1	Scope 2	Scope 3	Total
2014	73,97	4,80	6,65	85,42
2015	86,94	11,72	77,69	176,35
2016	89,50	3,73	73,79	167,02
2017	85,68	1,35	15,94	102,96
2018	13,59	6,01	25,52	45,12
2019	37,50	7,23	17,09	61,82

In 2019, UETR increased 47% of their emissions comparing to 2018. This fact ocuured due to higher scope 1 mobile combustion emissions.

f) Wind Power Plant Santa Monica – ESMA

ESMA emitted 2.46 tCO_2e during 2019. It was reported only emissions related to electricity consumption.

Annex figure 11 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



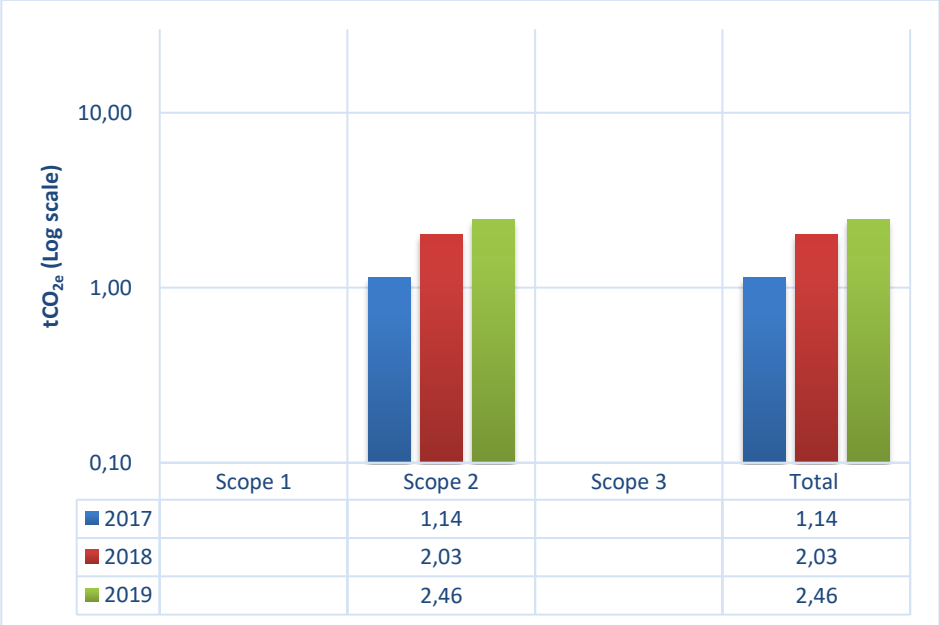
Emissions per GHG are detailed in the table below.

Annex Table 16 – ESMA Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 2	**2,46**	-	-	-	**2,46**	-
Electricity	2,46	-	-	-	2,46	-
Total	**2,46**	-	-	-	**2,46**	-

In 2019, ESMA increased 21.6% of its emissions due to higher electricity consumption. The following graph presents ESMA GHG emission trajectory.

Annex figure 12 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



g) Wind Power Plant Cacimbas – EECA

EECA emitted 2.48 tCO_2e during 2019. It was reported only emissions related to electricity consumption.

Annex figure 13 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



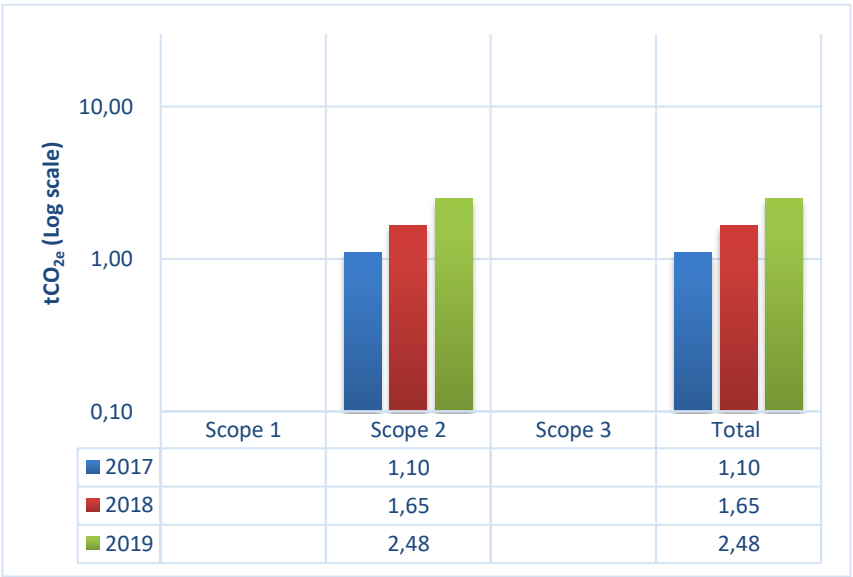
Emissions per GHG are detailed in the table below.

Annex Table 17 – EECA Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 02	**2,48**	-	-	-	**2,48**	-
Electricity	2,48	-	-	-	2,48	-
Total	**2,48**	-	-	-	**2,48**	-

In 2019, EECA increased 50.7% of its emissions due to higher electricity consumption. The following graph presentes EECA GHG emissions trajectory.

Annex figure 14 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



h) Wind Power Plant Ouro Verde – EOVE

EOVE emitted 4.05 tCO_2e during 2019. It was reported only emissions related to electricity consumption.

Annex figure 15 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



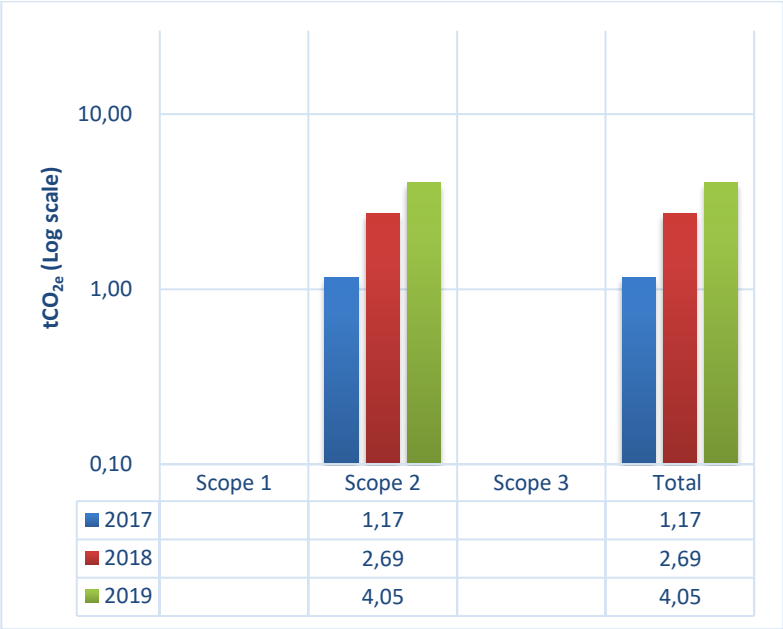
Emissions per GHG are detailed in the table below.

Annex Table 18 – EOVE Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 2	**4,05**	-	-	-	**4,05**	-
Electricity	4,05	-	-	-	4,05	-
Total	**4,05**	-	-	-	**4,05**	-

In 2019, EOVE increased 50.6% iths emisisons due higher electricity consumption.

Annex figure 16 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



	Scope 1	Scope 2	Scope 3	Total
2017		1,17		1,17
2018		2,69		2,69
2019		4,05		4,05

i) Wind Power Plant Estrela – EEST

EEST emitted 4.53 tCO_2e during 2019. It was reported only emissions related to electricity consumption.

Annex figure 17 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



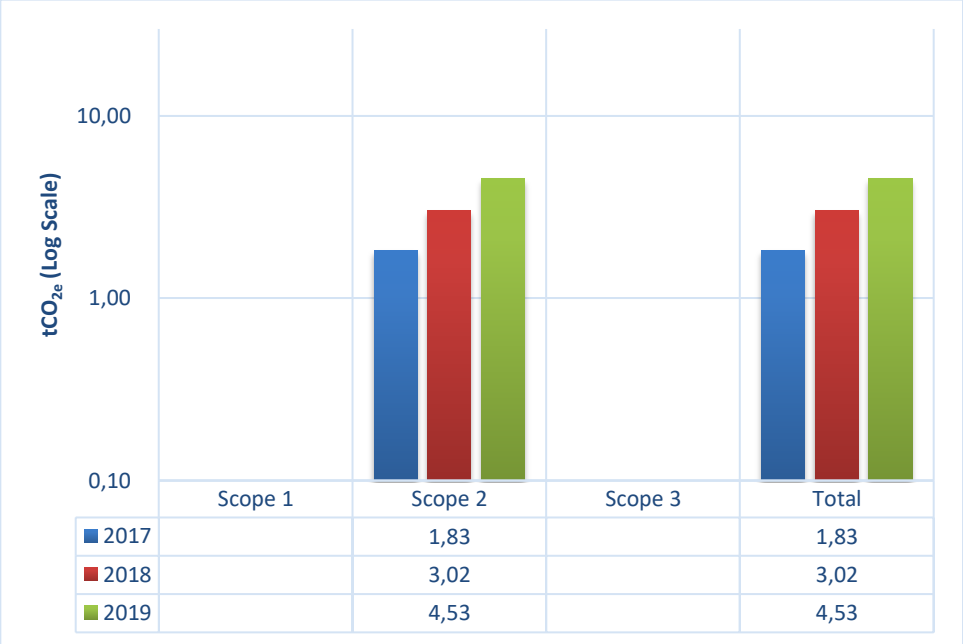
Emissions per GHG are detailed in the table below.

Annex Table 19 – EEST Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 2	**4,53**	-	-	-	**4,53**	-
Electricity	4,53	-	-	-	4,53	-
Total	**4,53**	-	-	-	**4,53**	-

In 2019, EEST emissions increased 49.8% due to electricity consumption.

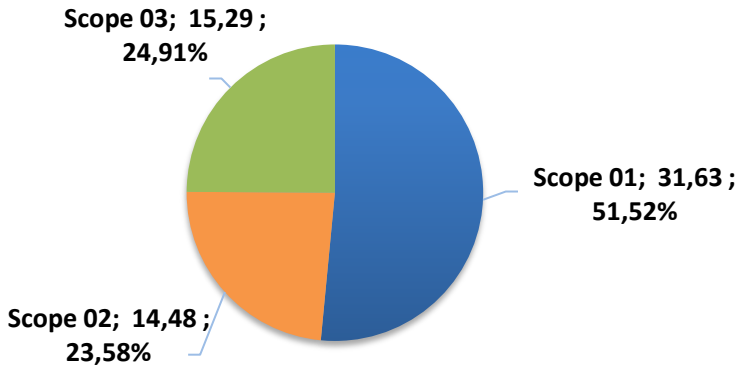
Annex figure 18 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



j) Wind Power Plant Campo Largo

CECL emitted 61.40 tCO_2e during 2019, as follows.

Annex figure 19 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



Emissions per GHG are detailed in the table below.

Annex Table 20 – CECL Emissions per GHG – 2019 (tCO2e)

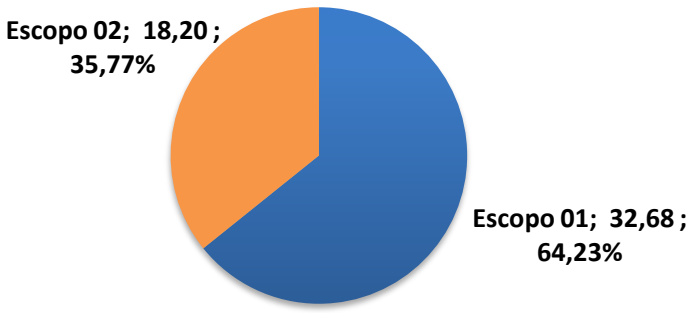
Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**30,75**	**0,16**	**0,72**	-	**31,63**	**5,23**
Stationary Combustion	1,88	0,00	0,01	-	1,89	0,20
Mobile Combustion	28,79	0,16	0,72	-	29,66	5,02
Fugitive Emission	0,08	-	-	-	0,08	-
Scope 02	**14,48**	-	-	-	**14,48**	-
Electricity	14,48	-	-	-	14,48	-
Scope 03	**12,18**	**3,00**	**0,11**	-	**15,29**	-
Waste	-	3,00	-	-	3,00	-
Air Travel	12,18	0,00	0,11	-	12,29	-
Total	**57,40**	**3,16**	**0,84**	-	**61,40**	**5,23**

CECL emisison are concentrated in mobile combustion, electricity consumption and air travel. This is the first CECL GHG measurement. Therefore, there are not comparison to previous years.

k) Wind Power Planst Umburanas

CEUM emitted 50.89 tCO2e during 2019. It was reported just scope 1 and 02 emissions.

Annex figure 20 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



Emissions per GHG are detailed in the table below.

Annex Table 21 – CEUM Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Escopo 01	**31,80**	**0,16**	**0,72**	-	**32,68**	**5,34**
Combustão Estacionária	2,97	0,00	0,01	-	2,98	0,32
Combustão Móvel	28,79	0,16	0,72	-	29,66	5,02
Emissões Fugitivas	0,04	-	-	-	0,04	-
Escopo 02	**18,20**	-	-	-	**18,20**	-
Compra de Energia	18,20	-	-	-	18,20	-
Total Geral	**50,00**	**0,16**	**0,72**	-	**50,89**	**5,34**

This is the first CECL GHG measurement. Therefore, there are not comparison to previous years.

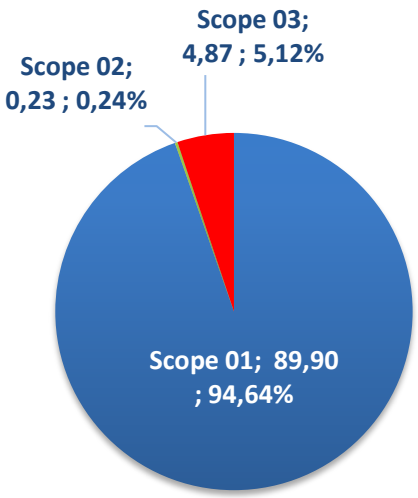
2. Small Hydropower Plants

Similar to the wind power plants, Engie has 100% of equity share of its small hydropower plants. Therefore, GHG emissions of these plants are the same for both accountability approaches.

a. José Gelazio da Rocha Small Hydropower Plant - PHJG

PHJG emitted 94.99 tCO_2e during 2019 as presented below.

Annex figure 21 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



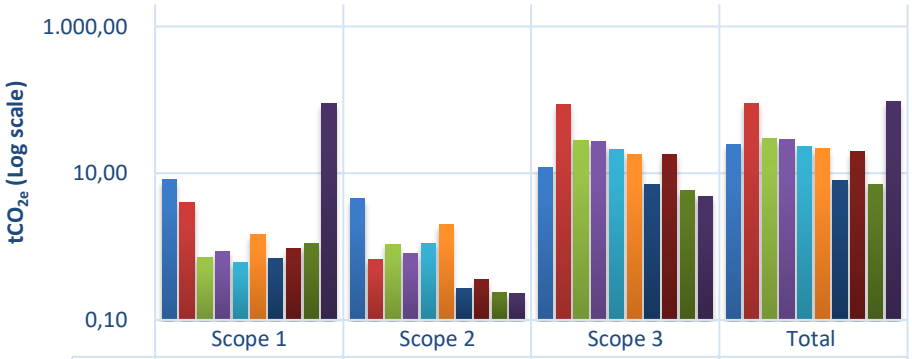
Emissions per GHG are presented as follows.

Annex Table 22 –PHJG emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**0,84**	**0,08**	**0,06**	**88,92**	**89,90**	**7,24**
SF6	-	-	-	88,92	88,92	-
Stationary Combustion	0,47	0,00	0,00	-	0,47	0,05
Mobile combustion	0,36	0,05	0,03	-	0,45	7,19
Waste	-	0,03	0,03	-	0,06	-
Scope 02	**0,23**	-	-	-	**0,23**	-
Electricity	0,23	-	-	-	0,23	-
Scope 03	**4,76**	**0,01**	**0,09**	-	**4,87**	**0,88**
Upstream	4,76	0,01	0,09	-	4,87	0,88
Total	**5,83**	**0,10**	**0,15**	**88,92**	**94,99**	**8,12**

PHJG GHG emissions between 2010 and 2019 are presented below.

Annex figure 22 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



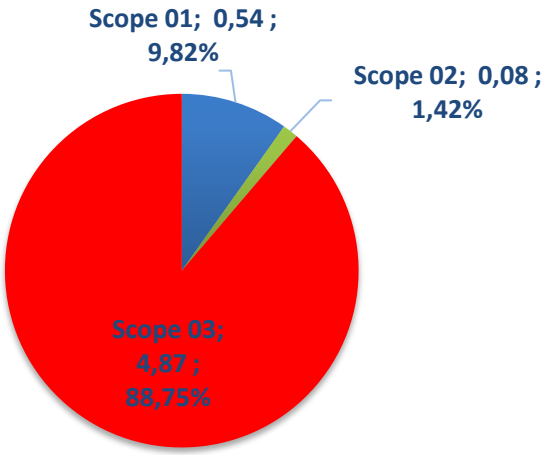
	Scope 1	Scope 2	Scope 3	Total
2010	8,12	4,49	11,81	24,42
2011	4,02	0,67	85,30	89,99
2012	0,72	1,08	28,05	29,86
2013	0,86	0,80	27,02	28,68
2014	0,60	1,12	21,16	22,87
2015	1,47	2,00	18,00	21,46
2016	0,69	0,27	7,09	8,06
2017	0,93	0,35	18,25	19,54
2018	1,09	0,23	5,77	7,09
2019	89,90	0,23	4,87	94,99

In 2019, PHJG increased its emissions compared to 2018, due SF6 emissions that did not occur in the last year.

b. Small Hidropower Plant Rondonópolis - PHRO

PHRO emitted 5.48 tCO_2e during 2019 as figure below.

Annex figure 23 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



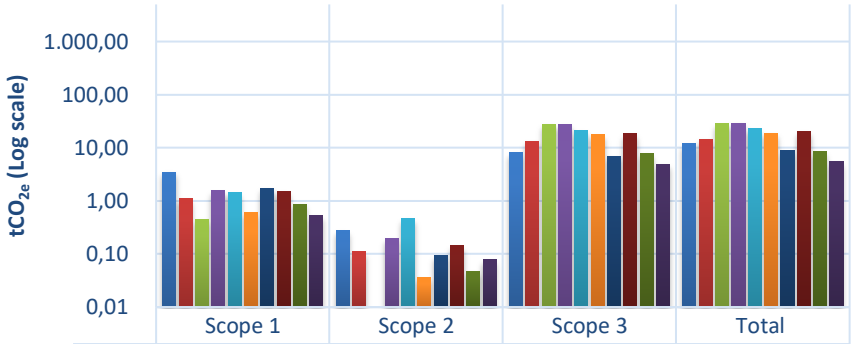
Emissions per GHG are presented on following table.

Annex Table 23 –PHRO Emissions per GHG– 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**0,47**	**0,05**	**0,02**	-	**0,54**	**6,15**
Stationary combustion	0,47	0,00	0,00	-	0,47	0,05
Mobile combustion	-	0,04	0,02	-	0,06	6,10
Waste	-	0,00	0,00	-	0,01	-
Scope 02	**0,08**	-	-	-	**0,08**	-
Electricity	0,08	-	-	-	0,08	-
Scope 03	**4,76**	**0,01**	**0,09**	-	**4,87**	**0,88**
Upstream	4,76	0,01	0,09	-	4,87	0,88
Total	**5,31**	**0,06**	**0,11**	-	**5,48**	**7,02**

The figure below presentes PHRO GHG emissions from 2010 to 2019.

Annex figure 24 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



	Scope 1	Scope 2	Scope 3	Total
2010	3,49	0,28	8,02	11,79
2011	1,11	0,11	13,26	14,48
2012	0,45	-	27,79	28,24
2013	1,54	0,20	27,36	29,10
2014	1,42	0,47	21,15	23,04
2015	0,60	0,04	18,00	18,64
2016	1,73	0,09	6,88	8,71
2017	1,52	0,14	18,25	19,91
2018	0,87	0,05	7,66	8,57
2019	0,54	0,08	4,87	5,48

Emissions of PHRO reduced 36% due to lower fuel consumption related for upstream outsourced vehicles.

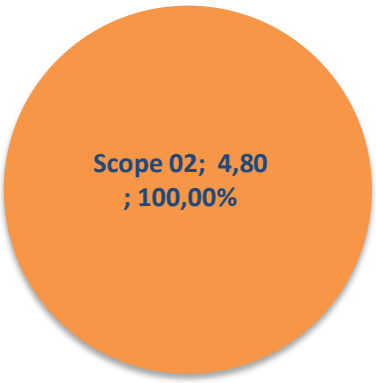
3. Photovoltaic Plant

Engie has two photovoltaic plants with 100% of equity share. Therefore, GHG emissions of these plants are the same in both approach.

a. Cidade Azul Photovoltaic Plant - UFCA

UFCA emitted 4.80 tCO_2e during 2019, as presented below.

Annex figure 25 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



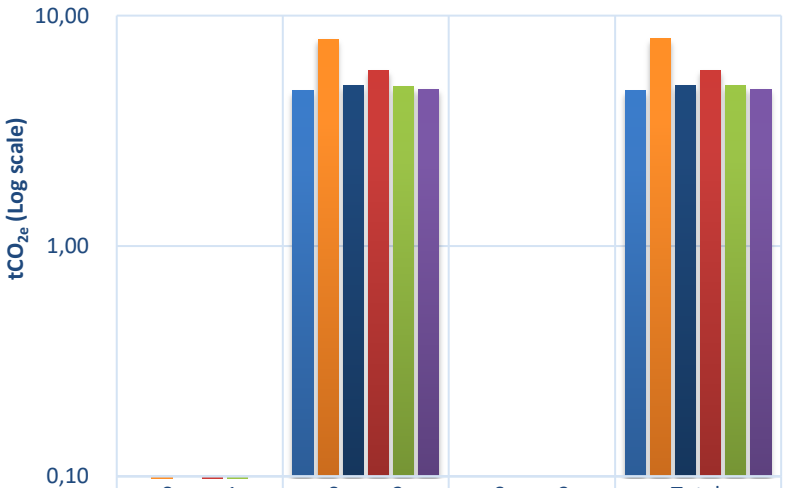
Emissions per GHG are detailed in the following table.

Annex Table 24 –UFCA Emissions per GHG– 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 02	**4,80**	-	-	-	**4,80**	-
Electricity	4,80	-	-	-	4,80	-
Total	**4,80**	-	-	-	**4,80**	-

Figure below presentes UFCA GHG emissions between 2014 and 2019.

Annex figure 26 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



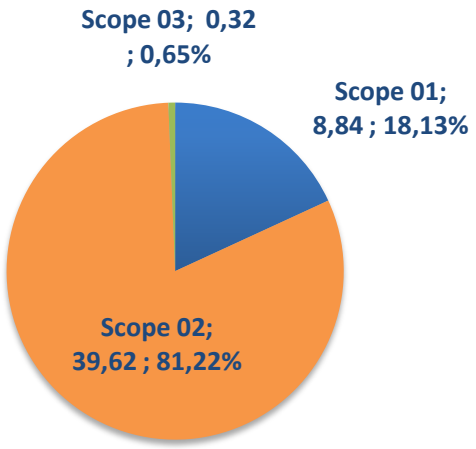
	Scope 1	Scope 2	Scope 3	Total
2014	-	4,74	-	4,74
2015	0,05	7,91	-	7,96
2016	-	4,99	-	4,99
2017	0,04	5,76	-	5,80
2018	0,05	4,92	-	4,97
2019		4,80		4,80

UFCA reduced 3.5% of their emissions related to 2018, mainly due to lower electricity consumption.

b. Assu V Photovoltaic Plant (FVAE)

FVAE emitted 48.78 tCO2e during 2019, as presented below:

Annex figure 27 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



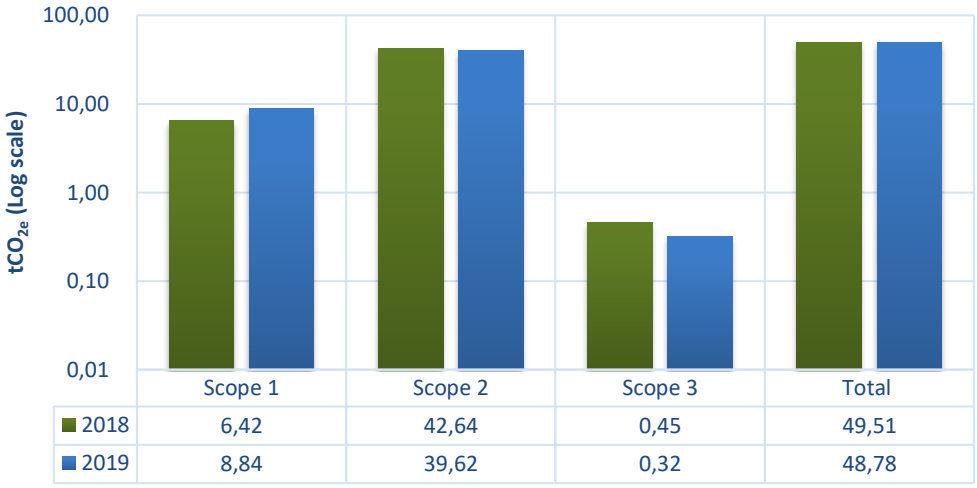
Emissions per GHG are detailed in the following table.

Annex Table 25 –FVAE Emissions per GHG– 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**8,66**	**0,02**	**0,16**	-	**8,84**	**1,07**
Mobile combustion	8,66	0,02	0,16	-	8,84	1,07
Scope 02	**39,62**	-	-	-	**39,62**	-
Electricity	39,62	-	-	-	39,62	-
Scope 03	-	**0,32**	-	-	**0,32**	-
Waste	-	0,32	-	-	0,32	-
Total	**48,29**	**0,34**	**0,16**	-	**48,78**	**1,07**

Figure below presentes FVAE GHG emissions between 2018 and 2019.

Annex figure 28 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



	Scope 1	Scope 2	Scope 3	Total
2018	6,42	42,64	0,45	49,51
2019	8,84	39,62	0,32	48,78

FVAE reduced 1.47% of its emission related to 2018 due to minor electricity consumption.

4. Hydropower Plants

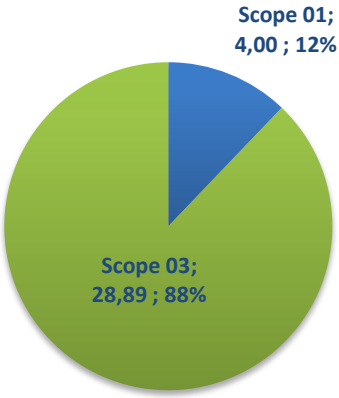
Engie has 100% of equity share over Hydropower plants Cana Brava (UHCB), Passo Fundo (UHPF), Ponte de Pedra (UHPP), Salto Osório (UHSO), Salto Santiago (UHSS) and São Salvador (UHSA), Miranda (UHMI) and Jaguara (UHJA). For these plants, GHG emissions of operational control approach are the same as equity share approach.

For Estreito (UHET), Itá (UHIT) e Machadinho (UHMA) Hydropower Plants, Engie does not have operational control. Engie just has an equity percentage of this enterprises (40.07%, 68.99% e 19.29% respectivelly). Therefore GHG emissions of UHET, UHIT and UHMA considers these percentage of equity.

a. Cana Brava Hydropower Plant – UHCB

UHCB emitted 32.88 tCO_2e in 2019, as presented.

Annex figure 29 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



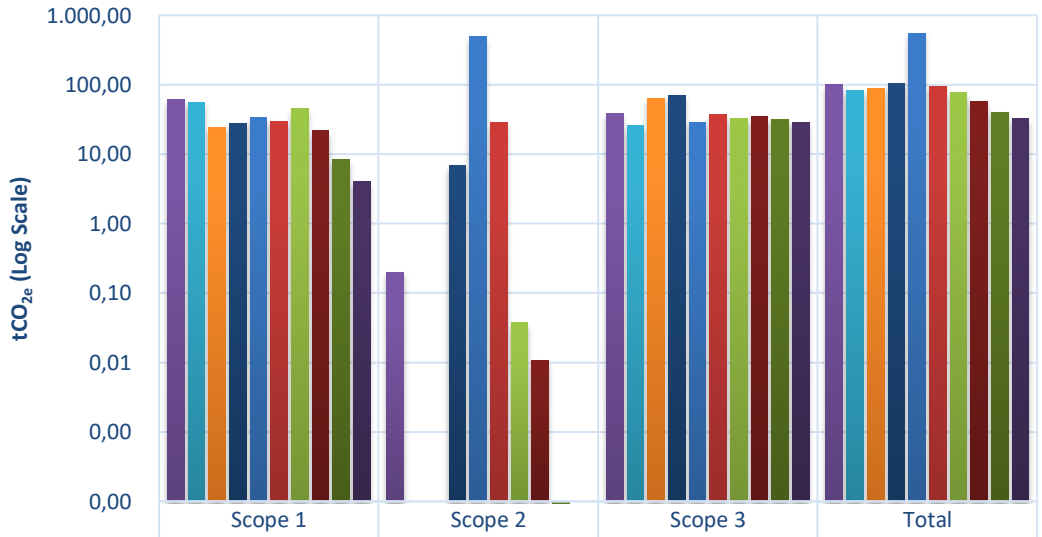
Emissions per GHG are detailed in the table below.

Annex Table 26 –UHCB emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**1,44**	**0,35**	**2,21**	-	**4,00**	**16,36**
Agricultural Activities	-	-	1,94	-	1,94	-
Stationary Combustion	1,42	0,00	0,00	-	1,43	0,15
Waste	-	0,24	0,22	-	0,46	-
Mobile Combustion	-	0,11	0,04	-	0,15	16,20
Fugitive Emissions	0,01	-	-	-	0,01	-
Scope 03	**26,92**	**1,46**	**0,51**	-	**28,89**	**22,91**
Commuting	9,30	0,02	0,15	-	9,47	1,00
Downstream	8,71	0,18	0,27	-	9,15	21,75
Air Travel	7,69	0,00	0,07	-	7,77	-
Waste	-	1,26	-	-	1,26	-
Business Travel	1,21	0,00	0,02	-	1,24	0,16
Total	**28,35**	**1,81**	**2,72**	-	**32,88**	**39,26**

UHCB GHG emissions from 2010 to 2019 are presented below.

Annex figure 30 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



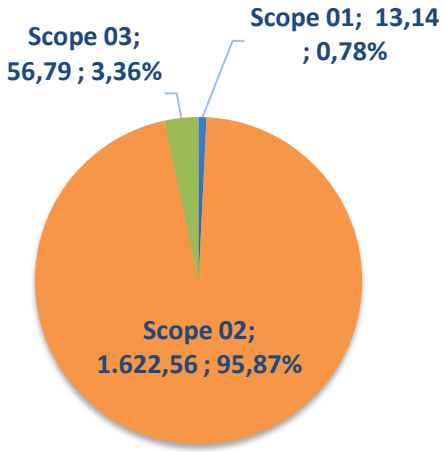
	Scope 1	Scope 2	Scope 3	Total
2010	60,85	0,20	38,58	99,63
2011	56,18	-	25,74	81,92
2012	24,38	-	64,29	88,67
2013	27,75	6,83	70,79	105,37
2014	34,09	487,51	28,99	550,58
2015	29,97	28,24	37,26	95,46
2016	45,04	0,04	32,36	77,44
2017	21,74	0,01	35,01	56,75
2018	8,28	0,0001	31,88	40,16
2019	4,00		28,89	32,88

UHCB reduced 18.1% of their emissions in 2018, mainly due to reductions on indirect mobile combustion (downstream).

b. Passo Fundo Hydropower Plant– UHPF

UHPF emitted 1,692 tCO_2e in 2019. Emissions per scope are presented below.

Annex figure 31 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



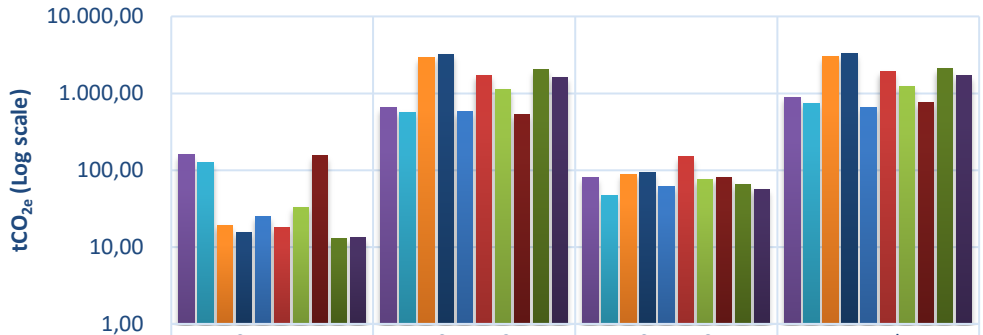
Emissions per GHG are detailed on the table below.

Annex Table 27 –UHPF Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**11,65**	**0,45**	**1,04**	-	**13,14**	**11,47**
Mobile combustion	10,01	0,13	0,30	-	10,44	11,45
Fugitive emissions	1,45	-	-	-	1,45	-
Waste	-	0,32	0,29	-	0,61	-
Agricultural activities	-	-	0,45	-	0,45	-
Stationary combustion	0,19	0,00	0,00	-	0,19	0,02
Scope 02	**1.622,56**	-	-	-	**1.622,56**	-
Electricity	1.622,56	-	-	-	1.622,56	-
Scope 03	**54,79**	**0,85**	**1,15**	-	**56,79**	**7,84**
Commuting	35,59	0,06	0,57	-	36,23	3,83
Upstream	17,60	0,15	0,56	-	18,31	3,97
Air travel	1,43	0,00	0,01	-	1,44	-
Waste	-	0,64	-	-	0,64	-
Business Travel	0,16	0,00	0,01	-	0,17	0,04
Total	**1.689,01**	**1,30**	**2,18**	-	**1.692,49**	**19,31**

UHPF GHG emissions from 2010 to 2019 are presented in the following figure.

Annex figure 29 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



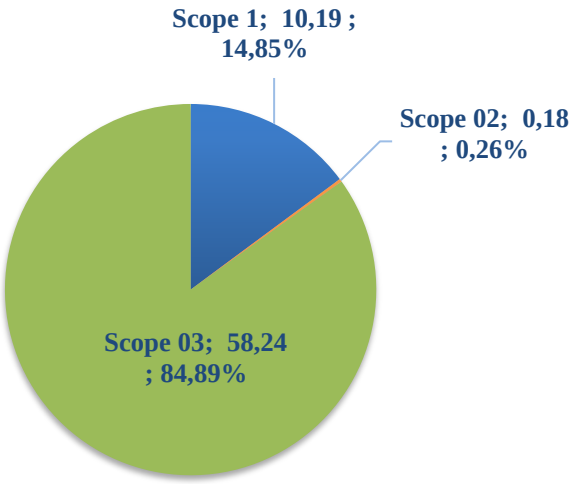
	Scope 1	Scope 2	Scope 3	Total
2010	160,97	644,58	79,56	885,11
2011	124,60	570,73	47,24	742,57
2012	19,35	2.883,34	88,83	2.991,52
2013	15,55	3.226,38	92,25	3.334,19
2014	25,02	574,82	61,04	660,88
2015	17,91	1.730,16	150,38	1.898,45
2016	33,05	1.132,56	75,94	1.241,55
2017	155,38	527,43	80,46	763,27
2018	12,88	2.034,35	64,83	2.112,06
2019	13,14	1.622,56	56,79	1.692,49

UHPF reduced 20% its emission compared to 2018. Main variations were concentrated on scope 2 emissions, due to electricity consumption reduction.

c. Ponte de Pedra Hydropower Plant – UHPP

UHPP emitted 68.61 tCO_2e during 2019, as presented on figure below.

Annex figure 33 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



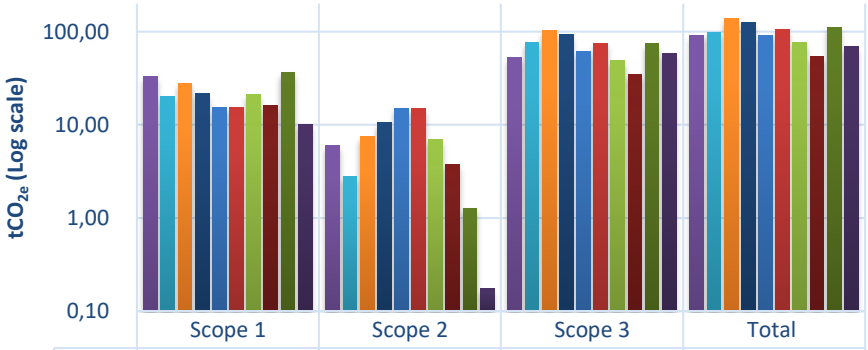
Emissions per GHG are detailed in the following table.

Annex Table 28 – UHPP GHG Emissions – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**9,49**	**0,33**	**0,36**	-	**10,19**	**18,50**
Mobile combustion	8,01	0,13	0,18	-	8,32	18,34
Stationary Combustion	1,48	0,00	0,00	-	1,49	0,16
Waste	-	0,20	0,18	-	0,38	-
Scope 02	**0,18**	-	-	-	**0,18**	-
Electricity	0,18	-	-	-	0,18	-
Scope 03	**56,86**	**0,22**	**1,16**	-	**58,24**	**9,58**
Upstream	36,41	0,19	0,86	-	37,46	8,07
Commuting	11,84	0,02	0,19	-	12,05	1,27
Air travel	7,69	0,00	0,07	-	7,76	-
Business travel	0,92	0,01	0,03	-	0,97	0,24
Total	**66,53**	**0,56**	**1,53**	-	**68,61**	**28,08**

The following figure presents UHPP GHG emissions between 2010 and 2019.

Annex figure 34 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



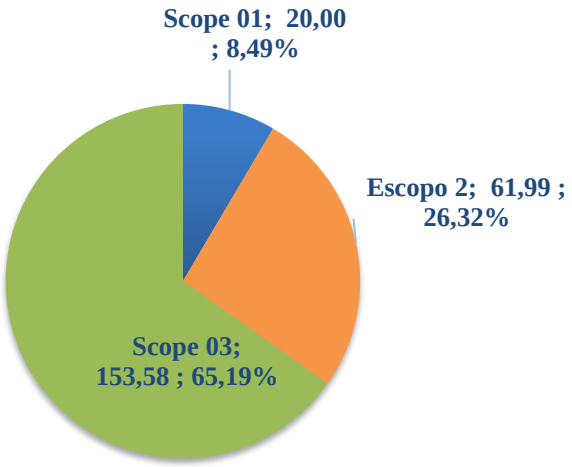
	Scope 1	Scope 2	Scope 3	Total
2010	32,93	5,96	52,87	91,76
2011	20,01	2,79	75,92	98,72
2012	27,92	7,45	103,42	138,78
2013	21,46	10,52	94,08	126,06
2014	15,16	15,14	61,07	91,38
2015	15,52	14,84	74,43	104,78
2016	21,12	6,87	48,64	76,64
2017	15,97	3,73	34,37	54,08
2018	36,62	1,28	74,16	112,05
2019	10,19	0,18	58,24	68,61

UHPP reduced 39% their emission compared to 2018, with smaller emissions in almost all sources.

d. Salto Osório Hydropower Plant – UHSO

UHSO emitted 235.58 tCO_2e during 2019, more concentrated on escopo 03, as presented below.

Annex figure 35 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



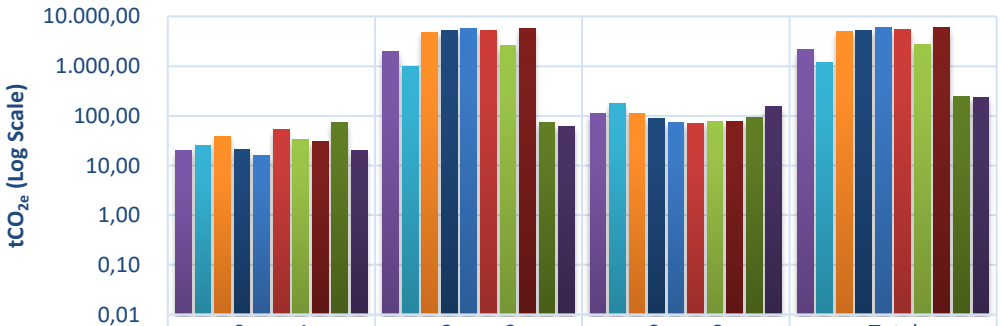
Emissions per GHG are detailed below.

Annex Table 29 –UHSO Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**19,44**	**0,16**	**0,40**	-	**20,00**	**21,98**
Mobile Combustion	11,73	0,16	0,26	-	12,16	21,87
Fugitive Emissions	6,68	-	-	-	6,68	-
Stationary Combustion	1,03	0,00	0,00	-	1,04	0,11
Agricultural Activities	-	-	0,13	-	0,13	-
Scope 02	**61,99**	-	-	-	**61,99**	-
Electricity	61,99	-	-	-	61,99	-
Scope 03	**140,87**	**9,98**	**2,74**	-	**153,58**	**47,08**
Commuting	94,43	0,22	1,66	-	96,31	11,23
Upstream	35,00	0,43	0,98	-	36,40	35,13
Waste	-	9,32	-	-	9,32	-
Air Travel	6,35	0,00	0,06	-	6,41	-
Indirect Fugitive Emissions	2,28	-	-	-	2,28	-
Indirect Fugitive Emissions	1,95	0,00	0,01	-	1,96	0,49
Business Travel	0,86	0,01	0,03	-	0,90	0,22
Total	**222,30**	**10,14**	**3,13**	-	**235,58**	**69,05**

The following figure shows UHSO GHG emissions from 2010 to 2019.

Annex figure 36 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



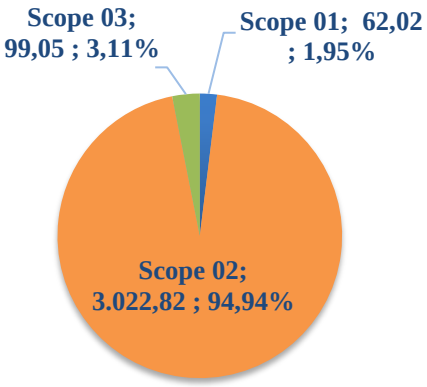
	Scope 1	Scope 2	Scope 3	Total
2010	20,34	2.010,32	111,44	2.142,10
2011	25,79	985,06	180,16	1.191,01
2012	38,90	4.841,48	112,94	4.993,32
2013	21,41	5.103,7990	88,65	5.213,86
2014	15,68	5.837,95	75,02	5.928,66
2015	52,14	5.298,14	71,24	5.421,52
2016	33,65	2.565,19	77,99	2.676,83
2017	30,75	5.852,30	77,19	5.960,24
2018	74,51	72,62	93,19	240,33
2019	20,00	61,99	153,58	235,58

UHSO reduced 2% its emissions compared to 2018.

e. Hydropower Plant Salto Santiago – UHSS

UHSS emitted 3,183 tCO_2e during 2019 as presented on table below.

Annex figure 37 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



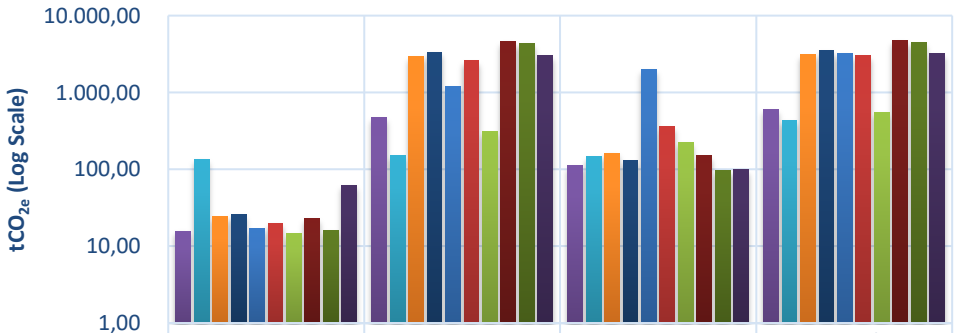
Emissions per GHG are shown on table below.

Annex table 30 –UHSS emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**61,42**	**0,14**	**0,46**	-	**62,02**	**18,94**
Fugitive emissions	49,95	-	-	-	49,95	-
Mobile combustion	9,10	0,14	0,21	-	9,45	18,69
Stationary combustion	2,36	0,00	0,01	-	2,37	0,25
Agricultural Activities	-	-	0,25	-	0,25	-
Scope 02	**3.022,82**	-	-	-	**3.022,82**	-
Electricity	3.022,82	-	-	-	3.022,82	-
Scope 03	**91,26**	**5,78**	**2,01**	-	**99,05**	**28,90**
Commuting	45,82	0,19	0,84	-	46,84	17,68
Upstream	32,22	0,25	0,94	-	33,41	9,16
Waste	-	5,29	-	-	5,29	-
Air Travel	5,21	0,00	0,05	-	5,26	-
Business Travel	4,71	0,05	0,17	-	4,93	1,20
Indirect Stationary Combustion	3,30	0,00	0,01	-	3,32	0,86
Total	**3.175,49**	**5,92**	**2,47**	-	**3.183,88**	**47,84**

The figure below presents UHSS GHG emissions between 2010 and 2019.

Annex figure 38 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



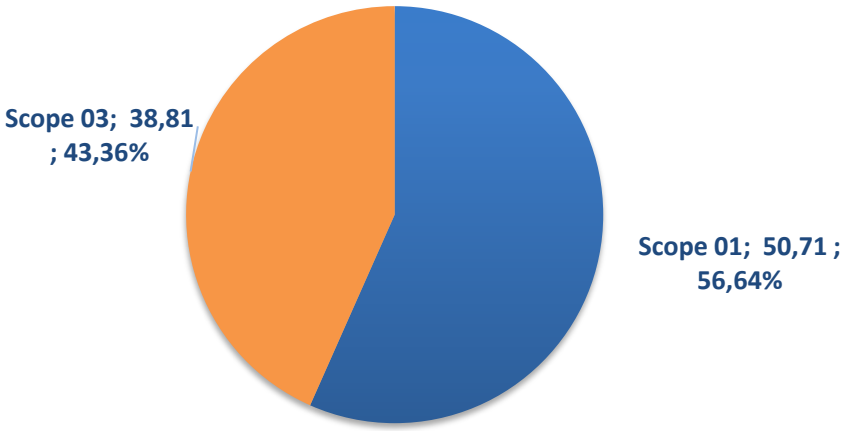
	Scope 1	Scope 2	Scope 3	Total
2010	15,78	469,07	111,20	596,05
2011	135,11	151,99	145,24	432,34
2012	24,09	2.938,79	163,23	3.126,11
2013	25,58	3.352,19	128,78	3.506,55
2014	16,94	1.182,46	1.973,33	3.172,73
2015	19,91	2.603,50	360,48	2.983,89
2016	14,59	311,21	224,51	550,31
2017	23,26	4.571,20	151,52	4.745,99
2018	16,08	4.367,33	95,99	4.479,39
2019	62,02	3.022,82	99,05	3.183,88

UHSS reduced 28.9% of its emissions related to 2018, mainly due to electrity consumption related to its SIN synchron compensation role. Higher emissions on scope 01 are related to higher fugitive emissions (air-conditioning).

f. São Salvador Hidropower Plant – UHSA

UHSA emitted 89.53 tCO_2e in 2019, as presented in the following figure.

Annex figure 39 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



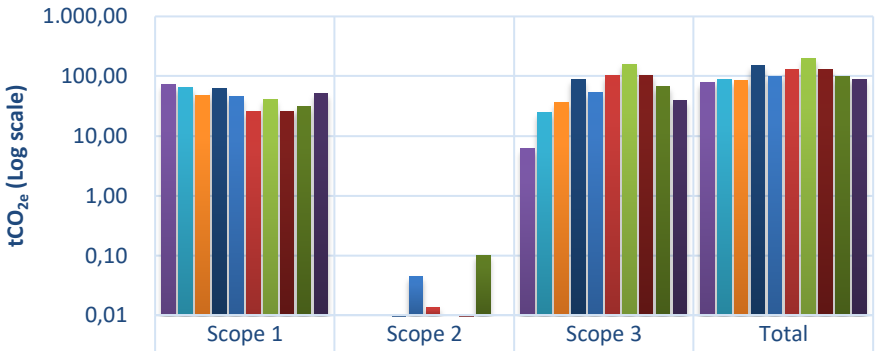
Emissions per GHG are the detailed on following table.

Annex Table 31 –UHSA Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**49,47**	**0,42**	**0,82**	-	**50,71**	**27,27**
Mobile Combustion	34,61	0,22	0,63	-	35,45	27,02
Fugitive Emission	12,50	-	-	-	12,50	-
Stationary Combustion	2,36	0,00	0,01	-	2,37	0,25
Waste	-	0,21	0,18	-	0,39	-
Scope 03	**37,08**	**0,86**	**0,88**	-	**38,81**	**27,64**
Commuting	19,53	0,03	0,31	-	19,88	2,10
Upstream	16,11	0,27	0,55	-	16,93	25,54
Air Travel	1,43	0,00	0,01	-	1,45	-
Waste	-	0,55	-	-	0,55	-
Total	**86,55**	**1,28**	**1,69**	-	**89,53**	**54,91**

Figure below presente UHSA GHG emissions form 2010 to 2019.

Annex figure 40 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



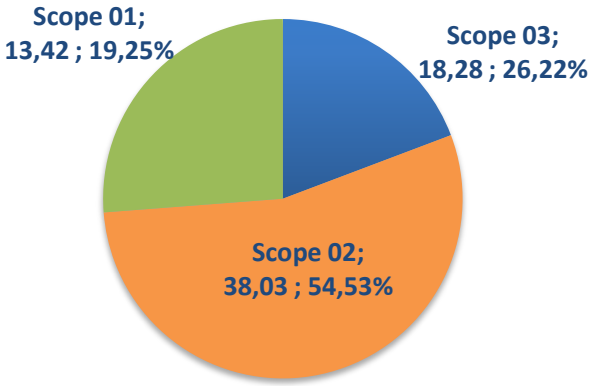
	Scope 1	Scope 2	Scope 3	Total
2010	72,73	-	6,13	78,86
2011	64,52	-	24,46	88,98
2012	47,29	-	35,92	83,21
2013	61,36	0,0003	87,60	148,97
2014	45,48	0,04	52,30	97,83
2015	25,68	0,01	101,29	126,98
2016	40,19	-	159,20	199,39
2017	25,80	0,01	104,58	130,39
2018	31,62	0,10	67,03	98,75
2019	50,71		38,81	89,53

UHSA reduced 9.3% their emissions compared to 2018. Main emissions sources responsible for this reduction were transport and distribution upstream and commuting.

g. Hydropower Plant Jaguara - UHJA

UHJA emitted 69.74 tCO_2e in 2019, as presented in the following figure.

Annex figure 41 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



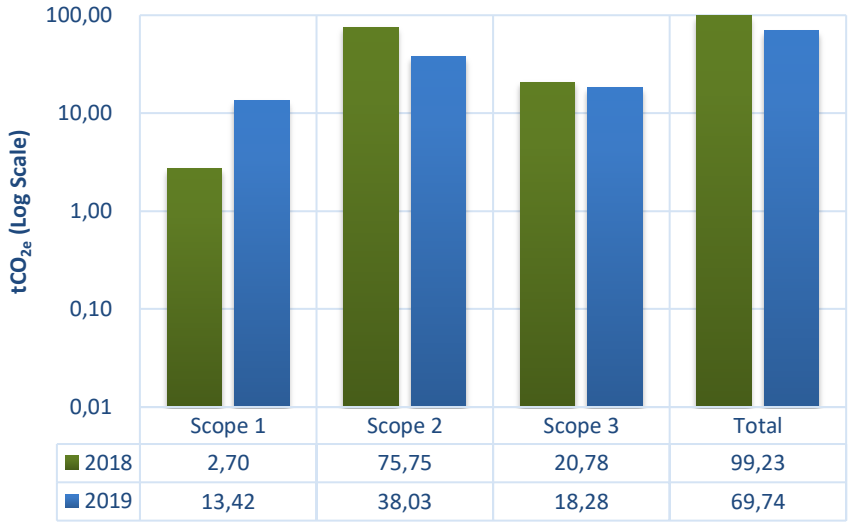
Emissions per GHG are the detailed on following table.

Annex Table 32 –UHJA Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**12,78**	**0,33**	**0,31**	-	**13,42**	**47,62**
Mobile Combustion	11,73	0,33	0,31	-	12,37	47,61
Fugitive Emissions	0,96	-	-	-	0,96	-
Stationary Combustion	0,09	0,00	0,00	-	0,09	0,01
Scope 02	**38,03**	-	-	-	**38,03**	-
Electricity	38,03	-	-	-	38,03	-
Scope 03	**15,50**	**2,52**	**0,26**	-	**18,28**	**9,65**
Upstream	7,81	0,08	0,18	-	8,08	9,55
Air Travel	7,29	0,00	0,07	-	7,36	-
Waste	-	2,44	-	-	2,44	-
Business Travel	0,39	0,00	0,01	-	0,41	0,10
Total	**66,31**	**2,85**	**0,58**	-	**69,74**	**57,27**

The figue below show GHG emission trajectory of UHJA from 2018 to 2019.

Annex figure 42 – Emissions trajectory – Operational Control and Equity Share (tCO2e)

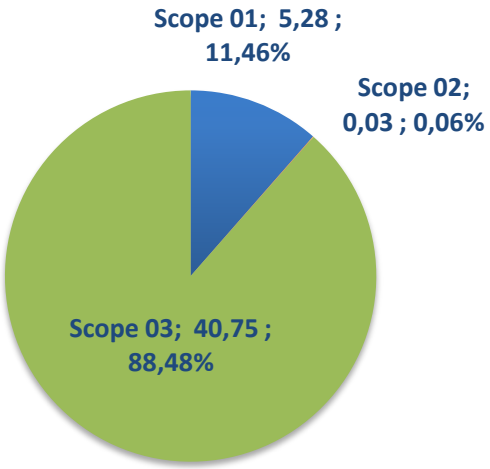


UHJA reduced 29.7% emission related to 2018, mainly to lower electriciy consumption.

h. Hydropower Plant Miranda - UHMI

UHMI emitted 46.05 tCO_2e in 2019, as presented in the following figure.

Annex figure 43 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



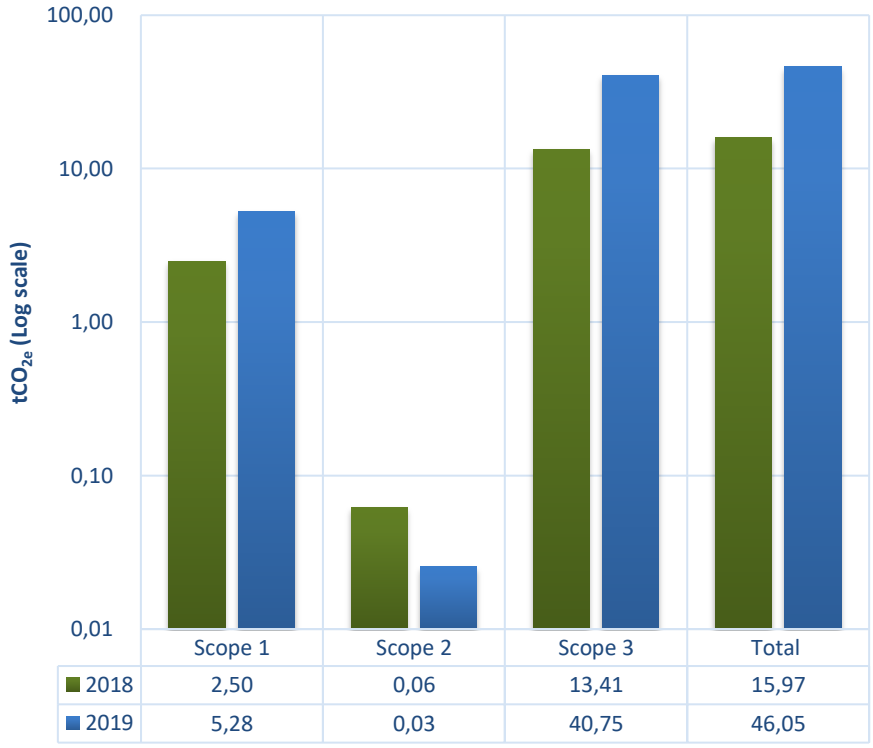
Emissions per GHG are the detailed on following table.

Annex Table 31 –UHMI Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**4,85**	**0,22**	**0,21**	-	**5,28**	**15,50**
Mobile combustion	4,40	0,11	0,12	-	4,62	15,49
Fugitive emissions	0,42	-	-	-	0,42	-
Waste	-	0,11	0,10	-	0,21	-
Stationary combustion	0,03	0,00	0,00	-	0,03	0,01
Scope 02	**0,03**	-	-	-	**0,03**	-
Electricity	0,03	-	-	-	0,03	-
Scope 03	**39,44**	**0,31**	**1,00**	-	**40,75**	**20,28**
Upstream	21,23	0,28	0,73	-	22,24	18,69
Commuting	13,77	0,02	0,22	-	14,01	1,48
Air Travel	4,03	0,00	0,04	-	4,06	-
Business Travel	0,41	0,00	0,01	-	0,43	0,10
Total	**44,31**	**0,52**	**1,22**	-	**46,05**	**35,78**

The figure below present UHMI GHG emissions trajectory between 2018 and 2019.

Annex figure 44 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



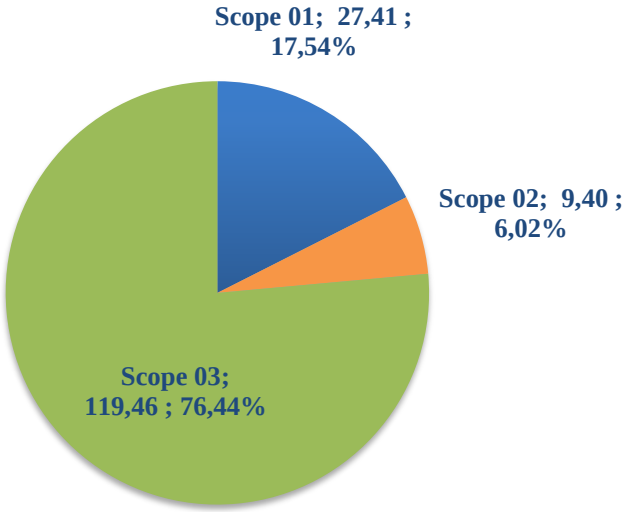
	Scope 1	Scope 2	Scope 3	Total
2018	2,50	0,06	13,41	15,97
2019	5,28	0,03	40,75	46,05

UHMI increased its emission (188%) related to 2018 due to a higher scope 03 emissions of upstream and commuting.

i. Hydropower Plant Estreito – UHET

UHET emitted 156.27 tCO_2e during 2019, considering Engie equity share (40.07%). Emissions per scope is presented below.

Annex figure 45 – Emissions per scope (tCO_2e/ %) – Equity Share



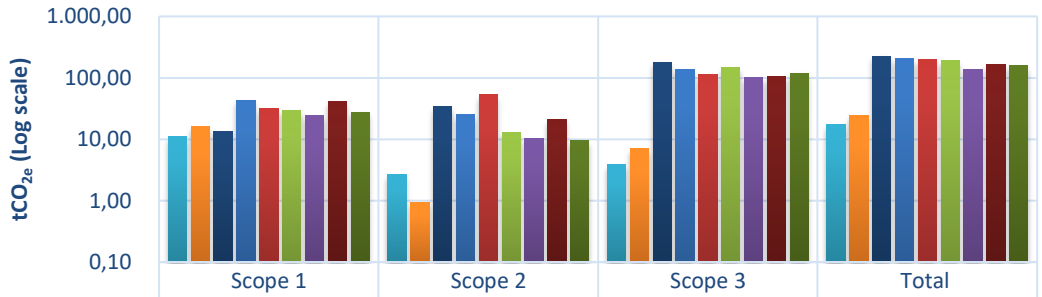
Emissions per GHG are detailed below.

Annex Table 34 – UHET Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**10,84**	**0,53**	**1,42**	**14,62**	**27,41**	**6,60**
SF6	-	-	-	14,62	14,62	-
Stationary Combustion	6,33	0,01	0,02	-	6,35	0,68
Fugitive Emissions	2,42	-	-	-	2,42	-
Mobile combustion	2,09	0,06	0,09	-	2,23	5,92
Agricultural Activities	-	-	1,18	-	1,18	-
Waste	-	0,47	0,13	-	0,60	-
Scope 02	**9,40**	-	-	-	**9,40**	-
Electricity	9,40	-	-	-	9,40	-
Scope 03	**117,18**	**0,36**	**1,92**	-	**119,46**	**21,21**
Upstream	60,04	0,30	1,30	-	61,63	18,59
Air Travel	44,29	0,01	0,42	-	44,71	-
Commuting	7,37	0,03	0,16	-	7,56	1,13
Waste	4,31	-	-	-	4,31	-
Downstream	1,18	0,01	0,04	-	1,23	0,35
Business Travel	-	0,01	0,00	-	0,01	1,13
Total	**137,43**	**0,89**	**3,34**	**14,62**	**156,27**	**27,80**

Figure below presents UHET GHG Emissions between 2011 and 2019.

Annex figure 46 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



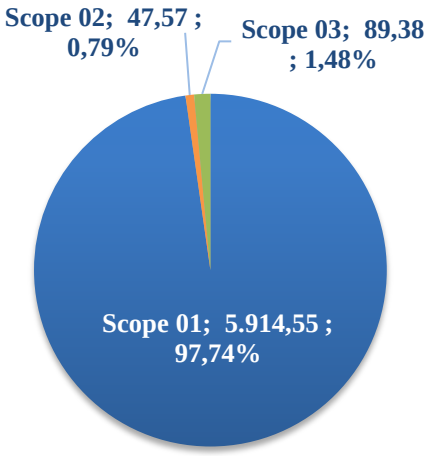
	Scope 1	Scope 2	Scope 3	Total
2011	10,92	2,69	3,88	17,49
2012	16,26	0,92	7,12	24,30
2013	13,30	33,57	179,97	226,84
2014	43,38	24,92	138,11	206,41
2015	32,06	53,09	112,20	197,35
2016	29,92	12,70	145,49	188,11
2017	24,05	10,37	101,72	136,15
2018	41,62	20,97	104,52	167,11
2019	27,41	9,40	119,46	156,27

UHET reduced 6.5% of their emissions comparing to 2018, due to minor scope 01 and 02 emissions.

j. Itá Hydropower Plant – UHIT

UHIT emitted 6,051 tCO_2e in 2019, considering Engie equity share of 68.99%. GHG emissions are concentrated on scope 1, as shown on figure below.

Annex figure 47 – Emissions per scope (tCO_2e/ %) –Equity Share



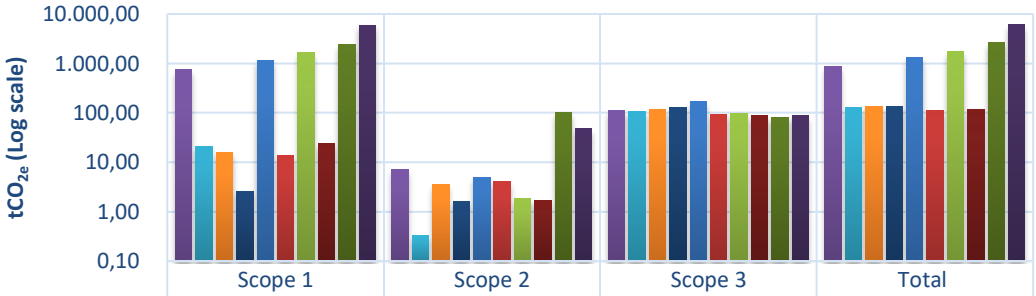
Emissions per GHG are detailed on the following table.

Annex Table 35 – UHIT emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**14,76**	**0,29**	**0,86**	**5.898,65**	**5.914,55**	**6,12**
SF6	-	-	-	5.898,65	5.898,65	-
Fugitive Emissions	10,23	-	-	-	10,23	-
Mobile Combustion	4,39	0,07	0,15	-	4,61	6,11
Agricultural Activities	-	-	0,51	-	0,51	-
Waste	-	0,22	0,20	-	0,42	-
Stationary combustion	0,15	0,00	0,00	-	0,15	0,02
Scope 02	**47,57**	-	-	-	**47,57**	-
Electricity	47,57	-	-	-	47,57	-
Scope 03	**82,79**	**4,92**	**1,67**	-	**89,38**	**8,76**
Commuting	45,57	0,08	0,73	-	46,38	4,90
Air Travel	18,95	0,01	0,18	-	19,14	-
Upstream	17,51	0,13	0,52	-	18,16	3,66
Waste	-	4,70	0,22	-	4,91	-
Business Travel	0,76	0,01	0,03	-	0,79	0,19
Total	**145,12**	**5,21**	**2,53**	**5.898,65**	**6.051,50**	**14,88**

The figure below shows UHIT GHG emissions between 2010 and 2019.

Annex figure 48 – Emissions trajectory –Equity Share (tCO2e)



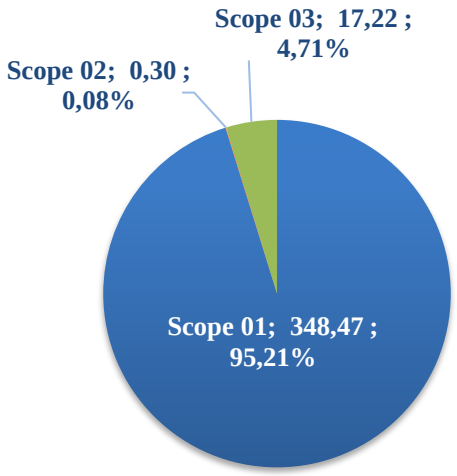
	Scope 1	Scope 2	Scope 3	Total
2010	737,66	7,10	113,11	857,87
2011	20,44	0,33	106,56	127,33
2012	15,50	3,56	116,12	135,18
2013	2,62	1,62	130,18	134,43
2014	1.137,84	5,00	169,09	1.311,93
2015	13,94	4,07	92,95	110,96
2016	1.636,35	1,82	98,43	1.736,60
2017	23,82	1,67	89,19	114,69
2018	2.455,03	101,36	81,06	2.637,45
2019	5.914,55	47,57	89,38	6.051,50

In 2019, UHIT increased signficantly their emissions compared to 2018 due to SF6 emissions. SF6 leakage is the main factor for variations on scope 1 emissions of UHIT.

k. Hydropower Plant Machadinho – UHMA

UHMA emitted 365.99 tCO_2e in 2019, considering Engie equity share of 19.29%. GHG emissions are more concentrated on scope 1 as presented in the following figure.

Annex figure 49 – Emissions per scope (tCO_2e/ %) –Equity Share



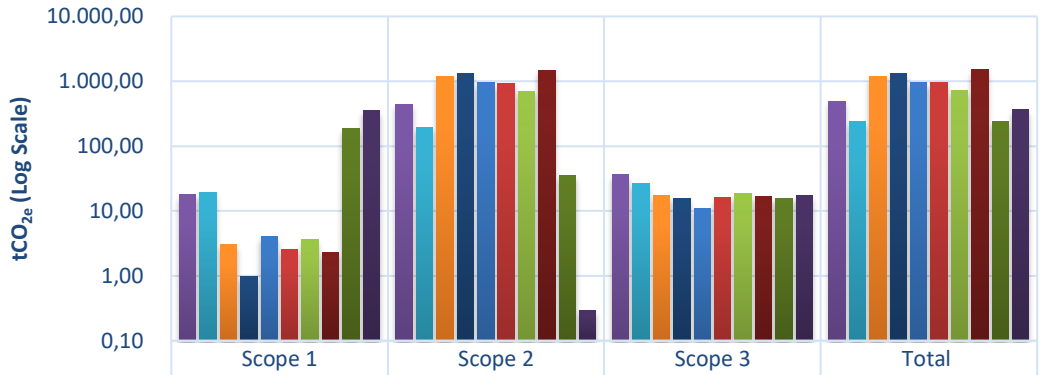
Emissions per GHG are presented in the table below.

Annex Table 36 – UHMA Emissions per GHG– 2019 (tCO2e)

Emission Sources	Emissions per Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**1,46**	**0,15**	**0,20**	**346,66**	**348,47**	**2,71**
SF6	-	-	-	346,66	346,66	-
Mobile Combustion	1,45	0,03	0,05	-	1,52	**2,71**
Waste	-	0,12	0,11	-	0,23	-
Agricultural Activities	-	-	0,05	-	0,05	-
Fugitive Emissions	0,00	-	-	-	0,00	-
Scope 02	**0,30**	-	-	-	**0,30**	-
Electricity	0,30	-	-	-	0,30	-
Scope 03	**16,68**	**0,26**	**0,28**	-	**17,22**	**1,88**
Commuting	14,29	0,02	0,23	-	14,55	1,54
Upstream	2,08	0,01	0,05	-	2,14	0,34
Air Travel	0,31	0,00	0,00	-	0,31	-
Waste	-	0,22	-	-	0,22	-
Total	**18,43**	**0,41**	**0,49**	**346,66**	**365,99**	**4,59**

Figure below shows UHMA GHG emisions from 2010 to 2019.

Annex figure 50 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



	Scope 1	Scope 2	Scope 3	Total
2010	18,15	442,58	35,97	496,70
2011	19,33	191,23	26,50	237,06
2012	3,08	1.175,85	17,31	1.196,25
2013	0,98	1.302,76	15,88	1.319,62
2014	4,01	957,13	10,75	971,89
2015	2,56	931,91	16,12	950,59
2016	3,60	707,17	18,71	729,47
2017	2,33	1.490,25	16,83	1.509,41
2018	186,26	35,11	15,81	237,18
2019	348,47	0,30	17,22	365,99

UHMA increased 54% of the emissions compared to 2018, mainly due higher SF6 emissions.

5. Thermoelectric Plants

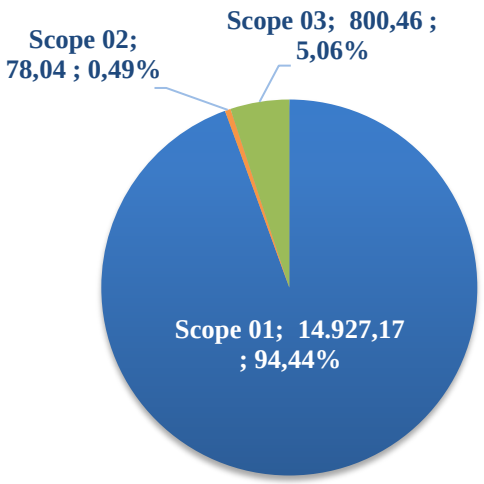
Engie has 100% of equity share over thermoelectric plants Ferrari (UTFE), Jorge Lacerda (CTJL), Lages (UCLA) and Pampa Sul (UTPS). For these entrepreneurships, GHG emissions for equity share approach are the same as operational control approach.

For Ibitiúva Plant (UTIB), Engie has operational control and 69.26% of equity share. Therefore, this is the only enterprise of the group that presents different results for different approaches.

a. Thermoelectric Plant Ferrari – UTFE

UTFE emitted 15,805 tCO_2e during 2019, with higher concentration on scope 1, as presented below.

Annex figure 51 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



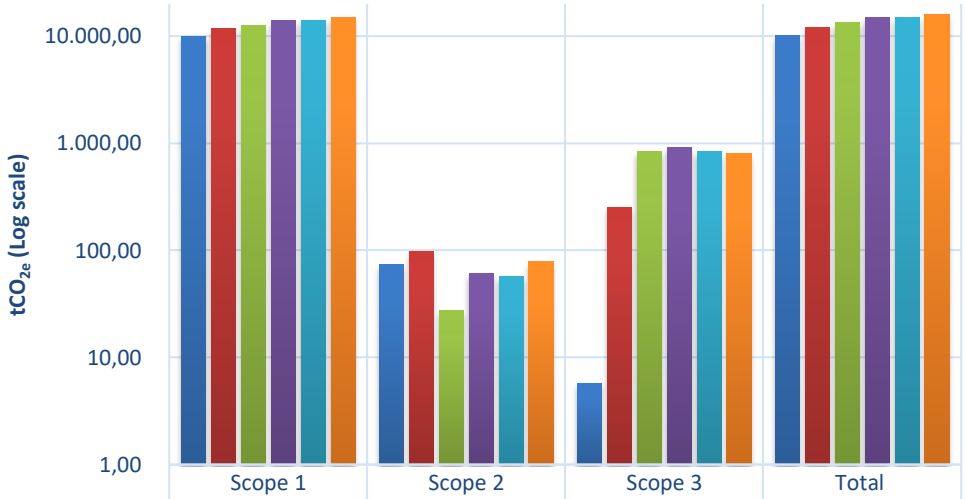
Emissions per GHG are presented below.

Annex Table 37 –UTFE Emissions per GHG– 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**17,77**	**5.758,01**	**9.151,39**	-	**14.927,17**	**768.501,75**
Stationary Combustion	5,77	5.757,98	9.151,35	-	14.915,10	768.497,91
Fugitive Emission	11,33	-	-	-	11,33	-
Mobile Combustion	0,68	0,03	0,03	-	0,74	3,84
Scope 02	**78,04**	-	-	-	**78,04**	-
Electricity	78,04	-	-	-	78,04	-
Scope 03	**786,45**	**1,34**	**12,68**	-	**800,46**	**84,64**
Upstream	786,45	1,34	12,68	-	800,46	84,64
Total	**882,26**	**5.759,34**	**9.164,06**	-	**15.805,67**	**768.586,39**

The figure below shows UTFE GHG emissions from 2014 to 2019.

Annex figure 52 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



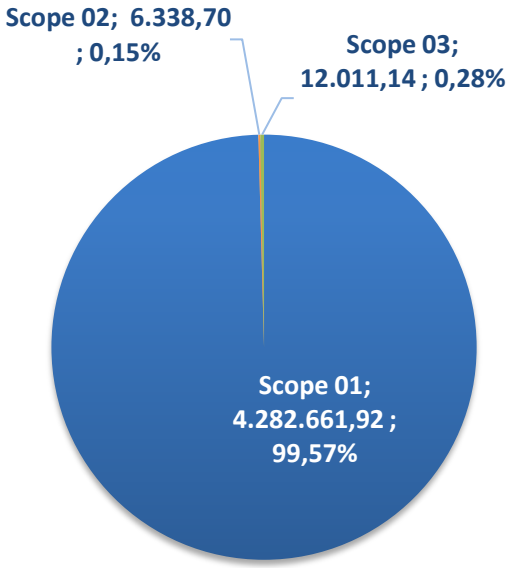
	Scope 1	Scope 2	Scope 3	Total
2014	9.953,05	73,44	5,75	10.032,25
2015	11.779,33	96,75	249,51	12.125,59
2016	12.621,98	27,16	835,41	13.484,55
2017	13.956,67	61,19	902,81	14.920,68
2018	14.013,70	56,62	837,19	14.907,51
2019	14.927,17	78,04	800,46	15.805,67

UTFE increased 6% its emission related to 2018 due to higher stationary combustiom emissions (scope 01).

b. Thermoelectric Complex Jorge Lacerda – CTJL

CTJL emitted 4,301,011 tCO_2e during 2019 with concentration on coal combustion, main emission source of the group.

Annex figure 53 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



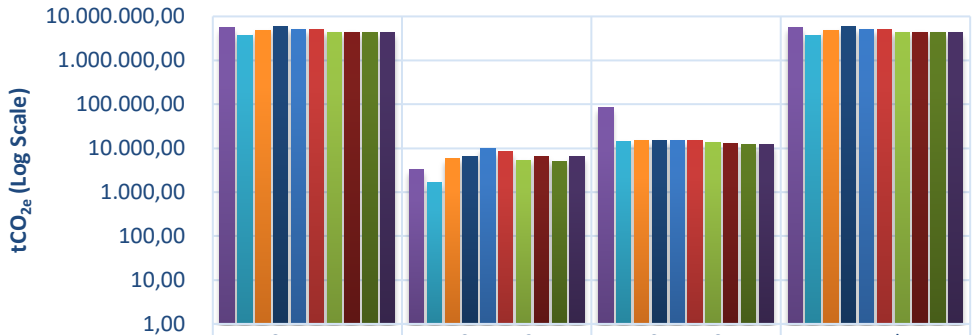
CTJL emissions per GHG are detailed on table below.

Annex Table 38 – CTJL emissions per GHG– 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**4.261.737,68**	**1.132,61**	**19.791,63**	-	**4.282.661,92**	**1.293,84**
Stationary Combustion	4.261.562,74	1.125,76	19.783,89	-	4.282.472,38	1.256,43
Mobile Combustion	87,85	1,02	1,17	-	90,04	37,42
Fugitive Emissions	87,10	-	-	-	87,10	-
Waste	-	5,83	5,21	-	11,04	-
Agricultural Activities	-	-	1,364	-	1,364	-
Scope 02	**6.338,70**	-	-	-	**6.338,70**	-
Electricity	6.338,70	-	-	-	6.338,70	-
Scope 03	**11.637,96**	**170,87**	**202,31**	-	**12.011,14**	**1.229,18**
Downstream	6.034,85	10,24	97,29	-	6.142,39	649,51
Upstream	5.237,55	9,42	85,48	-	5.332,45	571,66
Waste	248,92	151,02	17,86	-	417,80	-
Commuting	55,32	0,09	0,89	-	56,30	5,95
Air Travel	53,28	0,01	0,50	-	53,79	-
Business Travel	8,05	0,08	0,29	-	8,42	2,05
Total	**4.279.714,34**	**1.303,48**	**19.993,94**	-	**4.301.011,76**	**2.523,03**

CTJL GHG emisisons between 2010 and 2019 is presented as follows.

Annex figure 54 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



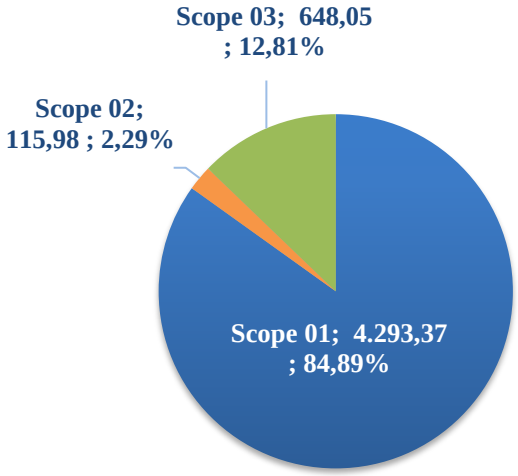
	Scope 1	Scope 2	Scope 3	Total
2010	5.574.077,71	3.199,20	84.399,55	5.661.676,46
2011	3.654.967,06	1.616,55	14.346,65	3.670.930,26
2012	4.856.278,09	5.755,72	14.796,04	4.876.829,86
2013	5.874.984,89	6.517,50	15.158,22	5.896.660,61
2014	5.141.350,52	9.781,26	14.681,80	5.165.813,58
2015	4.971.560,84	8.289,22	15.155,49	4.995.005,55
2016	4.353.516,67	5.358,60	13.463,83	4.372.339,10
2017	4.376.632,89	6.494,10	12.502,01	4.395.629,00
2018	4.316.714,97	4.983,63	11.897,72	4.333.596,32
2019	4.282.661,92	6.338,70	12.011,14	4.301.011,76

CTJL emissions reduced 0.8% compared to 2018, due to a sligh lower coal consumption.

c. Lages Cogeneration Plant – UCLA

UCLA emitted 5,057 tCO_2e during 2019, as presented below.

Annex figure 55 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



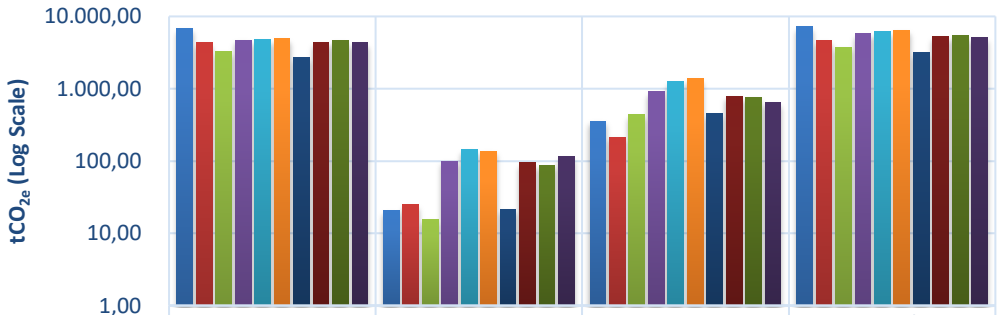
Emissions per GHG and sources can been seen in the following table.

Annex Table 39 –UCLA emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**196,85**	**1.581,25**	**2.515,27**	-	**4.293,37**	**211.797,45**
Stationary Combustion	5,18	1.580,96	2.512,68	-	4.098,82	211.778,27
Mobile Combustion	160,10	0,29	2,59	-	162,98	19,18
Fugitive Emissions	31,57	-	-	-	31,57	-
Scope 02	**115,98**	-	-	-	**115,98**	-
Electricity	115,98	-	-	-	115,98	-
Scope 03	**629,89**	**7,72**	**10,44**	-	**648,05**	**69,21**
Upstream	598,07	1,02	9,64	-	608,73	64,37
Commuting	29,43	0,14	0,68	-	30,25	4,76
Waste	-	6,56	0,09	-	6,65	-
Air Travel	2,06	0,00	0,02	-	2,08	-
Business Travel	0,33	0,00	0,01	-	0,34	0,08
Total	**942,72**	**1.588,97**	**2.525,71**	-	**5.057,40**	**211.866,66**

UCLA GHG emissions from 2010 to 2019 are presented below.

Annex figure 56 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



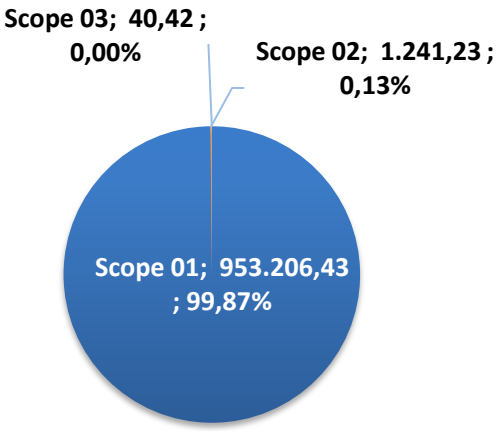
	Scope 1	Scope 2	Scope 3	Total
2010	6.874,85	20,45	355,12	7.250,42
2011	4.378,23	24,76	214,07	4.617,06
2012	3.296,34	15,55	444,97	3.756,86
2013	4.717,54	99,93	915,02	5.732,49
2014	4.750,27	144,11	1.240,06	6.134,44
2015	4.934,80	137,15	1.386,55	6.458,50
2016	2.686,00	21,31	448,80	3.156,11
2017	4.415,07	95,61	785,10	5.295,78
2018	4.572,33	87,95	757,49	5.417,77
2019	4.293,37	115,98	648,05	5.057,40

UCLA decreased 6.7% related to 2018, mainly due to lower stationary combustion emisisons.

d. Thermoelectric Plant Pampa Sul (UTPS)

UTPS emitted 954,488 tCO_2e during 2019, as follows.

Annex figure 57 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



Emissions per GHG and sources can been seen in the following table.

Annex Table 40 –UTPS emissions per GHG – 2019 (tCO2e)

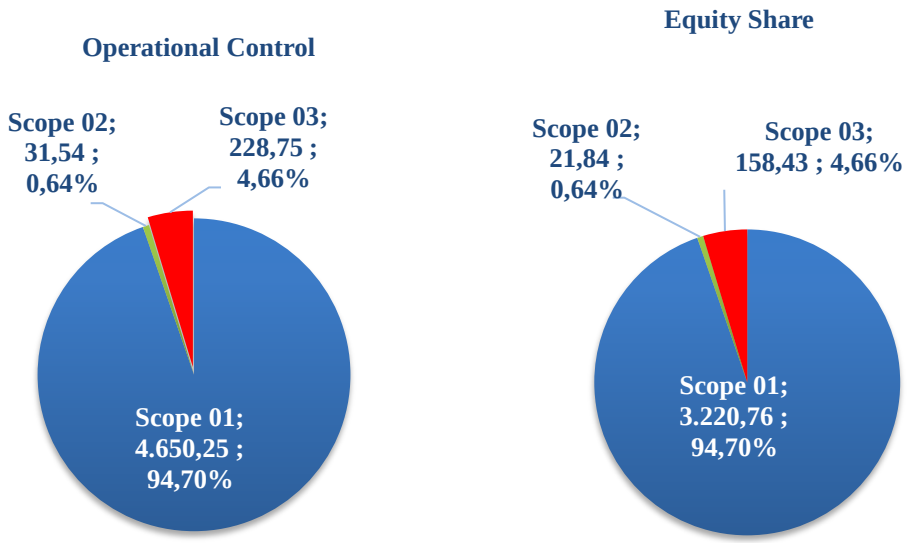
Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**948.782,79**	**235,91**	**4.187,73**	-	**953.206,43**	**187,57**
Stationary Combustion	948.782,79	235,91	4.187,73	-	953.206,43	187,57
Scope 02	**1.241,23**	-	-	-	**1.241,23**	-
Electricity	1.241,23	-	-	-	1.241,23	-
Scope 03	**40,03**	**0,01**	**0,38**	-	**40,42**	-
Air Travel	40,03	0,01	0,38	-	40,42	-
Total	**950.064,05**	**235,92**	**4.188,11**	-	**954.488,08**	**187,57**

This is the first UTPS GHG measurement. Therefore there are no comparison to previous results.

e. Thermoelectric Plant Ibitiúva – UTIB

UTIB emitted 4,910 tCO_2e using operational control approach and 3,401 tCO_2e using equity share approach. GHG emissions are presented below.

Annex Figure 58 – Emissions per scope (tCO2e/ %) – Operational Control and Equity Share



Emissions per GHG and sources are detailed on the following table.

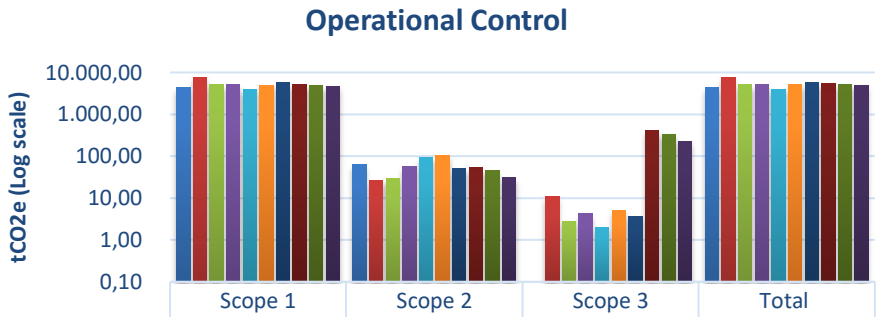
Annex Table 41 –UTIB Emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per operational control (tCO_2e)						Emissions per equity share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**13,96**	**1.790,47**	**2.845,81**	-	**4.650,25**	**238.967,16**	**9,67**	**1.240,08**	**1.971,01**	-	**3.220,76**	**165.508,66**
Stationary combustion	2,13	1.790,45	2.845,62	-	4.638,21	238.965,25	1,48	1.240,07	1.970,88	-	3.212,42	165.507,34
Mobile combustion	11,77	0,02	0,19	-	11,99	1,91	8,15	0,02	0,13	-	8,30	1,32
Fugitive emission	0,06	-	-	-	0,06	-	0,04	-	-	-	0,04	-
Scope 02	**31,54**	-	-	-	**31,54**	-	**21,84**	-	-	-	**21,84**	-
Electricity	31,54	-	-	-	31,54	-	21,84	-	-	-	21,84	-
Scope 03	**223,77**	**1,37**	**3,61**	-	**228,75**	**24,08**	**154,98**	**0,95**	**2,50**	-	**158,43**	**16,68**
Downstream	223,77	0,38	3,61	-	227,76	24,08	154,98	0,26	2,50	-	157,74	16,68
Waste	-	0,99	-	-	0,99	-	-	0,69	-	-	0,69	-
Total	**269,26**	**1.791,84**	**2.849,42**	-	**4.910,53**	**238.991,25**	**186,49**	**1.241,03**	**1.973,51**	-	**3.401,03**	**165.525,34**

UTIB GHG emissions between 2010 and 2019 for both approaches are presented below.

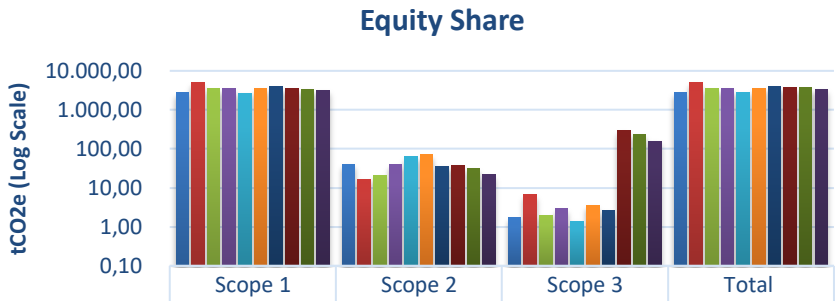
Annex Figure 59 – Emissions per scope (tCO2e/ %) – Operational Control and Equity Share Approach

Operational Control Approach



	Scope 1	Scope 2	Scope 3	Total
2010	4.257,13	63,20	-	4.320,33
2011	7.647,88	25,61	10,62	7.684,11
2012	5.080,99	29,58	2,81	5.113,38
2013	5.081,93	55,69	4,20	5.141,81
2014	3.830,13	91,08	2,03	3.923,23
2015	5.007,13	102,09	5,12	5.114,34
2016	5.689,12	51,75	3,68	5.744,55
2017	5.017,23	54,70	415,01	5.486,94
2018	4.910,97	46,07	337,37	5.294,42
2019	4.650,25	31,54	228,75	4.910,53

Equity Share Approach



	Scope 1	Scope 2	Scope 3	Total
2010	2.728,81	40,54	1,71	2.771,06
2011	4.905,35	16,43	6,81	4.928,59
2012	3.519,09	20,49	1,95	3.541,53
2013	3.519,74	38,57	2,91	3.561,22
2014	2.652,74	63,08	1,41	2.717,23
2015	3.467,94	70,71	3,54	3.542,19
2016	3.940,28	35,84	2,55	3.978,67
2017	3.474,93	37,89	287,43	3.800,25
2018	3.401,34	31,91	233,66	3.666,91
2019	3.220,76	21,84	158,43	3.401,03

UTIB reduced 7.3% of its emission using operational control approach, as well as equity share approach. This reduction happened in all scopes.

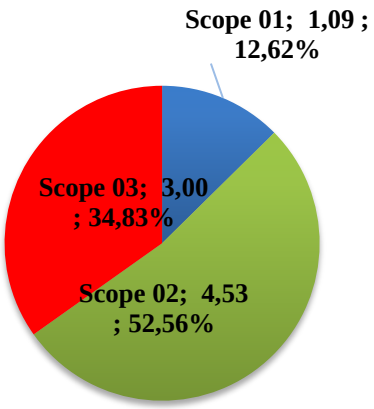
6. Offices

Engie has two offices located in São Paulo and Florianopólis. Engie has operational control and 100% equity share over both.

a. Engie Office in São Paulo – ESCSP

ESCSP emitted 8.62 tCO_2e during 2019, as presented below.

Annex figure 60 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



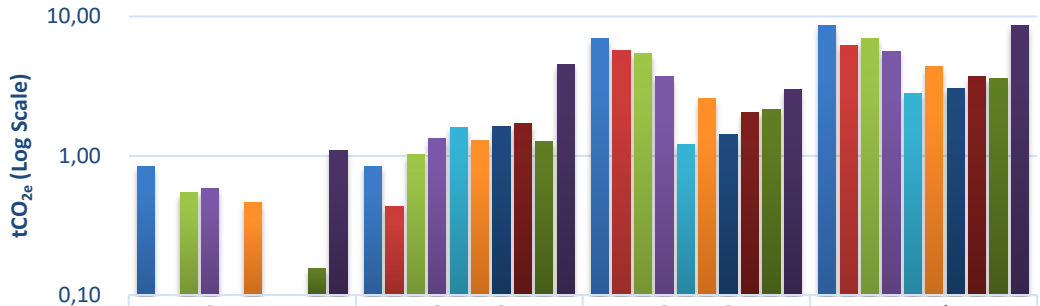
Emissions per GHG are detailed on the following table.

Annex Table 42 –ESCSP emissions per GHG– 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**1,04**	**0,01**	**0,04**	-	**1,09**	**0,27**
Mobile Combustion	1,04	0,01	0,04	-	1,09	0,27
Scope 02	**4,53**	-	-	-	**4,53**	-
Electricity	4,53	-	-	-	4,53	-
Scope 03	**2,94**	**0,01**	**0,05**	-	**3,00**	0,19
Air Travel	2,20	0,00	0,02	-	2,22	-
Business Travel	0,74	0,01	0,03	-	0,78	0,19
Total	**8,51**	**0,02**	**0,08**	-	**8,62**	**0,45**

ESCSP emissions from 2010 to 2019 are presented below.

Annex figure 61 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



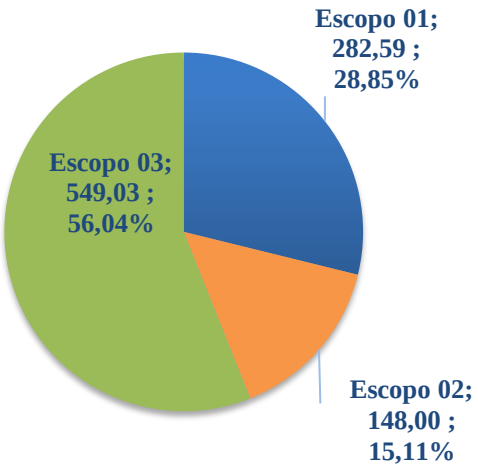
	Scope 1	Scope 2	Scope 3	Total
2010	0,84	0,84	6,95	8,63
2011	-	0,43	5,72	6,15
2012	0,54	1,02	5,42	6,98
2013	0,58	1,32	3,68	5,59
2014	-	1,60	1,21	2,80
2015	0,46	1,29	2,59	4,34
2016	-	1,62	1,42	3,04
2017	-	1,70	2,04	3,73
2018	0,16	1,26	2,15	3,56
2019	1,09	4,53	3,00	8,62

ESCSP increased 142% its emissions comparing to 2018, showing higher emission in al sources, but mainly on electricity.

b. Engie Office in Florianópolis - Headquarters

Engie Headquarters emitted 979.62 tCO_2e in 2019, as follows.

Annex figure 62 – Emissions per scope (tCO_2e/ %) – Operational Control and Equity Share



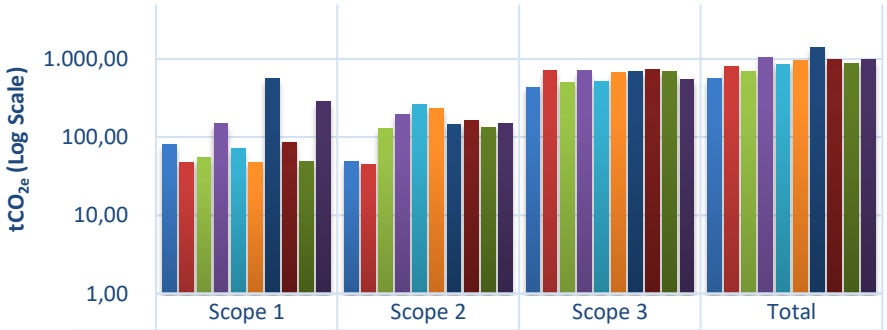
Emissions per GHG are detailed as follows.

Annex Table 43 – Headquarters emissions per GHG – 2019 (tCO2e)

Emission Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Escopo 01	**280,74**	**0,94**	**0,91**	-	**282,59**	**4,49**
Fugitive Emissions	239,02	-	-	-	239,02	-
Stationary Combustion	41,72	0,05	0,11	-	41,88	4,49
Waste	-	0,89	0,80	-	1,69	-
Escopo 02	**148,00**	-	-	-	**148,00**	-
Electricity	148,00	-	-	-	148,00	-
Escopo 03	**541,30**	**1,08**	**6,65**	-	**549,03**	**15,17**
Air Travel	481,86	0,14	4,54	-	486,54	-
Business Travel	59,44	0,60	2,11	-	62,15	15,17
Waste	-	0,34	-	-	0,34	-
Total	**970,04**	**2,02**	**7,56**	-	**979,62**	**19,66**

Headquarters emissions from 2010 to 2019 can be seen in the following figure.

Annex figure 63 – Emissions trajectory – Operational Control and Equity Share (tCO2e)



	Scope 1	Scope 2	Scope 3	Total
2010	80,44	48,44	438,55	567,43
2011	47,67	45,38	711,71	804,76
2012	54,69	129,08	501,22	684,98
2013	149,93	193,17	716,94	1.060,04
2014	71,78	262,04	518,90	852,73
2015	46,91	230,05	675,97	952,93
2016	566,74	146,53	696,54	1.409,80
2017	86,68	164,61	729,54	980,83
2018	48,24	131,41	687,81	867,47
2019	282,59	148,00	549,03	979,62

Headquarters emisisons increased 12.9% related to 2018 due to higher fugitive emission and electricity consumption.

ANNEX VI. UHET, UHIT AND UHMA TOTAL EMISSIONS

This annex shows the results of plants that Engie does not own 100% of equity share: UHIT, UHET and UHMA.

Discussions about results of each entrepreneurship were already done in Annex V and are also applied to this results. The representativeness and relevance of each emisison source and scope remains the same, as well as the impacts of the emissions sources on variations.

The only difference in the results presented in this Annex is that 100% of the emissions are considered, rather than the percentage of ownership that Engie has over the enterprise.

Thus, in this section, we present for each enterprise a table with the total results and by emission source of each enterprise (in tCO2e).

- **Total Results - UHIT**

UHIT emitted 8,771 tCO2e, with concentration on scope 01 emissions, mainly SF6 emissions, as presented below.

Annex Table 44 – UHIT Total Emissions per GHG and Source

Fonte de Emissão	Emissões por Participação Societária (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomassa
Scope 01	**21,40**	**0,42**	**1,24**	**8.550,00**	**8.573,06**	**8,87**
SF6	-	-	-	8.550,00	8.550,00	-
Fugitive Emissions	14,83	-	-	-	14,83	-
Mobile Combustion	6,36	0,10	0,22	-	6,68	8,85
Agricultural Activities	-	-	0,74	-	0,74	-
Waste	-	0,32	0,29	-	0,61	-
Stationary combustion	0,21	0,00	0,00	-	0,21	0,02
Scope 02	**68,95**	-	-	-	**68,95**	-
Electricity	68,95	-	-	-	68,95	-
Scope 03	**120,00**	**7,13**	**2,42**	-	**129,55**	**12,70**
Commuting	66,05	0,11	1,06	-	67,23	7,11
Air Travel	27,47	0,01	0,26	-	27,74	-
Upstream	25,38	0,19	0,75	-	26,32	5,31
Waste	-	6,81	0,31	-	7,12	-
Business Travel	1,09	0,01	0,04	-	1,14	0,28
Total	**210,35**	**7,55**	**3,66**	**8.550,00**	**8.771,56**	**21,57**

- **Total Results - UHET**

UHET emitted 390 tCO2e, with concentration on scope 3 emissions (Transport and Distribution upstream and air travel), as table below.

Annex Table 42 – UHET total emissions per GHG and source

Emission Sources	Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**27,06**	**1,32**	**3,55**	**36,48**	**68,40**	**16,46**
SF6	-	-	-	36,48	36,48	-
Stationary Combustion	15,79	0,02	0,04	-	15,85	1,70
Fugitive Emissions	6,05	-	-	-	6,05	-
Mobile combustion	5,22	0,14	0,22	-	5,58	14,76
Agricultural Activities	-	-	2,95	-	2,95	-
Waste	-	1,16	0,33	-	1,49	-
Scope 02	**23,46**	-	-	-	**23,46**	-
Electricity	23,46	-	-	-	23,46	-
Scope 03	**292,44**	**0,89**	**4,80**	-	**298,13**	**52,92**
Upstream	149,83	0,74	3,24	-	153,82	46,39
Air Travel	110,53	0,02	1,04	-	111,59	-
Commuting	18,39	0,08	0,41	-	18,88	2,82
Waste	10,75	-	-	-	10,75	-
Downstream	2,94	0,03	0,10	-	3,08	0,88
Business Travel	-	0,02	0,01	-	0,03	2,83
Total	**342,96**	**2,21**	**8,35**	**36,48**	**390,00**	**69,38**

- **Total Results - UHMA**

UHMA emitted 1.897 tCO2e, with emissions concentrated on scope 01, mainly SF6 emissions, as the following table.

Annex Table 46 – UHMA total emissions per GHG and source

Emission Sources	Emissions per Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 01	**7,55**	**0,77**	**1,06**	**1.797,10**	**1.806,47**	**14,05**
SF6	-	-	-	1.797,10	1.797,10	-
Mobile Combustion	7,53	0,13	0,24	-	7,90	14,05
Waste	-	0,63	0,57	-	1,20	-
Agricultural Activities	-	-	0,25	-	0,25	-
Fugitive Emissions	0,02	-	-	-	0,02	-
Scope 02	**1,53**	-	-	-	**1,53**	-
Electricity	1,53	-	-	-	1,53	-
Scope 03	**86,49**	**1,33**	**1,46**	-	**89,28**	**9,75**
Commuting	74,09	0,13	1,19	-	75,41	7,97
Upstream	10,80	0,05	0,25	-	11,11	1,77
Air Travel	1,59	0,00	0,01	-	1,61	-
Waste	-	1,16	-	-	1,16	-
Total	**95,57**	**2,10**	**2,53**	**1.797,10**	**1.897,29**	**23,80**

ANNEX VII. GLOBAL WARMING POTENTIAL

Annex Table 47 – Greenhouse Gases regulated by Kyoto Protocol and Global Warming Potential (GWP)

GWP for 100 years		
Gas	**Family/Type**	**GWP – IPCC 4th Assessment Report (AR4)**
Carbon Dioxide	CO2	1
Methane	CH4	25
Nitrous Oxide	N2O	298
Substances controlled bythe Montreal Protocol		
CFC-11	CCl3F	4.750
CFC-12	CCl2F2	10.900
CFC-13	CClF3	14.400
CFC-113	CCl2FCClF2	6.130
CFC-114	CClF2CClF2	10.000
CFC-115	CClF2CF3	7.370
Halon-1301	CBrF3	7.140
Halon-1211	CBrClF2	1.890
Halon-2402	CBrF2CBrF2	1.640
Carbon tetrachloride	CCl4	1.400
Methyl bromide	CH3Br	5
Methyl chloroform	CH3CCl3	146
HFCF-21	CHCl2F	151
HCFC-22	CHCLF2	1.810
HCFC-123	CHCl2CF3	77
HCFC-124	CHClFCF3	609
HCFC-141b	CH3CCl2F	725
HCFC-142b	CH3CClF2	2.310
HCFC-225ca	CHCl2CF2CF3	122
HCFC-225cb	CHClFCF2CClF2	595
Hidrofluorcarbonos (HFCs)		
HFC-23	CHF3	14.800
HFC-32	CH2F2	675
HFC-41	CH3F2	92
HFC-125	CHF2CF3	3.500
HFC-134	CHF2CHF2	1.100
HFC-134a	CH2FCF3	1.430
HFC-143	CH2FCHF2	353
HFC-143a	CH3CF3	4.470

GWP for 100 years		
Gas	**Family/Type**	**GWP – IPCC 4th Assessment Report (AR4)**
HFC-152	CH2FCH2F	53
HFC-152a	CH3CHF2	124
HFC-161	CH3CH2F	12
HFC-227ea	CF3CHFCF3	3.220
HFC-236cb	CH2FCF2CF3	1.340
HFC-236ea	CHF2CHFCF3	1.370
HFC-236fa	CF3CH2CF3	9.810
HFC-245ca	CH2FCF2CHF2	693
HFC-254fa	CHF2CH2CF3	1.030
HFC-365mfc	CH3CF2CH2CF3	794
HFC-43-10mee	CF3CHFCHFCF2CF3	1.640
Perfluorcarbonos (PFCs)		
Sulfur hexafluoride	SF6	22.800
Nitrogen trifluoride	NF3	17.200
PFC-14	CF4	7.390
PFC-116	C2F6	12.200
PFC-218	C3F8	8.830
PFC-318	c-C4F8	10.300
PFC-3-1-10	C4F10	8.860
PFC-4-1-12	C5F12	9.160
PFC-5-1-14	C6F14	9.300
PCF-9-1-18	C10F18	>7.500
Trifluoromethyl sulfur pentafluoride	SF5CF3	17.700
Perfluorocyclopropane	c-C3F6	>17.340
Éteres Fluorados		
HFE-125	CHF2OCF3	14.900
HFE-134	CHF2OCHF2	6.320
HFE-143a	CH3OCF3	756
HCFE-235da2	CHF2OCHClCF3	350
HFE-245cb2	CH3OCF2CF3	708
HFE-245fa2	CHF2OCH2CF3	659
HFE-254cb2	CH3OCF2CHF2	359
HFE-347mcc3	CH3OCF2CF2CF3	575
HFE-347pcf2	CHF2CF2OCH2CF3	580
HFE-356pcc3	CH3OCF2CF2CHF2	110
HFE-449sl (HFE-7100)	C4F9OCH3	297
HFE-569sf2 (HFE-7200)	C4F9OC2H5	59
HFE-43-10pccc124 (H-Galden 1040x)	CHF2OCF2OC2F4OCHF2	1.870
HFE-236ca12 (HG-10)	CHF2OCF2OCHF2	2.800

GWP for 100 years		
Gas	**Family/Type**	**GWP – IPCC 4th Assessment Report (AR4)**
HFE-338pcc13 (HG-01)	CHF2OCF2CF2OCHF2	1.500
HFE-227ea	CF3CHFOCF3	1.540
HFE-236ea2	CHF2OCHFCF3	989
HFE-236fa	CF3CH2OCF3	487
HFE-245fa1	CHF2CH2OCF3	286
HFE 263fb2	CF3CH2OCH3	11
HFE-329mcc2	CHF2CF2OCF2CF3	919
HFE-338mcf2	CF3CH2OCF2CF3	552
HFE-347mcf2	CHF2CH2OCF2CF3	374
HFE-356mec3	CH3OCF2CHFCF3	101
HFE-356pcf2	CHF2CH2OCF2CHF2	265
HFE-356pcf3	CHF2OCH2CF2CHF2	502
HFE 365mcf3	CF3CF2CH2OCH3	11
HFE-374pc2	CHF2CF2OCH2CH3	557
Perfluoropoliéteres		
PFPMIE	CF3OCF(CF3)CF2OCF2OCF3	10.300
Hydrocarbons and other compounds		
Dimethylether	CH3OCH3	1
Chloroform	CHCl3	31
Methylene chloride	CH2Cl2	8,7
Methyl choloride	CH3Cl	13
Halon-1201	CHBrF2	404
Trifluoroiodomethane	CF3I	0,4

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