GREENGOUSE GAS INVENTORY VERIFICATION ENGIE BRASIL ENERGIA S.A - 2016

➤ GHG Verification Statement

ENGIE

WHEN YOU NEED TO BE SURE

SGS

Greenhouse Gas Verification Statement

The inventory of Greenhouse Gas emissions in 2016 of

Engie Brasil Energia S.A.

Rua Paschoal Apostolo Pítsica, 5.064
Florianópolis – SC
CEP: 88025-255

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

ISO 14064-1:2007

For the following activities

Operation of electricity generating plants and electric energy trading agent.

Disclosing emissions of **4.839.528,91 (OC) and 4.840.417,85 (SA)** metric tonnes of CO2 equivalent

Lead auditor: **Lucas Engelbrecht**

Authorized by
Vanda Nunes
Director
Date: *March 24th, 2017*

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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 2016

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 2016. The verification was based on the verification scope, objectives and criteria as agreed between CLIENT and SGS on 03/15/2017.

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 hereto.
- 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)
- Types of GHGs included: CO2; CH4; N2O; HFCs; PFCs; SF6 e NF3.
- Directed actions: N.A.
- GHG information for the following period was verified: 2016
- 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 2016 disclosing emissions of 4.839.528,91 metric tonnes of CO2 equivalent (operational control) and 4.840.417,85 metric tonnes of CO2 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

Consolidated emissions for all GHG and scopes

Total Emission (TCO2) for each Scope - Operational Control (OC)						
GHG	Emissions in metric tonnes			Emissions in metric tonnes of CO2 equivalent (tCO_2e)		
	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3
CO_2	4.756.512,43	10.231,74	26.922,14	4.756.512,43	10.231,74	26.922,14
CH_4	373,64		23,02	9.340,97		575,47
N_2O	117,26		1,45	34.944,82		433,22
HFCs	0,27		-	568,1014		-
HFC-32	0,130183			87,8735		
HFC-125	0,132161			462,5635		
HFC-134a	0,005754			8,2282		
HFC-143a	0,002111			9,4362		
SF6	-			-		-
Total				4.801.366,33	10.231,74	27.930,83
				Total emissions (tCO_2e)		4.839.528,90

Source: Spreadsheet of Engie´s calculation 2016 V02 – Operational Control (OC)

Consolidated emissions for all GHG and scopes

Total Emission (TCO2) for each Scope - Shareholding Approach						
GHG	Emissions in metric tonnes			Emissions in metric tonnes of CO2 equivalent (tCO_2e)		
	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3
CO_2	4.756.541,16	10.938,15	27.167,06	4.756.541,16	10.938,15	27.167,06
CH_4	346,76		23,52	8.669,11		587,93
N_2O	113,68		1,47	33.877,32		437,35
HFCs	0,27135		-	570,48049		-
HFC-32	0,13075			88,3		
HFC-125	0,13273			464,6		
HFC-134a	0,00575			8,23		
HFC-143a	0,00211			3,44		
SF6	0,07			1.629,30		-
Total				4.801.287,37	10.938,15	28.192,34
				Total emissions (tCO_2e)		4.840.417,85

Source: Spreadsheet of Engie´s calculation 2016 V02 – Shareholding Approach

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 2016 are fairly stated.

We conducted our verification with regard to 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.

Annex A – List of Units included in Scope

HEAD OFFICE / POWER PLANT	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	Alameda Santos, 905 4º floor de São Paulo Bairro: Cerqueira César CEP: 01.419-001 São Paulo – SP
Thermoelectric Complex Jorge Lacerda CTJL	Av. Paulo Santos Mello, 555 Bairro: Centro CEP: 88.745-000 Capivari de Baixo – SC
Thermoelectric Charqueadas UTCH	Rua Geólogo White, s/nº Bairro: Centro CEP: 96.745-000 Charqueadas – RS
Thermoelectric Alegrete UTAL	Rua João Galant, s/nº Bairro: Ibirapuitã CEP: 97.546-330 Alegrete – RS

Thermoelectric William Arjona **UTWA**	**Rodovia BR 060, s/nº** **Estrada Vicinal – Distrito Imbirissu** **CEP: 79.115-540** **Campo Grande – MS**
Thermoelectric Ibitiúva Bioenergética **UTIB**	**Fazenda Piratininga, s/nº** **Bairro: Pitangueiras** **CEP: 14.750-000** **Pitangueiras – SP**
Thermoelectric Ferrari/Ferrari Termoelétrica S/A **UTFE**	**Fazenda da Rocha, s/nº** **Bairro: Zona Rural** **CEP: 13.631-301** **Pirassununga – SP**
Unit of cogeneration Lages **UCLA**	**Rua Vivandério Santos do Vale, s/nº** **Bairro: Caroba** **CEP: 88.516-600** **Lages – SC**
Hydroelectric Itá **UHIT**	**Volta do Uvá** **CEP: 99.770-000** **Aratiba – RS**
Hydroelectric Machadinho **UHMA**	**Linha São Paulo, s/nº** **CEP: 89.667-000** **Piratuba – SC**
Hydroelectric Salto Santiago **UHSS**	**Rodovia BR 158, Km 441,5** **CEP: 85.568-000** **Saudade do Iguaçu – PR**

Hydroelectric Salto Osório **UHSO**	**Rodovia PR 475, Km 3** **CEP: 85.575-000** **São Jorge D'Oeste – PR**
Hydroelectric Passo Fundo **UHPF**	**Usina Hidrelétrica Passo Fundo, s/nº** **CEP: 99.645-000** **Entre Rios do Sul – RS**
Hydroelectric Cana Brava **UHCB**	**UHE – Cana Brava** **Zona Rural** **Bairro: Cana Brava** **CEP: 73.790-000** **Cavalcante – GO**
Hydroelectric São Salvador **UHSA**	**Rod. TO 387 PRN São Salvador** **Km 40 à Esquerda + 20 Km** **Bairro: Zona Rural** **CEP: 77.360-000** **Paranã – TO**
Hydroelectric Estreito **UHET**	**Rodovia BR 230, Km 8, s/nº** **Zona Rural** **CEP: 65.975-000** **Estreito – MA**
Hydroelectric Ponte de Pedra **UHPP**	**Estrada UHE – Ponte de Pedra, s/nº** **Zona Rural** **CEP: 78.790-000** **Itiquira – MT**

PCH Areia Branca **PHAB**	**Fazenda Cachoeira Bonita, s/nº** **Santo Antonio do Manhuaçu** **Bairro: Zona Rural** **CEP: 35.321-000** **Caratinga – MG**
PCH José Gelásio **PHJG**	**Rodovia BR 163 Km 102, s/nº** **Ribeirão de Ponte de Pedra** **Bairro: Zona Rural** **CEP: 78.740-275** **Rondonópolis – MT**
PCH Rondonópolis **PHRO**	**Rodovia BR 163 Km 102, s/nº** **Ribeirão de Ponte de Pedra** **Bairro: Zona Rural** **CEP: 78.740-275** **Rondonópolis – MT**
Wind power Beberibe **UEBB**	**Fazenda Uberaba, s/nº - Praia das Fontes** **CEP: 62.840-000** **Beberibe – CE**
Wind power Pedra do Sal **UEPS**	**Praia Pedra do Sal, s/nº** **Bairro: Zona Rural** **CEP: 64.200-000** **Parnaíba – Piauí**
Wind power Guajirú **UEGU**	**Sítio Manguinhos, s/nº** **Bairro: Manguinhos** **CEP: 62.690-000** **Trairi – CE**

Wind power Mundaú	**Fazenda Boca da Mata, s/nº** **Bairro: Zacarias** **CEP: 62.690-000**
UEMU	**Trairi – CE**
Wind power Fleixeiras I	**Sítio Canaã, s/nº** **Bairro: Canaã** **CEP: 62.690-000**
UEFL	**Trairi – CE**
Wind power Trairi	**Sítio Estrela, s/nº** **Bairro: Sítio Estrela** **CEP: 62.690-000**
UETR	**Trairi – CE**
Wind power Tubarão	**BR 101, s/nº - Km 329** **Bairro: Revoredo** **CEP: 88704-700**
UETB	**Tubarão – SC**
Photovoltaic power plant Cidade Azul	**BR 101, s/nº - Km 329** **Bairro: Revoredo** **CEP: 88704-700**
UFCA	**Tubarão – SC**

Greenhouse Gas Emissions Report

ENGIE BRASIL ENERGIA S.A

2016

Elaborated by: ECOFINANCE NEGÓCIOS

Florianópolis, March 2017.

SUMMARY

EXECUTIVE SUMMARY

This document presents the Corporate Inventory of Greenhouse Gas Emissions (GGE) of Engie Brasil Energia S.A. (in this report, referred to as Engie) in 2016, by the approaches of operational control and shareholding of its companies and ventures.

The total greenhouse gas (GHG) emissions of the Engie business group 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 **4,839,528.91** tons of carbon dioxide equivalent (tCO2e) and considering the equity share approach, the total emissions were **4,840,417.85** tCO2e, according to table 1.

In both approaches, the group's GHG emissions are concentrated in the Jorge Lacerda Thermoelectric Complex (CTJL), representing 90.3% of the total emissions in 2016. The coal burned in this plant (89.6%) and at the Charqueadas Thermoelectric Plant (UTCH) (7.2%) accounted for 96% of the total group emissions.

Scope 1 and scope 2 emissions were **4.811.598,07 tCO_2e** according to operational control approach (99.4% of the grand total) and **4.812.225,51 tCO_2e** per equity share (99.4% 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 the CTJL (more than 48%), Salto Osório Hydropower Plant (UHSO) (more than 26%) and Passo Fundo Hidropower Plant (UHPF) (more than 10%). They represent 91.3% and 85.4% of this scope in the operational control and equity participation approaches, respectively.

Scope 03 emissions account for 0.5% 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 and UTCH, referring to more than 93% of the emissions scope in both accounting approaches.

The company's total emissions decreased 21.3% in relation to 2015, mainly due to the lower demand of thermoelectric power plants, essentially due to the reduction of coal consumption at CTJL and UTCH (15.3% and 34.2%, respectively) and of natural gas at William Arjona Thermoelectric Plant (UTWA) (a fall of 92.9%).

The emission reductions provided by clean and renewable energy to the grid and the planting of trees provided a positive emission balance for the company. Emission reductions and CO2 sequestration exceeded emissions by 2.07 million tCO_2e (42.7%) in the operational control approach and by 5.1 million tCO_2e (107%) considering equity share. This difference between the approaches is mainly related to the inclusion of Estreito, Itá and Machadinho Hydropower Power Plants, which produced more than 18 million MWh of clean energy for the National Interconnected System (SIN).

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

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

Units	Total Emissions tCO_2e - Operational Control (tCO2e)					Total Emissions tCO_2e - Equity Share (tCO2e)				
	Scope 1	Scope 2	Scope 3	Total	%	Scope 1	Scope 2	Scope 3	Total	%
CTJL	4.353.542,61	5.358,60	13.463,83	4.372.365,04	90,35%	4.353.542,61	5.358,60	13.463,83	4.372.365,04	90,33%
UTCH	356.039,74	180,26	11.698,59	367.918,59	7,60%	356.039,74	180,26	11.698,59	367.918,59	7,60%
UTWA	69.919,29	60,80	36,32	70.016,40	1,45%	69.919,29	60,80	36,32	70.016,40	1,45%
UTFE	12.621,98	27,16	835,41	13.484,55	0,28%	12.621,98	27,16	835,41	13.484,55	0,28%
UTIB	5.689,12	51,75	3,68	5.744,55	0,12%	3.940,28	35,84	2,55	3.978,67	0,082%
UHCB	45,04	0,04	32,36	77,44	0,00%	45,04	0,04	32,36	77,44	0,002%
UCLA	2.686,00	60,71	448,80	3.195,52	0,07%	2.686,00	60,71	448,80	3.195,52	0,07%
UHSO	33,65	2.850,51	77,99	2.962,14	0,06%	33,65	2.850,51	77,99	2.962,14	0,06%
PHRO	1,73	0,09	6,88	8,71	0,000%	1,73	0,09	6,88	8,71	0,000%
PHJG	0,69	0,27	7,09	8,06	0,000%	0,69	0,27	7,09	8,06	0,000%
Sede	566,74	146,53	696,54	1.409,80	0,03%	566,74	146,53	696,54	1.409,80	0,03%
UHPF	33,05	1.132,56	75,94	1.241,55	0,03%	33,05	1.132,56	75,94	1.241,55	0,03%
UHSS	14,59	311,21	224,51	550,31	0,01%	14,59	311,21	224,51	550,31	0,011%
UHSA	40,19	-	159,20	199,39	0,00%	40,19	-	159,20	199,39	0,00%
UETR	92,26	3,73	73,79	169,78	0,00%	92,26	3,73	73,79	169,78	0,00%
UHPP	21,12	6,87	48,64	76,64	0,00%	21,12	6,87	48,64	76,64	0,002%
UHIT	-	-	-	-	0,00%	1.636,35	1,82	98,43	1.736,60	0,04%
UEPS	-	0,94	33,94	34,88	0,001%	-	0,94	33,94	34,88	0,001%
PHAB	8,30	10,58	1,73	20,62	0,000%	8,30	10,58	1,73	20,62	0,000%
UEBB	6,54	0,70	1,11	8,34	0,00%	6,54	0,70	1,11	8,34	0,00%
UHET	-	-	-	-	0,00%	29,92	13,32	145,49	188,74	0,00%
UETB	-	7,44	-	7,44	0,00%	-	7,44	-	7,44	0,00%
UTAL	3,40	7,82	3,06	14,28	0,00%	3,40	7,82	3,06	14,28	0,000%
UFCA	-	4,99	-	4,99	0,00%	-	4,99	-	4,99	0,00%
ESCSP	-	1,62	1,42	3,04	0,00%	-	1,62	1,42	3,04	0,00%
UEGU	0,09	2,32	-	2,41	0,00%	0,09	2,32	-	2,41	0,00%
UEMU	0,18	2,17	-	2,35	0,00%	0,18	2,17	-	2,35	0,00%
UEFL	0,01	2,08	-	2,08	0,00%	0,01	2,08	-	2,08	0,00%
UHMA	-	-	-	-	0,00%	3,60	707,17	18,71	729,47	0,02%
Total	**4.801.366,33**	**10.231,74**	**27.930,83**	**4.839.528,91**	**100,00%**	**4.801.287,37**	**10.938,15**	**28.192,34**	**4.840.417,85**	**100,00%**
%	**99,21%**	**0,21%**	**0,58%**	**100,00%**		**99,19%**	**0,23%**	**0,58%**	**100,00%**	

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

Emissions Sources	Operational Control Emissions (tCO_2e)	%	Equity Share Emissions (tCO_2e)	%
Scope 1	**4.801.366,33**	**99,21%**	**4.801.287,37**	**99,19%**
Stationary Combustion	**4.796.867,41**	**99,12%**	**4.795.133,36**	**99,06%**
Acetylen	0,01	0,00%	0,01	0,00%
Sugarcane bagasse	18.293,35	0,38%	16.549,94	0,34%
Coal Steam 3100 kcal / kg	351.443,68	7,26%	351.443,68	7,26%
Coal Steam 4500 kcal / kg	4.339.517,23	89,67%	4.339.517,23	89,65%
Dry Natural Gas	69.899,27	1,44%	69.899,27	1,44%
Wood	2.567,73	0,05%	2.567,73	0,05%
Fuel Oil	4.957,90	0,10%	4.957,90	0,10%
Commercial Diesel Oil	10.188,24	0,21%	10.197,61	0,21%
Direct Mobile Combustion	**536,97**	**0,01%**	**555,09**	**0,01%**
Diesel Oil	408,94	0,01%	420,53	0,01%
Gasoline	122,49	0,00%	128,94	0,00%
Liquefied Petroleum Gas	4,78	0,00%	4,78	0,000%
Ethanol	0,76	0,00%	0,84	0,000%
Fugitives	**574,15**	**0,01%**	**2.207,65**	**0,05%**
Sulfur Hexafluoride (SF_6)	-	0,00%	1.629,30	0,03%
Carbon Dioxide (CO_2)	6,04	0,00%	7,88	0,00%
HFCs	568,10	0,01%	570,48	0,01%
Industrial Processes Emissions	**3.360,39**	**0,07%**	**3.360,39**	**0,07%**
Desulphurisation of gases	3.360,39	0,07%	3.360,39	0,07%
Agricultural Activities	**23,66**	**0,00%**	**25,81**	**0,00%**
Fertilizers - Organic	1,18	0,00%	1,54	0,00%
Aynthetic Fertilizers	22,48	0,00%	24,27	0,00%
Waste	**3,76**	**0,00%**	**5,05**	**0,00%**
Landfill	1,79	0,00%	3,08	0,00%
Composting	1,97	0,00%	1,97	0,00%
Scope 2	**10.231,74**	**0,21%**	**10.938,15**	**0,23%**
Energia	**10.231,74**	**0,21%**	**10.938,15**	**0,23%**
Electricity	10.231,74	0,21%	10.938,15	0,23%
Scope 3	**27.930,83**	**0,58%**	**28.192,34**	**0,58%**
Fuel and energy related activities not included in scopes 1 and 2	**2,57**	**0,00%**	**2,57**	**0,00%**
Acetylen	0,001	0,00%	0,00	0,00%
Gasoline	2,565	0,00%	2,56	0,00%
Transport and Distribution (downstream)	**8.788,02**	**0,18%**	**8.788,02**	**0,18%**
Diesel Oil	8.776,60	0,18%	8.776,60	0,18%
Gasoline	11,42	0,00%	11,42	0,00%
Transporte e Distribuição (upstream)	**17.360,36**	**0,36%**	**17.458,07**	**0,36%**
Diesel Oil	17.253,33	0,36%	17.300,24	0,36%

Emissions Sources	Operational Control Emissions (tCO_2e)	%	Equity Share Emissions (tCO_2e)	%
Gasoline	102,23	0,00%	153,79	0,00%
Biodiesel	2,48	0,00%	1,72	0,00%
Ethanol	0,06	0,00%	0,06	0,00%
Liquefied Petroleum Gas	2,26	0,00%	2,26	0,00%
Deslocamento de Funcionários	**304,73**	**0,01%**	**370,00**	**0,01%**
Diesel Oil	250,53	0,01%	315,80	0,01%
Gasoline	54,07	0,00%	54,07	0,0011%
Ethanol	0,13		0,13	0,0000%
Air Travel	**944,05**	**0,02%**	**1.030,41**	**0,02%**
Aviation Gasoline (AvGas)	816,70	0,02%	896,14	0,02%
Gasoline	127,35	0,00%	131,51	0,00%
Diesel Oil	-	0,00%	2,76	0,000%
Resíduos Gerados nas Operações	**531,11**	**0,01%**	**543,27**	**0,01%**
Landfill	529,75	0,01%	541,93	0,01%
Composting	0,99		0,99	0,00%
Incineration	0,37	0,00%	0,35	0,00%
Total (tCO2e)	**4.839.528,91**	**100%**	**4.840.417,85**	**100%**

1. INTRODUCTION

1.1. Presentation

This report aims to present the inventory of greenhouse gases (GHG) emissions of Engie Brasil Energia S.A for 2016.

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 27 operational ventures during 2016, distributed in twelve Brazilian states, as well as its administrative headquarters in Florianópolis (SC) and its Energy Commercialization Office located and in São Paulo (SP), totaling 29 organization units.

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 2017, in order to certify the quality and credibility of its 2016 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 each group company are discussed, by methodological scope and by greenhouse gas according to each approach. Comparisons are also provided between GHG emissions from 2016 and emissions from previous years. Information on the management of

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

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 and Ceará.

The Company has its own installed capacity of 7,010 MW, equivalent to approximately 6.2% of the total in Brazil. In 2015, Engie had 27 (twenty seven) plants in operation: 7 (seven) wind power plants, 9 (nine) hydropower plants, 3 (three) small hydropower plants, 1 (one) solar plant and 7 (seven) thermoelectric plants, with three of its thermoelectric plants being operated with biomass (sugarcane bagasse and wood residues).

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 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 been developing its inventory of GHG emissions 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 the quantification of GHG emissions; (ii) to adopt new procedures and controls necessary for the quantification of 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.

Tabela 3: Colaboradores da Engie responsáveis pelo processo de coleta de dados por empreendimento

Corporative Area	Cordinator- Engie	Job Titlle	Substitute Cordinator.	Job Title
MRS	Ilmar Goltara Gomes	Environmental Specialist	José Lourival Magri	Environmental Manager
Plant/Office	**Cordinator- Engie**	**Job Titlle**	**Substitute Cordinator.**	**Job Title**
SEDE	Leticia Pivetta Camisão	Supply Analist	Milena Pamplona	Supply Analist
Escritório de SP	Simone Fretin	Administrative Assistant	Antônio Previtali	Manager TCE
UEBB	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
UEPS	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
UEFL	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
UEGU	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
UEMU	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
UETR	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
UETB	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
UTFE	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
UCLA	Liliana Dutra dos Santos	Chemical Engineer	Geovane Soares	Utilities Technician III
UTIB	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
CTJL	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III
UTWA	Liliana Dutra dos Santos	Chemical Engineer	David Dilson Ferreira Paim	Chief
UTCH	Rita Tissot	Environmental Process Cordinator	Simone Da Silva Guimarães	Utilities Technician
UTAL	Rita Tissot	Environmental Process Cordinator	Simone Da Silva Guimarães	Utilities Technician

Plant/Office	Cordinator- Engie	Job Titlle	Substitute Cordinator.	Job Title
PHAB	Claudiano do Amaral Souza	Environmental Analyst	Marcos Damont	Cordinator
PHJG	Claudiano do Amaral Souza	Environmental Analyst	Rogério Suematsu	Manager
PHRO	Claudiano do Amaral Souza	Environmental Analyst	Rogério Suematsu	Manager
UHPP	Claudiano do Amaral Souza	Environmental Analyst	Rogério Suematsu	Manager
UHCB	Andreia Ramos S. Szortyka	Environmental Analyst	Simone Rodrigues Gonçalves	Environmental Analyst
UHSA	Andreia Ramos S. Szortyka	Environmental Analyst	Adriano Diniz Baldissera	Environmental Analyst
UHET	Andreia Ramos S. Szortyka	Environmental Analyst	Adriano Diniz Baldissera	Environmental Analyst
UHSO	Anderson Gibathe	Environmental technician	Clovis Agripino Tosin da Silva	Environmental Process Cordinator
UHSS	Anderson Gibathe	Environmental technician	Clovis Agripino Tosin da Silva	Environmental Process Cordinator
UHPF	Sérgio Luiz Souza	Environmental Process Cordinator	Gilnei Minella	Environmental Technician
UHIT	Sérgio Luiz Souza	Environmental Process Cordinator	Gilnei Minella	Environmental Technician
UHMA	Sérgio Luiz Souza	Environmental Process Cordinator	Gilnei Minella	Environmental Technician
UFCA	Liliana Dutra dos Santos	Chemical Engineer	Eduardo Guedes dos Santos	Utilities Technician III

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 2 million carbon credits, and has already produced more than 50 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 2016, covering all direct and indirect emissions, including all companies in the group.

2.2. Base-Year

Engie GHG emissiona 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 3, it is possible to visualize the List of Companies that make up Engie group and the data on operational control and equity share.

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

Plants / Offices	Acronym	Fuel / River	State	Total Installed Capacity (MW)	Institution that has Operational Control	Equity Share - Engie
Wind Power Plant Beberibe	UEBB	Wind	CE	26	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 Pedra do Sal	UEPS	Wind	PI	18	Engie	100%
Wind Power Plant Tubarão	UETB	Wind	SC	2,1	Engie	100%
Wind Power Plant Trairi	UETR	Wind	CE	25	Engie	100%
Hydropower Plant Cana Brava	UHCB	Tocantins	GO	450	Engie	100%
Hydropower Plant Estreito	UHET	Tocantins	MA/TO	1.087	Estreito Consortium	40,07%
Hydropower Plant Itá	UHIT	Uruguai	SC/RS	1.450	Itá Consortium	68,99%
Hydropower Plant Machadinho	UHMA	Pelotas	SC/RS	1.140	Machadinho Consortium	19,29%
Hydropower Plant Passo Fundo	UHPF	Passo Fundo	RS	226	Engie	100%
Hydropower Plant Ponte de Pedra	UHPP	Correntes	MT/MS	176	Engie	100%
Hydropower Plant Salto Osório	UHSO	Iguaçu	PR	1.078	Engie	100%
Hydropower Plant Salto Santiago	UHSS	Iguaçu	PR	1.420	Engie	100%
Hydropower Plant São Salvador	UHSA	Tocantins	TO	243	Engie	100%
Small Hydropower Plant Areia Branca	PHAB	Manhuaçu	MG	20	Engie	100%
Small Hydropower Plant José Gelazio da Rocha	PHJG	Ribeirão Ponte de Pedra	MT	24	Engie	100%
Small Hydropower Plant Rondonópolis	PHRO	Ribeirão Ponte de Pedra	MT	27	Engie	100%
Thermoelectric Plant Alegrete	UTAL	Oil	RS	66	Engie	100%
Thermoelectric Plant Charqueadas	UTCH	Coal	RS	72	Engie	100%
Thermoelectric Plant Ferrari	UTFE	Sugarcane Bagasse	SP	80.5	Engie	100%
Thermoelectric Plant Ibitiúva	UTIB	Sugarcane Bagasse	SP	33	Engie	69,26%
Termoelectrict Complex Jorge Lacerda	CTJL	Coal	SC	857	Engie	100%
Biomass Plant Lages	UCLA	Wood Residue	SC	28	Engie	100%
Thermoelectric Plant William Arjona	UTWA	Natural Gas and Diesel Oil	MS	190	Engie	100%
Photovoltaic Plant Cidade Azul	UFCA	Sun	SC	3	Engie	100%
Engie – Office SP	ESP	-	SP	-	Engie	100%
Headquarter - Engie (Florianópolis - Office)	SEDE	-	SC	-	Engie	100%

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 of 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 not 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 means of vehicles hired by the 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 Engie - 2016

Scopes	Emission Sources	
Scope 1 **Scope 1**	Stationary Combustion	Boilers installed in thermal power plants
		Combustion chambers of gas turbine power plant
		Diesel group of emergency (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)
	Industrial Processes	Combustion gas desulphurization (desulphurizer)
	Fugitives	Air-condition
		SF_6 Equipment
		Fire extinguishers with CO_2/ CO_2 cylinders for cleaning in welding process
	Agricultural activities	Use of fertilizers
	Waste	Composting
		Waste disposed, composted or incinerated in solid waste disposal site not 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)

Scopes	Emission Sources	
	Viagens a negócios	Air travel Any travel of employees in leased vehicles
	Waste	Waste disposed, composted or incinerated in solid waste disposal site not controlled by the company.
	Commuting	Vehicles used for commuting transportation
	Transporte e distribuição (*downstream*)	Rented or hired vehicles used to transport people, raw materials and/or products/by products not funded by the company
Biomass emission	CO_2 emissions generated in the combustion of biomass	Combustion of biodiesel, ethanol, wood waste and bagasse of sugar cane

2.5. Excluded Sources

In order to define the scope of Engie's emissions, the criterion was defined to account for 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 R-22 was identified, which was duly accounted for and reported in a specific section.

GHG emissions from electricity consumption are mainly associated with the ancillary services rendered by Engie to the SIN. 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.

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.

To calculate emissions, a spreadsheet was developed, taking into account the emission factors provided by PBGHGP in the tool Tool_GHG_Protocol_v2017.2.xlsx because they are the most directed to emissions in the Brazilian territory since they use adaptations to the national reality.

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.

According to the article by Kalkreuth (2005), the coal of the state of Rio Grande do Sul, used at Charqueadas power plant, is classified as sub-bituminous. Thus, the CO2, CH4 and N2O emission factors of the coal used for the UTCH were reviewed as shown in Annex I - Emission Factors. Such a review was necessary since the Brazilian GHG Protocol Program considers CO2, CH4 and N2O emission factors only for bituminous coal.

The percentage of nitrogen contained in fertilizers was also monitored by UHIT, resulting in 2.0% 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, desulphurisation, 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 6 - Methodological references for the emission factors used in Engie inventory – 2016

Emission Source	Methodology	Reference for Emission Factors
Direct and indirect stationary combustion	- IPCC 2006 – vol. 2 Energy – Cap. 2 Stationary combustion; Brazil GHG Protocol tool 2017.2	- National 2016 energy balance (BEN 2016); - IPCC 2006-vol. 2 Energy-Cap. 2 Stationary combustion; - Ministry of Science and Technology. Second National Communication of Brazil to the United Nations Framework Convention on climate change. Brasília: MCT, 2010.
Direct and indirect mobile combustion	- IPCC 2006 – vol. 2 Energy – Cap. 3 Mobile combustion; Brazil GHG Protocol tool 2017.2	- National 2016 energy balance (BEN 2016); - - IPCC 2006-vol. 2 Energy-Cap. 2 Stationary combustion; - National Oil and Gas Agency ANP.
Processes	- Stoichiometric calculation of gas desulphurization gypsum	- GDF Suez group - Local Instruction - GHG Emissions Reporting – 28/07/2014.
Fugitives	- IPCC 2006 – vol. 2 Energy – Cap. 4 Fugitive emissions; Brazil GHG Protocol tool 2017.2	- 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.

Emission Source	Methodology	Reference for Emission Factors
Energy purchased	- Brazil GHG Protocol tool 2017.2	- CO2 emission factors of the SIN to corporate inventories – Ministry of Science and Technology (MCTI 2017).
Business travels	- IPCC 2006 – vol. 2 Energy – Cap. 3 Mobile combustion;, Brazil GHG Protocol tool 2017.2	- IPCC 2006 – vol. 2 Energy – Cap. 3 Mobile combustion;, Brazil GHG Protocol tool2016; - 2016 Government GHG Conversion Factors for Company Reporting: Methodology Paper for Emission Factors. FINAL. (DEFRA 2016).
Solid wastes	- IPCC 2006 – vol. 5 Waste – Cap. 3 Solid waste disposal / Cap. 4 – Biological treatment of solid waste; - Brazil GHG Protocol tool 2017.2	- 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	- GHG Protocol - Brazil GHG Protocol tool 2017.2	- 2016 National energy balance (BEN 2016); - The national oil and Gas Agency-ANP. - - Ministry of science and technology. Second National Communication of Brazil to the United Nations Framework Convention on climate change. Brasília: MCT, 2010.

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 7.

Table 7: 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**

During 2016, no emission source was sold or transferred to another organization.

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).

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.

2.10. Methodological Changes Compared to the Year 2015 GHG Emissions Report

Structural changes in an inventory company and methodological changes can significantly affect the calculation of emissions, making it difficult to monitor emissions over time and, consequently, to compare inventories.

There was no acquisition or sale of enterprises by Engie during the year 2016. There were also no changes in Engie's shareholding in the projects. Thus, there was no organizational change that would have an impact on the inventory of GHG emissions.

There was no methodological change in relation to the calculation methodology used in 2015.

3. CONSOLIDATED EMISSIONS

3.1. Consolidated Emissions per Scope

In this section, total emissions of Engie consolidated for the year 2016 are presented broken down per scope. In 2016, in the approach for operational control, the company emitted the total of **4,839,528.91** tCO2e, and for equity share approach **4,840,417.85** 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 (89.5% of total emissions) and at UTCH (7.2 %).

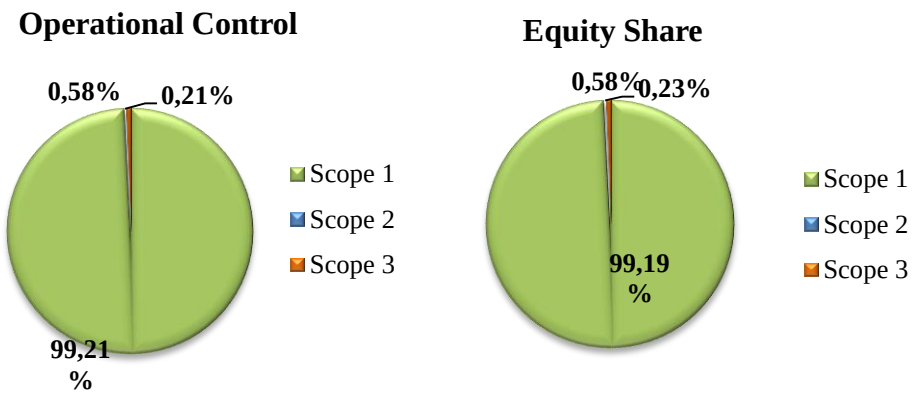


Figure 1 – Consolidated Emissions per scope (%)

3.2. Scope 1 Emissions

Engie's direct emissions totaled 4,801,366.33 tCO2e for operating control, and 4,801,287.37 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 2016

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

Emission Sources	Operational Control		Equity Share	
	Emissions (tCO2e)	%	Emissions (tCO2e)	%
Scope 1	**4.801.366,33**	**100,0%**	**4.801.287,37**	**100,00%**
Stationary Combustion	**4.796.867,41**	**99,91%**	**4.795.133,36**	**99,87%**
Acetylen	0,01	0,00%	0,01	0,00%
Sugarcane bagasse	18.293,35	0,38%	16.549,94	0,34%
Coal Steam 3100 kcal / kg	351.443,68	7,32%	351.443,68	7,32%
Coal Steam 4500 kcal / kg	4.339.517,23	90,38%	4.339.517,23	90,38%
Dry Natural Gas	69.899,27	1,46%	69.899,27	1,46%
Wood	2.567,73	0,05%	2.567,73	0,05%
Fuel Oil	4.957,90	0,10%	4.957,90	0,10%
Commercial Diesel Oil	10.188,24	0,21%	10.197,61	0,21%
Direct Mobile Combustion	**536,97**	**0,01%**	**555,09**	**0,01%**
Diesel Oil	408,94	0,01%	420,53	0,01%
Gasoline	122,49	0,00%	128,94	0,00%
Liquefied Petroleum Gas	4,78	0,00%	4,78	0,000%
Ethanol	0,76	0,00%	0,84	0,000%
Fugitives	**574,15**	**0,01%**	**2.207,65**	**0,05%**
Sulfur Hexafluoride (SF6)	-	0,00%	1.629,30	0,03%
Carbon Dioxide (CO2)	6,04	0,00%	7,88	0,00%
HFCs	568,10	0,01%	570,48	0,01%
Industrial Processes Emissions	**3.360,39**	**0,07%**	**3.360,39**	**0,07%**
Desulphurisation of gases	3.360,39	0,07%	3.360,39	0,07%
Agricultural Activities	**23,66**	**0,00%**	**25,81**	**0,00%**
Fertilizers - Organic	1,18	0,00%	1,54	0,00%
Aynthetic Fertilizers	22,48	0,00%	24,27	0,00%
Waste	**3,76**	**0,00%**	**5,05**	**0,00%**
Landfill	1,79	0,00%	3,08	0,00%
Composting	1,97	0,00%	1,97	0,00%

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

Units	Total Emissions – Operational Control (tCO2e)		Total Emissions – Equity Share (tCO2e)	
	Scope 1	%	Scope 1	%
CTJL	4.353.542,61	90,7%	4.353.542,61	90,7%
UTCH	356.039,74	7,4%	356.039,74	7,4%
UTWA	69.919,29	1,5%	69.919,29	1,5%
UTFE	12.621,98	0,3%	12.621,98	0,3%
UTIB	5.689,12	0,1%	3.940,28	0,1%
UHCB	45,04	0,0%	45,04	0,0%
UCLA	2.686,00	0,1%	2.686,00	0,1%
UHSO	33,65	0,0%	33,65	0,0%
PHRO	1,73	0,0%	1,73	0,0%
PHJG	0,69	0,0%	0,69	0,0%
Headquarters	566,74	0,0%	566,74	0,0%
UHPF	33,05	0,0%	33,05	0,0%
UHSS	14,59	0,0%	14,59	0,0%
UHSA	40,19	0,0%	40,19	0,0%
UETR	92,26	0,0%	92,26	0,0%
UHPP	21,12	0,0%	21,12	0,0%
UHIT	-	0,0%	1.636,35	0,0%
UEPS	-	0,0%	-	0,0%
PHAB	8,30	0,0%	8,30	0,0%
UEBB	6,54	0,0%	6,54	0,0%
UHET	-	0,0%	29,92	0,0%
UETB	-	0,0%	-	0,0%
UTAL	3,40	0,0%	3,40	0,0%
UFCA	-	0,0%	-	0,0%
ESCSP	-	0,0%	-	0,0%
UEGU	0,09	0,0%	0,09	0,0%
UEMU	0,18	0,0%	0,18	0,0%
UEFL	0,01	0,0%	0,01	0,0%
UHMA	-	0,0%	3,60	0,0%
Total	**4.801.366,33**	**100,0%**	**4.801.287,37**	**100,0%**

The tables show the emission concentration of Scope 01 in coal-fired power plants (more than 97% of scope 01 emissions) CTJL (90.7%) and UTCH (7.4%).

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 UTCH (more than 98% in both approaches). The following table shows the emissions of stationary combustion per enterprise and fuel. The natural gas used at UTWA is the second most significant fuel (1.46%).

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

Emissions Sources	Operational Control									Equity Share								
	Acetylene	Sugarcane Bagasse	Coal	Natural Gas	Wood	Fuel Oil	Diesel Oil	Total	%	Acetylene	Sugarcane Bagasse	Coal	Natural Gas	Wood	Fuel Oil	Diesel Oil	Total	%
CTJL	0,01		4.339.517,23			4.957,90	8.922,93	4.353.398,07	90,76%	0,01		4.339.517,23			4.957,90	8.922,93	4.353.398,07	90,79%
PHAB							1,78	1,78	0,00%							1,78	1,78	0,00%
PHJG							0,47	0,47	0,00%							0,47	0,47	0,00%
PHRO							0,20	0,20	0,00%							0,20	0,20	0,00%
Headquarters							13,77	13,77	0,00%							13,77	13,77	0,00%
UCLA	-				2.567,73		2,79	2.570,52	0,05%	-				2.567,73		2,79	2.570,52	0,05%
UETR							5,98	5,98	0,00%							5,98	5,98	0,00%
UHCB							4,05	4,05	0,00%							4,05	4,05	0,00%
UHET							-	-	0,00%							9,98	9,98	0,00%
UHIT							-	-	0,00%							0,00	0,00	0,00%
UHMA							-	-	0,00%							0,00	0,00	0,00%
UHPF							0,49	0,49	0,00%							0,49	0,49	0,00%
UHPP							2,81	2,81	0,00%							2,81	2,81	0,00%
UHSA							0,65	0,65	0,00%							0,65	0,65	0,00%
UHSO							0,86	0,86	0,00%							0,86	0,86	0,00%
UHSS							1,98	1,98	0,00%							1,98	1,98	0,00%
UTCH			351.443,68				1.221,58	352.665,25	7,35%			351.443,68				1.221,58	352.665,25	7,35%
UTFE		12.621,88						12.621,88	0,26%		12.621,88						12.621,88	0,26%
UTIB		5.671,47					2,00	5.673,47	0,12%		3.928,06					1,38	3.929,44	0,08%
UTWA				69.899,27			5,90	69.905,17	1,46%				69.899,27			5,90	69.905,17	1,46%
TOTAL	**0,01**	**18.293,35**	**4.690.960,91**	**69.899,27**	**2.567,73**	**4.957,90**	**10.188,24**	**4.796.867,41**	**100,00%**	**0,01**	**16.549,94**	**4.690.960,91**	**69.899,27**	**2.567,73**	**4.957,90**	**10.197,61**	**4.795.133,36**	**100,00%**
%	0,00%	0,38%	97,79%	1,46%	0,05%	0,10%	0,21%	100,00%		0,00%	0,35%	97,83%	1,46%	0,05%	0,10%	0,21%	100,00%	

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 2016, with more than 74% in both accounting approaches, as shown in Figure 2.

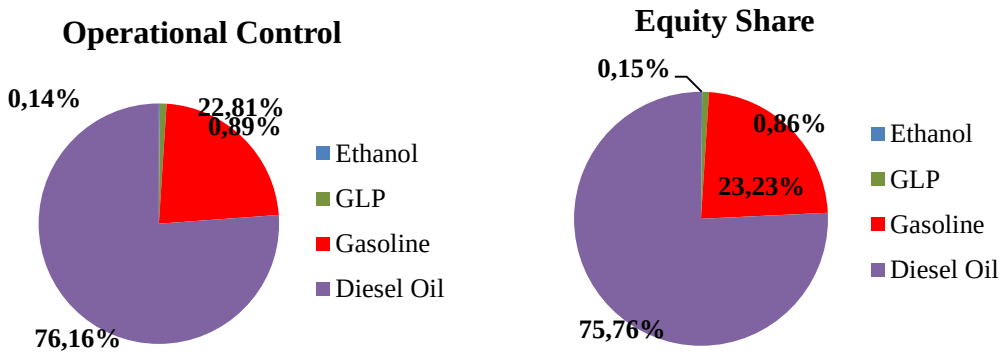


Figure 2 – Mobile Combustion Emission per Fuel (%)

Table 12 below shows that CTJL, UCLA and UHCB units are the most relevant, being responsible, in both approaches, for almost 70% of the mobile combustion emissions.

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

Emissions Sources	Operational Control						Equity Share					
	Ethanol	GLP	Gasoline	Diesel Oil	Ethanol	%	Ethanol	GLP	Gasoline	Diesel Oil	Total	%
CTJL		4,48	60,69	60,67	125,85	23,4%		4,48	60,69	60,67	125,85	22,7%
PHAB	0,00		1,06	5,47	6,53	1,2%	0,00		1,06	5,47	6,53	1,2%
PHJG	0,00		0,03	0,17	0,20	0,0%	0,00		0,03	0,17	0,20	0,0%
PHRO	0,06		0,07	1,40	1,53	0,3%	0,06		0,07	1,40	1,53	0,3%
Headquarters			25,40		25,40	4,7%			25,40		25,40	4,6%
UCLA	0,02		-	115,29	115,30	21,5%	0,02		-	115,29	115,30	20,8%
UEBB				6,54	6,54	1,2%				6,54	6,54	1,2%
UETR			6,59	79,62	86,20	16,1%			6,59	79,62	86,20	15,5%
UHCB	0,08		7,77	30,75	38,60	7,2%	0,08		7,77	30,75	38,60	7,0%
UHET	-		-	-	-	0,0%	0,02		3,49	4,94	8,44	1,5%
UHIT	-		-	-	-	0,0%	0,07		2,74	9,58	12,39	2,2%
UHMA	-		-	-	-	0,0%	0,01		0,24	1,83	2,08	0,4%
UHPF	0,03		-	8,43	8,46	1,6%	0,03		-	8,43	8,46	1,5%
UHPP	0,14		4,42	12,89	17,45	3,3%	0,14		4,42	12,89	17,45	3,1%
UHSA	0,15		3,68	27,45	31,28	5,8%	0,15		3,68	27,45	31,28	5,6%
UHSO	0,09	0,30	0,36	14,52	15,26	2,8%	0,09	0,30	0,36	14,52	15,26	2,7%
UHSS	0,15			11,50	11,65	2,2%	0,15			11,50	11,65	2,1%
UTAL			2,77	0,61	3,38	0,6%			2,77	0,61	3,38	0,6%
UTCH			8,63	5,27	13,90	2,6%			8,63	5,27	13,90	2,5%
UTIB	0,04		0,05	15,47	15,56	2,9%	0,03		0,04	10,71	10,77	1,9%

Emissions Sources	Operational Control						Equity Share					
	Ethanol	GLP	Gasoline	Diesel Oil	Ethanol	%	Ethanol	GLP	Gasoline	Diesel Oil	Total	%
UTWA	0,00		0,97	12,89	13,86	2,6%	0,00		0,97	12,89	13,86	2,5%
TOTAL	**0,76**	**4,78**	**122,49**	**408,94**	**536,97**	**100,0%**	**0,84**	**4,78**	**128,94**	**420,53**	**555,09**	
%	**0%**	**1%**	**23%**	**76%**	**100%**		**0%**	**1%**	**23%**	**76%**	**100%**	

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. Emissions from the SF6 gas leak are the most relevant emission source in this category, concentrated at PHJG, PHRO and UHIT, as it can be seen in table 13 and figure 03 below.

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

Emissions Sources	Operational Control					Equity Share				
	CO2	HFCs	SF6	Total	%	CO2	HFCs	SF6	Total	%
CTJL	2,8	15,9		18,7	3,3%	2,8	15,9		18,7	0,85%
Headquarters	0,0	526,1		526,1	91,6%	0,0	526,1		526,1	23,83%
UCLA	0,2			0,2	0,0%	0,2			0,2	0,01%
UEFL	0,0			0,0	0,0%	0,0			0,0	0,00%
UEGU	0,1			0,1	0,0%	0,1			0,1	0,00%
UEMU	0,2			0,2	0,0%	0,2			0,2	0,01%
UETR	0,1			0,1	0,0%	0,1			0,1	0,00%
UHCB	0,6			0,6	0,1%	0,6			0,6	0,03%
UHIT	-			-	0,0%	0,3			0,3	0,01%
UHMA	-			-	0,0%	1,5			1,5	0,07%
UHPF	0,2			0,2	0,0%	0,2			0,2	0,01%
UHPP		0,9		0,9	0,1%		0,9		0,9	0,04%
UHSA	0,0	8,2		8,3	1,4%	0,0	8,2		8,3	0,37%
UHSO	0,5	17,0		17,5	3,1%	0,5	17,0		17,5	0,79%
UHSS	0,8			0,8	0,1%	0,8			0,8	0,04%
UTAL	0,0			0,0	0,0%	0,0			0,0	0,00%
UTCH	0,2			0,2	0,0%	0,2			0,2	0,01%
UTFE	0,1			0,1	0,0%	0,1			0,1	0,00%
UTIB	0,0			0,0	0,0%	0,0			0,0	0,00%
UTWA	0,2			0,2	0,0%	0,2			0,2	0,01%
PHJG				-	0,0%				-	0,00%
PHRO				-	0,0%				-	0,00%
UHET				-	0,0%			9,1	9,1	0,41%
UHIT				-	0,0%		2,4	1.620,2	1.622,5	73,50%
TOTAL	6,042	568,104	-	574,15	100,0%	7,9	570,5	1.629,3	2.207,7	100,00%
%	1,1%	98,95%	0,00%	100,00%		0,36%	25,84%	73,80%	100,00%	

3.2.4. Emissions per Process

At UTCH, emissions from the limestone desulphurisation process occur. In 2016, this process produced 13,136 tons of gypsum, providing the emission of 3,360.39 tCO_2e.

3.2.5. 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.

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

Units	Operational Control		Equity Share	
	tCO2e	%	tCO2e	%
CTJL	0,00	0,01%	0,00	0,01%
UHCB	1,79	7,58%	1,79	6,95%
UHET	-	0,00%	1,36	5,27%
UHIT	-	0,00%	0,80	3,12%
UHPF	21,68	91,64%	21,68	83,99%
UHSO	0,01	0,05%	0,01	0,04%
UHSS	0,13	0,55%	0,13	0,50%
UTIB	0,04	0,18%	0,03	0,12%
Total	**23,66**	**100,00%**	**25,81**	**100,00%**

3.2.6. 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 14 shows the emissions of waste per business unit and per type of treatment applied to the waste.

In the operational control approach, the composting process is more relevant with a concentration of emissions at UHPF (59.5%) and at the headquarters (39.9%). Regarding the equity approach, the waste sent to landfill is more relevant (61%), with a higher concentration of emissions at UHPF (44.2%) and at the headquarters (29.6%), but with the UHET gaining relevance (19.9%).

Table 15: Scope 1 emissions per waste (tCO_2e)

Units	Operational Control				Equity Share			
	Landfill	Composting	Total	%	Landfill	Composting	Total	%
PHJG		0,02	0,02	0,62%		0,02	0,02	0,46%
Sede		1,50	1,50	39,9%		1,50	1,50	29,68%
UHET	-		-	0,0%	1,01		1,01	19,99%
UHIT	-		-	0,0%	0,28		0,28	5,64%
UHPF	1,79	0,45	2,23	59,5%	1,79	0,45	2,23	44,24%
Total	**1,79**	**1,97**	**3,76**	**100,0%**	**3,08**	**1,97**	**5,05**	**100,00%**
%	**47,6%**	**52,4%**	**100,0%**		**61,0%**	**39,0%**	**100,0%**	

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. As mentioned earlier, the power plants provide ancillary services to the SIN in accordance with agreements established with the ONS.

The ancillary services of the plants are the main source of energy consumption and, consequently, of CO2 emissions from Engie. Engie's total scope 2 emissions in 2016 was 10,231.74 tCO2e per operating control, and 10,938.15 tCO2e per sequity share approach.

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

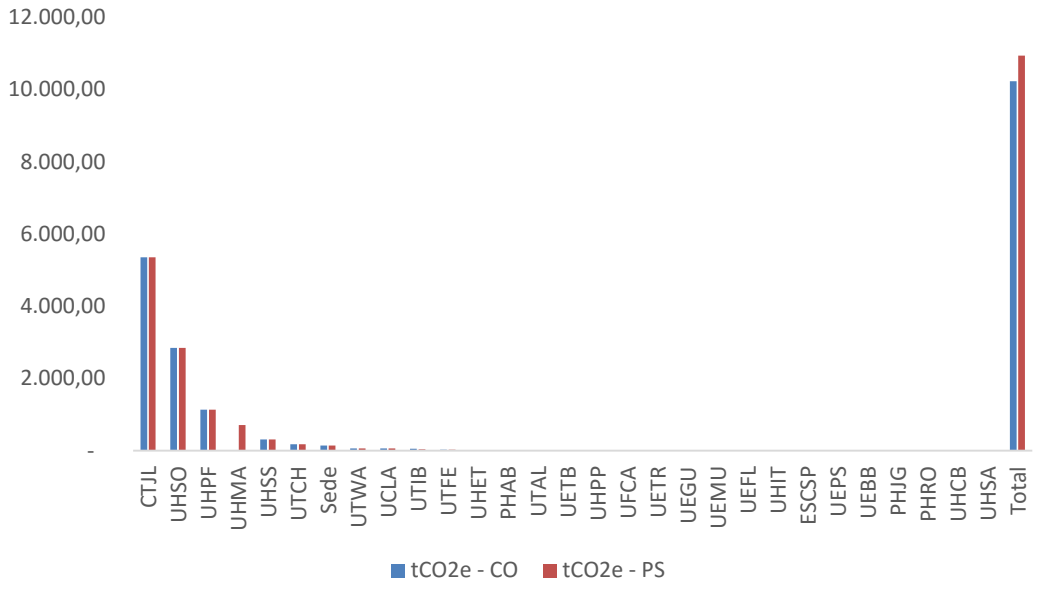


Figure 3: Scope 2 emissions per enterprise and approach (tCO2e)

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)

Units	Operational Control		Equity Share		Consumption (MWh)	
	tCO2e - CO	%	tCO2e - PS	%	MWh	%
CTJL	5.358,60	52,37%	5.358,60	48,99%	64.794,11	38,05%
UHSO	2.850,51	27,86%	2.850,51	26,06%	34.877,09	20,48%
UHPF	1.132,56	11,07%	1.132,56	10,35%	13.704,03	8,05%
UHMA	-	0,00%	707,17	6,47%	45.592,11	26,77%
UHSS	311,21	3,04%	311,21	2,85%	3.714,75	2,18%
UTCH	180,26	1,76%	180,26	1,65%	2.300,88	1,35%
Headquarters	146,53	1,43%	146,53	1,34%	1.800,97	1,06%
UTWA	60,80	0,59%	60,80	0,56%	746,81	0,44%
UCLA	60,71	0,59%	60,71	0,56%	727,87	0,43%
UTIB	51,75	0,51%	35,84	0,33%	625,22	0,37%
UTFE	27,16	0,27%	27,16	0,25%	343,72	0,20%
UHET	-	0,00%	13,32	0,12%	406,65	0,24%
PHAB	10,58	0,10%	10,58	0,10%	128,07	0,08%
UTAL	7,82	0,08%	7,82	0,07%	90,13	0,05%
UETB	7,44	0,07%	7,44	0,07%	91,64	0,05%
UHPP	6,87	0,07%	6,87	0,06%	83,79	0,05%
UFCA	4,99	0,05%	4,99	0,05%	61,72	0,04%
UETR	3,73	0,04%	3,73	0,03%	45,48	0,03%
UEGU	2,32	0,02%	2,32	0,02%	28,80	0,02%

Units	Operational Control		Equity Share		Consumption (MWh)	
	tCO2e - CO	%	tCO2e - PS	%	MWh	%
UEMU	2,17	0,02%	2,17	0,02%	27,26	0,02%
UEFL	2,08	0,02%	2,08	0,02%	26,19	0,02%
UHIT	-	0,00%	1,82	0,02%	32,19	0,02%
ESCSP	1,62	0,02%	1,62	0,01%	19,93	0,01%
UEPS	0,94	0,01%	0,94	0,01%	12,05	0,01%
UEBB	0,70	0,01%	0,70	0,01%	8,33	0,00%
PHJG	0,27	0,00%	0,27	0,00%	3,21	0,00%
PHRO	0,09	0,00%	0,09	0,00%	1,08	0,00%
UHCB	0,04	0,00%	0,04	0,00%	0,41	0,00%
UHSA	-	0,00%	-	0,00%	-	0,00%
Total	**10.231,74**	**100,00%**	**10.938,15**	**100,00%**	**170.294,50**	**100,0%**

In the operational control approach, emissions of scope 02 are strongly concentrated at CTJL (52.3%), UHSO (27.8%) and UHPF (11.07%). In the Equity approach, the emissions remain concentrated in these enterprises with different percentages (48.9%, 26.0% and 10.3%, respectively), in addition to UHMA with 6.47%.

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.

3.4. Scope 03 Emissions

Engie's indirect emissions totaled 27,930.83 tCO2e for operational control, and 28,192.34 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 2016.

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

Emissions Sources	Operational Control		Equity Share	
	Emissions (tCO2e)	%	Emissions (tCO2e)	%
Scope 3	**27.930,83**	**100,00%**	**28.192,34**	**100,00%**
Fuel and energy related activities not included in scopes 1 and 2	**2,57**	**0,01%**	**2,57**	**0,01%**
Acetylen	0,001	0,00%	0,00	0,00%
Gasoline	2,565	0,01%	2,56	0,01%
Transport and Distribution (downstream)	**8.788,02**	**31,46%**	**8.788,02**	**31,17%**
Diesel Oil	8.776,60	31,42%	8.776,60	31,13%
Gasoline	11,42	0,04%	11,42	0,04%
Transporte e Distribuição (upstream)	**17.360,36**	**62,15%**	**17.458,07**	**61,92%**
Diesel Oil	17.253,33	61,77%	17.300,24	61,37%
Gasoline	102,23	0,37%	153,79	0,55%
Biodiesel	2,48	0,01%	1,72	0,01%
Ethanol	0,06	0,00%	0,06	0,00%
Liquefied Petroleum Gas	2,26	0,01%	2,26	0,01%
Deslocamento de Funcionários	**304,73**	**1,09%**	**370,00**	**1,31%**
Diesel Oil	250,53	0,90%	315,80	1,12%
Gasoline	54,07	0,19%	54,07	0,1918%
Ethanol	0,13	0,00%	0,13	0,0005%
Air Travel	**944,05**	**3,38%**	**1.030,41**	**3,65%**
Aviation Gasoline (AvGas)	816,70	2,92%	896,14	3,18%
Gasoline	127,35	0,46%	131,51	0,47%
Diesel Oil	-	0,00%	2,76	0,010%
Resíduos Gerados nas Operações	**531,11**	**1,90%**	**543,27**	**1,93%**
Landfill	529,75	1,90%	541,93	1,92%
Composting	0,99	0,00%	0,99	0,00%
Incineration	0,37	0,00%	0,35	0,00%

Table 18 – Scope 03 emissions per enterprise (tCO2e /%)

Units	Total Emissions – Operational Control (tCO2e)		Total Emissions – Equity Share (tCO2e)	
	Scope 3	%	Scope 3	%
CTJL	13.463,83	48,2%	13.463,83	47,8%
UTCH	11.698,59	41,9%	11.698,59	41,5%
UTWA	36,32	0,1%	36,32	0,1%
UTFE	835,41	3,0%	835,41	3,0%
UTIB	3,68	0,0%	2,55	0,0%
UHCB	32,36	0,1%	32,36	0,1%
UCLA	448,80	1,6%	448,80	1,6%
UHSO	77,99	0,3%	77,99	0,3%
PHRO	6,88	0,0%	6,88	0,0%
PHJG	7,09	0,0%	7,09	0,0%
Headquarters	696,54	2,5%	696,54	2,5%
UHPF	75,94	0,3%	75,94	0,3%
UHSS	224,51	0,8%	224,51	0,8%
UHSA	159,20	0,6%	159,20	0,6%
UETR	73,79	0,3%	73,79	0,3%
UHPP	48,64	0,2%	48,64	0,2%
UHIT	-	0,0%	98,43	0,3%
UEPS	33,94	0,1%	33,94	0,1%
PHAB	1,73	0,0%	1,73	0,0%
UEBB	1,11	0,0%	1,11	0,0%
UHET	-	0,0%	145,49	0,5%
UETB	-	0,0%	-	0,0%
UTAL	3,06	0,0%	3,06	0,0%
UFCA	-	0,0%	-	0,0%
ESCSP	1,42	0,0%	1,42	0,0%
UEGU	-	0,0%	-	0,0%
UEMU	-	0,0%	-	0,0%
UEFL	-	0,0%	-	0,0%
UHMA	-	0,0%	18,71	0,1%
Total	**27.930,83**	**100%**	**28.192,34**	**100%**

Scope 03 emissions are mainly concentrated in the transportation of inputs and wastes to CTJL and UTCH thermoelectric plants (approximately 89% 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 (more than 90%) in the consumption of diesel for suppliers of transport of inputs (coal, oil, etc.) of UT CH and CTJL (slightly more than 60% and 30%, respectively).

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

Emission Sources	Operational Control							Equity Share						
	Biodiesel	Ethanol	GLP	Gasoline	Diesel Oil	Total	%	Biodiesel	Ethanol	GLP	Gasoline	Diesel Oil	Total	%
CTJL			2,26	37,01	5.305,38	**5.344,64**	**30,79%**			2,26	37,01	5.305,38	**5.344,64**	**30,61%**
PHAB				1,61		**1,61**	**0,01%**				1,61		**1,61**	**0,01%**
PHJG		0,00		3,82	3,27	**7,09**	**0,04%**		0,00		3,82	3,27	**7,09**	**0,04%**
PHRO		0,00		3,00	3,88	**6,88**	**0,04%**		0,00		3,00	3,88	**6,88**	**0,04%**
UCLA					394,16	**394,16**	**2,27%**					394,16	**394,16**	**2,26%**
UETR				0,53	7,50	**8,03**	**0,05%**				0,53	7,50	**8,03**	**0,05%**
UHET		-		-	-	-	**0,00%**		-		43,00	41,35	**84,35**	**0,48%**
UHIT				-	-	-	**0,00%**				7,07	4,28	**11,35**	**0,07%**
UHMA				-	-	-	**0,00%**				1,49	1,29	**2,78**	**0,02%**
UHPF				21,26	8,95	**30,21**	**0,17%**				21,26	8,95	**30,21**	**0,17%**
UHPP		0,00		15,41	20,26	**35,67**	**0,21%**		0,00		15,41	20,26	**35,67**	**0,20%**
UHSA				9,98	100,81	**110,79**	**0,64%**				9,98	100,81	**110,79**	**0,63%**
UHSO		0,05		8,51	1,83	**10,39**	**0,06%**		0,05		8,51	1,83	**10,39**	**0,06%**
UHSS		0,01		1,11	133,32	**134,43**	**0,77%**		0,01		1,11	133,32	**134,43**	**0,77%**
UTCH					10.506,76	**10.506,76**	**60,52%**					10.506,76	**10.506,76**	**60,18%**
UTFE					767,21	**767,21**	**4,42%**					767,21	**767,21**	**4,39%**

Emission Sources	Operational Control							Equity Share						
	Biodiesel	Ethanol	GLP	Gasoline	Diesel Oil	Total	%	Biodiesel	Ethanol	GLP	Gasoline	Diesel Oil	Total	%
UTIB	2,48					**2,48**	**0,01%**	1,72					**1,72**	**0,01%**
TOTAL	**2,48**	**0,06**	**2,26**	**102,23**	**17.253,33**	**17.360,36**	**1,00**	**1,72**	**0,06**	**2,26**	**153,79**	**17.300,24**	**17.458,07**	**1,00**
%	**0,0%**	**0,0%**	**0,0%**	**0,6%**	**99,4%**	**100,0%**		**0,0%**	**0,0%**	**0,0%**	**0,9%**	**99,1%**	**100,0%**	

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).

Downstream emissions are concentrated in diesel consumption in outsourced transportation at CTJL (87%) and UTCH (13%).

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

Emission Sources	Operational Control				Equity Share			
	Gasoline	Diesel Oil	Total	%	Gasoline	Diesel Oil	Total	%
CTJL	6,6	7.629,5	7.636,1	87%	6,6	7.629,5	7.636,1	87%
UHSA	4,8		4,8	0%	4,8		4,8	0%
UTCH		1.147,1	1.147,1	13%		1.147,1	1.147,1	13%
TOTAL	**11,4**	**8.776,6**	**8.788,0**	**100%**	**11,4**	**8.776,6**	**8.788,0**	**100%**
%	**0,13%**	**99,87%**	**100,00%**	**0,01%**	**0,13%**	**99,87%**	**100,00%**	**0,01%**

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 85%) and sprayed among the units, as shown in the following table.

Table 21: Scope 3 emissions per Commuting in tCO_2e

Emission Sources	Operational Control					Equity Share				
	Ethanol	Gasoline	Diesel Oil	Total	%	Ethanol	Gasoline	Diesel Oil	Total	%
CTJL			46,26	46,26	15,2%			46,26	46,26	12,5%
UCLA		13,55	24,44	37,99	12,5%		13,55	24,44	37,99	10,3%
UHCB	0,01	15,79	7,50	23,30	7,6%	0,01	15,79	7,50	23,30	6,3%
UHET			-	-	0,0%			3,09	3,09	0,8%
UHIT			-	-	0,0%			48,44	48,44	13,1%
UHMA			-	-	0,0%			13,74	13,74	3,7%
UHPF			38,80	38,80	12,7%			38,80	38,80	10,5%
UHPP	0,01	1,89		1,90	0,6%	0,01	1,89		1,90	0,5%
UHSA			33,99	33,99	11,2%			33,99	33,99	9,2%
UHSO		9,32	45,78	55,10	18,1%		9,32	45,78	55,10	14,9%
UHSS	0,11	4,15	53,77	58,03	19,0%	0,11	4,15	53,77	58,03	15,7%
UTWA	-	9,37		9,37	3,1%	-	9,37		9,37	2,5%
TOTAL	**0,13**	**54,07**	**250,53**	**304,73**	**100%**	**0,13**	**54,07**	**315,80**	**370,00**	**100%**
%	**0,0%**	**17,7%**	**82,2%**	**100,0%**		**0,0%**	**14,6%**	**85,4%**	**100,0%**	

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, enterprise and accounting approach. Sludge from treatment plants, mainly from thermal plants, sent to landfill and common waste (25%) is the waste responsible for the largest share of emissions (approximately 60%). Rubber, chemical, paper and cardboard waste were grouped in this table as "Other" due to their low relevance in this emission source.

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

Emission Sources	Operational Control							Equity Share						
	Sludge	Wood	Alimentares	Common	Others	Total	%	Sludge	Wood	Alimentares	Common	Others	Total	%
CTJL	231,8			77,3	-	**309,1**	**58,2%**	231,8			77,3	-	**309,1**	**56,9%**
PHAB			0,1		-	**0,1**	**0,0%**			0,1		-	**0,1**	**0,0%**
UCLA	3,7		0,9	1,9	0,3	**6,8**	**1,3%**	3,7		0,9	1,9	0,3	**6,8**	**1,3%**
UEBB			0,2	0,1	0,1	**0,4**	**0,1%**			0,2	0,1	0,1	**0,4**	**0,1%**
UEPS			0,2	0,1	0,2	**0,5**	**0,1%**			0,2	0,1	0,2	**0,5**	**0,1%**
UETR		51,3	0,1	3,5	0,0	**54,8**	**10,3%**		51,3	0,1	3,5	0,0	**54,8**	**10,1%**
UHCB			2,9	1,1	-	**4,0**	**0,8%**			2,9	1,1	-	**4,0**	**0,7%**
UHIT	-		-	-	-	**-**	**0,0%**	3,1		6,3	0,6	0,5	**10,5**	**1,9%**
UHMA	-	-	-	-	-	**-**	**0,0%**	0,6	0,1	1,2	0,1	0,0	**2,0**	**0,4%**
UHPF	2,6		3,7	0,1	0,1	**6,4**	**1,2%**	2,6		3,7	0,1	0,1	**6,4**	**1,2%**
UHSA			2,0	0,5	0,3	**2,8**	**0,5%**			2,0	0,5	0,3	**2,8**	**0,5%**
UHSO	6,2	0,1	2,1	1,8	-	**10,3**	**1,9%**	6,2	0,1	2,1	1,8	-	**10,3**	**1,9%**
UHSS	12,7	0,0	1,8	1,9	-	**16,4**	**3,1%**	12,7	0,0	1,8	1,9	-	**16,4**	**3,0%**
UTAL			0,4	0,1	-	**0,5**	**0,1%**			0,4	0,1	-	**0,5**	**0,1%**
UTCH	19,9		2,9	2,0	-	**24,9**	**4,7%**	19,9		2,9	2,0	-	**24,9**	**4,6%**
UTFE	20,7		0,9	46,6	-	**68,2**	**12,8%**	20,7		0,9	46,6	-	**68,2**	**12,6%**
UTIB		0,1	0,5		0,6	**1,2**	**0,2%**		0,0	0,4		0,4	**0,8**	**0,2%**
UTWA	23,9		0,8		-	**24,7**	**4,6%**	23,9		0,8		-	**24,7**	**4,5%**
TOTAL	**321,5**	**51,5**	**19,5**	**137,0**	**1,6**	**531,1**	**100%**	**325,3**	**51,5**	**26,9**	**137,7**	**1,9**	**543,3**	**100%**
%	**60,5%**	**9,7%**	**3,7%**	**25,8%**	**0,3%**	**100,0%**		**59,9%**	**9,5%**	**4,9%**	**25,3%**	**0,3%**	**100,0%**	

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 (73% on operational control approach and 67% on equity share approach)

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

Emission Sources	Operational Control					Equity Share				
	Gasoline	Diesel Oil	Aviation Gasoline	Total	%	Gasoline	Diesel Oil	Aviation Gasoline	Total	%
CTJL	32,89		94,87	**127,76**	**13,5%**	32,89		94,87	**127,76**	**12,4%**
Headquarter	46,21		650,33	**696,54**	**73,8%**	46,21		650,33	**696,54**	**67,6%**
ESCSP			1,42	**1,42**	**0,2%**			1,42	**1,42**	**0,1%**
UCLA	2,99		6,85	**9,85**	**1,0%**	2,99		6,85	**9,85**	**1,0%**
UEBB	0,67			**0,67**	**0,1%**	0,67		-	**0,67**	**0,1%**
UEPS	32,89		0,56	**33,45**	**3,5%**	32,89		0,56	**33,45**	**3,2%**
UETR	2,40		8,53	**10,93**	**1,2%**	2,40		8,53	**10,93**	**1,1%**
UHCB	0,65		4,40	**5,04**	**0,5%**	0,65		4,40	**5,04**	**0,5%**
UHET	-			**-**	**0,0%**	1,57	2,76	53,71	**58,05**	**5,6%**
UHIT	-			**-**	**0,0%**	2,52		25,62	**28,13**	**2,7%**
UHMA	-			**-**	**0,0%**	0,06		0,11	**0,17**	**0,0%**
UHPF			0,52	**0,52**	**0,1%**			0,52	**0,52**	**0,1%**
UHPP			11,07	**11,07**	**1,2%**			11,07	**11,07**	**1,1%**
UHSO			2,23	**2,23**	**0,2%**			2,23	**2,23**	**0,2%**
UHSS			13,11	**13,11**	**1,4%**			13,11	**13,11**	**1,3%**
UHSA	2,24		4,56	**6,80**	**0,7%**	2,24		4,56	**6,80**	**0,7%**
UTAL	2,55			**2,55**	**0,3%**	2,55		-	**2,55**	**0,2%**
UTCH	3,48		16,37	**19,86**	**2,1%**	3,48		16,37	**19,86**	**1,9%**
UTWA	0,39		1,88	**2,27**	**0,2%**	0,39		1,88	**2,27**	**0,2%**
TOTAL	**127,35**	**-**	**816,70**	**944,05**	**100,0%**	**131,51**	**2,76**	**896,14**	**1.030,41**	**100,0%**
%	**13,49%**	**0,0%**	**86,5%**	**100,0%**		**12,8%**	**0,3%**	**87,0%**	**100,0%**	

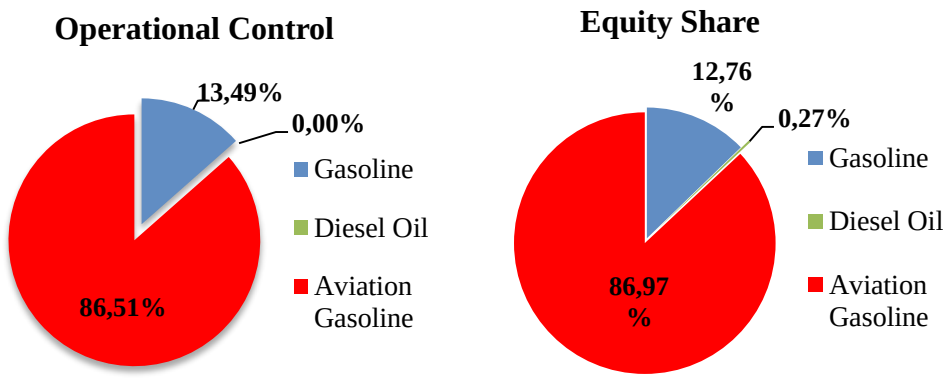


Figure 4: Business travel emissions (%)

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

Emissions of 2.57 tCO2e were provided by fuel and energy related activities not included in scopes 01 and 02. All these emissions were provided by UHSO in gasoline-consuming activities in trimmers and activities using cetylene

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 2016, providing an overview of Engie Energia emissions during the year.

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

Emissions Sources	Operational Control Emissions (tCO_2e)	%	Equity Share Emissions (tCO_2e)	%
Scope 1	**4.801.366,33**	**99,21%**	**4.801.287,37**	**99,19%**
Stationary Combustion	**4.796.867,41**	**99,12%**	**4.795.133,36**	**99,06%**
Acetylen	0,01	0,00%	0,01	0,00%
Sugarcane bagasse	18.293,35	0,38%	16.549,94	0,34%
Coal Steam 3100 kcal / kg	351.443,68	7,26%	351.443,68	7,26%
Coal Steam 4500 kcal / kg	4.339.517,23	89,67%	4.339.517,23	89,65%
Dry Natural Gas	69.899,27	1,44%	69.899,27	1,44%
Wood	2.567,73	0,05%	2.567,73	0,05%
Fuel Oil	4.957,90	0,10%	4.957,90	0,10%
Commercial Diesel Oil	10.188,24	0,21%	10.197,61	0,21%
Direct Mobile Combustion	**536,97**	**0,01%**	**555,09**	**0,01%**
Diesel Oil	408,94	0,01%	420,53	0,01%
Gasoline	122,49	0,00%	128,94	0,00%
Liquefied Petroleum Gas	4,78	0,00%	4,78	0,000%
Ethanol	0,76	0,00%	0,84	0,000%
Fugitives	**574,15**	**0,01%**	**2.207,65**	**0,05%**
Sulfur Hexafluoride (SF_6)	-	0,00%	1.629,30	0,03%
Carbon Dioxide (CO_2)	6,04	0,00%	7,88	0,00%
HFCs	568,10	0,01%	570,48	0,01%
Industrial Processes Emissions	**3.360,39**	**0,07%**	**3.360,39**	**0,07%**
Desulphurisation of gases	3.360,39	0,07%	3.360,39	0,07%
Agricultural Activities	**23,66**	**0,00%**	**25,81**	**0,00%**
Fertilizers - Organic	1,18	0,00%	1,54	0,00%
Aynthetic Fertilizers	22,48	0,00%	24,27	0,00%
Waste	**3,76**	**0,00%**	**5,05**	**0,00%**
Landfill	1,79	0,00%	3,08	0,00%
Composting	1,97	0,00%	1,97	0,00%
Scope 2	**10.231,74**	**0,21%**	**10.938,15**	**0,23%**
Energia	**10.231,74**	**0,21%**	**10.938,15**	**0,23%**
Electricity	10.231,74	0,21%	10.938,15	0,23%
Scope 3	**27.930,83**	**0,58%**	**28.192,34**	**0,58%**
Fuel and energy related activities not included in scopes 1 and 2	**2,57**	**0,00%**	**2,57**	**0,00%**
Acetylen	0,001	0,00%	0,00	0,00%
Gasoline	2,565	0,00%	2,56	0,00%
Transport and Distribution (downstream)	**8.788,02**	**0,18%**	**8.788,02**	**0,18%**
Diesel Oil	8.776,60	0,18%	8.776,60	0,18%
Gasoline	11,42	0,00%	11,42	0,00%
Transporte e Distribuição (upstream)	**17.360,36**	**0,36%**	**17.458,07**	**0,36%**
Diesel Oil	17.253,33	0,36%	17.300,24	0,36%
Gasoline	102,23	0,00%	153,79	0,00%
Biodiesel	2,48	0,00%	1,72	0,00%

Emissions Sources	Operational Control Emissions (tCO_2e)	%	Equity Share Emissions (tCO_2e)	%
Ethanol	0,06	0,00%	0,06	0,00%
Liquefied Petroleum Gas	2,26	0,00%	2,26	0,00%
Deslocamento de Funcionários	**304,73**	**0,01%**	**370,00**	**0,01%**
Diesel Oil	250,53	0,01%	315,80	0,01%
Gasoline	54,07	0,00%	54,07	0,0011%
Ethanol	0,13		0,13	0,0000%
Air Travel	**944,05**	**0,02%**	**1.030,41**	**0,02%**
Aviation Gasoline (AvGas)	816,70	0,02%	896,14	0,02%
Gasoline	127,35	0,00%	131,51	0,00%
Diesel Oil	-	0,00%	2,76	0,000%
Resíduos Gerados nas Operações	**531,11**	**0,01%**	**543,27**	**0,01%**
Landfill	529,75	0,01%	541,93	0,01%
Composting	0,99		0,99	0,00%
Incineration	0,37	0,00%	0,35	0,00%
Total (tCO2e)	**4.839.528,91**	**100%**	**4.840.417,85**	**100%**

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

Units	Total Emissions tCO_2e - Operational Control (tCO2e)					Total Emissions tCO_2e - Equity Share (tCO2e)				
	Scope 1	Scope 2	Scope 3	Total	%	Scope 1	Scope 2	Scope 3	Total	%
CTJL	4.353.542,61	5.358,60	13.463,83	4.372.365,04	90,35%	4.353.542,61	5.358,60	13.463,83	4.372.365,04	90,33%
UTCH	356.039,74	180,26	11.698,59	367.918,59	7,60%	356.039,74	180,26	11.698,59	367.918,59	7,60%
UTWA	69.919,29	60,80	36,32	70.016,40	1,45%	69.919,29	60,80	36,32	70.016,40	1,45%
UTFE	12.621,98	27,16	835,41	13.484,55	0,28%	12.621,98	27,16	835,41	13.484,55	0,28%
UTIB	5.689,12	51,75	3,68	5.744,55	0,12%	3.940,28	35,84	2,55	3.978,67	0,082%
UHCB	45,04	0,04	32,36	77,44	0,00%	45,04	0,04	32,36	77,44	0,002%
UCLA	2.686,00	60,71	448,80	3.195,52	0,07%	2.686,00	60,71	448,80	3.195,52	0,07%
UHSO	33,65	2.850,51	77,99	2.962,14	0,06%	33,65	2.850,51	77,99	2.962,14	0,06%
PHRO	1,73	0,09	6,88	8,71	0,000%	1,73	0,09	6,88	8,71	0,000%
PHJG	0,69	0,27	7,09	8,06	0,000%	0,69	0,27	7,09	8,06	0,000%
Sede	566,74	146,53	696,54	1.409,80	0,03%	566,74	146,53	696,54	1.409,80	0,03%
UHPF	33,05	1.132,56	75,94	1.241,55	0,03%	33,05	1.132,56	75,94	1.241,55	0,03%
UHSS	14,59	311,21	224,51	550,31	0,01%	14,59	311,21	224,51	550,31	0,011%
UHSA	40,19	-	159,20	199,39	0,00%	40,19	-	159,20	199,39	0,00%
UETR	92,26	3,73	73,79	169,78	0,00%	92,26	3,73	73,79	169,78	0,00%
UHPP	21,12	6,87	48,64	76,64	0,00%	21,12	6,87	48,64	76,64	0,002%
UHIT	-	-	-	-	0,00%	1.636,35	1,82	98,43	1.736,60	0,04%
UEPS	-	0,94	33,94	34,88	0,001%	-	0,94	33,94	34,88	0,001%
PHAB	8,30	10,58	1,73	20,62	0,000%	8,30	10,58	1,73	20,62	0,000%
UEBB	6,54	0,70	1,11	8,34	0,00%	6,54	0,70	1,11	8,34	0,00%
UHET	-	-	-	-	0,00%	29,92	13,32	145,49	188,74	0,00%
UETB	-	7,44	-	7,44	0,00%	-	7,44	-	7,44	0,00%
UTAL	3,40	7,82	3,06	14,28	0,00%	3,40	7,82	3,06	14,28	0,000%
UFCA	-	4,99	-	4,99	0,00%	-	4,99	-	4,99	0,00%
ESCSP	-	1,62	1,42	3,04	0,00%	-	1,62	1,42	3,04	0,00%
UEGU	0,09	2,32	-	2,41	0,00%	0,09	2,32	-	2,41	0,00%
UEMU	0,18	2,17	-	2,35	0,00%	0,18	2,17	-	2,35	0,00%
UEFL	0,01	2,08	-	2,08	0,00%	0,01	2,08	-	2,08	0,00%
UHMA	-	-	-	-	0,00%	3,60	707,17	18,71	729,47	0,02%
Total	**4.801.366,33**	**10.231,74**	**27.930,83**	**4.839.528,91**	**100,00%**	**4.801.287,37**	**10.938,15**	**28.192,34**	**4.840.417,85**	**100,00%**
%	**99,21%**	**0,21%**	**0,58%**	**100,00%**		**99,19%**	**0,23%**	**0,58%**	**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 a biogenic fuel 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 neutral in CO2 emissions.

Table 26 – Biomass Emissions (tCO_2e)

Unidade Empresarial	Controle Operacional				Participação Societária			
	Escopo 1	Escopo 3	Total	%	Escopo 1	Escopo 3	Total	%
CTJL	19,0	915,4	**934,4**	**0,09%**	19,0	915,4	**934,4**	**0,10%**
UTCH	2,5	805,9	**808,4**	**0,1%**	2,5	805,9	**808,4**	**0,1%**
UTWA	1,5	2,4	**3,9**	**0,0%**	1,5	2,4	**3,9**	**0,0%**
UTFE	631.527,1	53,0	**631.580,1**	**59,7%**	631.527,1	53,0	**631.580,1**	**65,1%**
UTIB	283.773,8	424,5	**284.198,3**	**26,9%**	196.541,7	294,0	**196.835,7**	**20,3%**
UHCB	13,3	5,4	**18,7**	**0,0%**	13,3	5,4	**18,7**	**0,0%**
UCLA	140.120,0	33,0	**140.152,9**	**13,2%**	140.120,0	33,0	**140.152,9**	**14,4%**
UHSO	10,4	12,7	**23,2**	**0,0%**	10,4	12,7	**23,2**	**0,0%**
PHRO	6,6	1,1	**7,7**	**0,0%**	6,6	1,1	**7,7**	**0,0%**
PHJG	0,1	1,3	**1,4**	**0,0%**	0,1	1,3	**1,4**	**0,0%**
Headquarters	7,1	11,3	**18,4**	**0,0%**	7,1	11,3	**18,4**	**0,0%**
UHPF	3,8	8,5	**12,3**	**0,0%**	3,8	8,5	**12,3**	**0,0%**
UHSS	16,7	27,9	**44,7**	**0,0%**	16,7	27,9	**44,7**	**0,0%**
UHSA	19,2	13,5	**32,7**	**0,0%**	19,2	13,5	**32,7**	**0,0%**
UETR	7,5	1,2	**8,7**	**0,0%**	7,5	1,2	**8,7**	**0,0%**
UHPP	17,4	7,6	**25,0**	**0,0%**	17,4	7,6	**25,0**	**0,0%**
UHIT	-	-	**-**	**0,0%**	8,8	6,0	**14,8**	**0,0%**
UEPS	-	8,0	**8,0**	**0,0%**	-	8,0	**8,0**	**0,0%**
PHAB	1,2	0,4	**1,6**	**0,0%**	1,2	0,4	**1,6**	**0,0%**
UEBB	0,5	0,2	**0,6**	**0,0%**	0,5	0,2	**0,6**	**0,0%**
UHET	-	-	**-**	**0,0%**	2,9	14,1	**17,1**	**0,0%**
UETB	-	-	**-**	**0,0%**	-	-	**-**	**0,0%**
UTAL	0,7	0,6	**1,3**	**0,0%**	0,7	0,6	**1,3**	**0,0%**
UFCA	-	-	**-**	**0,0%**	-	-	**-**	**0,0%**
ESCSP	-	-	**-**	**0,0%**	-	-	**-**	**0,0%**
UEGU	-	-	**-**	**0,0%**	-	-	**-**	**0,0%**
UEMU	-	-	**-**	**0,0%**	-	-	**-**	**0,0%**
UEFL	-	-	**-**	**0,0%**	-	-	**-**	**0,0%**
UHMA	-	-	-	**-**	0,7	1,4	**2,1**	**0,00**
Total (tCO2e)	**1.055.548,47**	**2.333,79**	**1.057.882,26**	**100,0%**	**968.328,92**	**2.224,85**	**970.553,77**	**100,0%**
%	**99,78%**	**0,22%**	**100,00%**		**99,77%**	**0,23%**	**100,00%**	

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

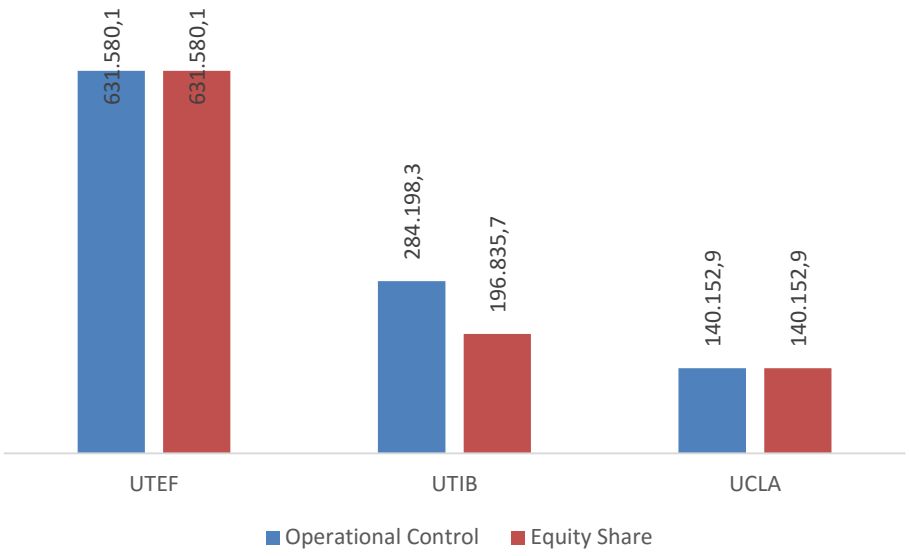


Figura 5: Biomass Emissions – UTEF, UTIB and UCLA (tCO2e)

3.7. Emissions per GEE

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 by GHG and scope - Operacional Control (tCO_2e)

Units	Scope 1 (tCO2e)					Scope 2 (tCO2e)	Scope 3 (tCO2e)				Total
	CO_2	CH_4	N_2O	SF_6	Total	CO_2	CO_2	CH_4	N_2O	Total	
CTJL	4.331.945,39	1.156,44	20.440,79	-	4.353.542,61	5.358,60	12.925,93	329,91	207,99	13.463,83	4.372.365,04
UTCH	354.317,06	92,41	1.630,28	-	356.039,74	180,26	11.471,81	42,92	183,86	11.698,59	367.918,59
UTWA	69.850,78	31,16	37,35	-	69.919,29	60,80	11,19	24,78	0,35	36,32	70.016,40
UTFE	0,11	4.874,57	7.747,31	-	12.621,98	27,16	753,94	68,97	12,50	835,41	13.484,55
UTIB	17,28	2.190,38	3.481,46	-	5.689,12	51,75	0,06	2,59	1,04	3,68	5.744,55
UHCB	42,28	0,19	2,58	-	45,04	0,04	27,45	4,19	0,72	32,36	77,44
UCLA	116,25	991,85	1.577,90	-	2.686,00	60,71	433,96	7,62	7,22	448,80	3.195,52
UHSO	33,27	0,10	0,28	-	33,65	2.850,51	66,05	10,55	1,39	77,99	2.962,14
PHRO	1,64	0,05	0,04	-	1,73	0,09	6,68	0,04	0,16	6,88	8,71
PHJG	0,66	0,01	0,02	-	0,69	0,27	6,87	0,04	0,18	7,09	8,06
Headquarters	564,08	1,05	1,60	-	566,74	146,53	688,35	0,55	7,64	696,54	1.409,80
UHPF	8,96	2,06	22,04	-	33,05	1.132,56	67,77	6,69	1,48	75,94	1.241,55
UHSS	14,11	0,12	0,36	-	14,59	311,21	204,42	16,81	3,29	224,51	550,31
UHSA	39,40	0,19	0,60	-	40,19	-	153,60	2,86	2,74	159,20	199,39
UETR	90,58	0,19	1,49	-	92,26	3,73	18,62	54,88	0,30	73,79	169,78
UHPP	20,56	0,17	0,40	-	21,12	6,87	47,41	0,21	1,01	48,64	76,64
UHIT	-	-	-	-	-	-	-	-	-	-	-
UEPS	-	-	-	-	-	0,94	32,01	0,81	1,12	33,94	34,88
PHAB	8,15	0,02	0,13	-	8,30	10,58	1,54	0,08	0,11	1,73	20,62
UEBB	6,43	0,01	0,10	-	6,54	0,70	0,64	0,44	0,02	1,11	8,34
UHET	-	-	-	-	-	-	-	-	-	-	-

Units	Scope 1 (tCO2e)					Scope 2 (tCO2e)	Scope 3 (tCO2e)				Total
	CO_2	CH_4	N_2O	SF_6	Total	CO_2	CO_2	CH_4	N_2O	Total	
UETB	-	-	-	-	-	7,44	-	-	-	-	7,44
UTAL	3,27	0,03	0,10	-	3,40	7,82	2,44	0,54	0,09	3,06	14,28
UFCA	-	-	-	-	-	4,99	-	-	-	-	4,99
ESCSP	-	-	-	-	-	1,62	1,41	0,00	0,01	1,42	3,04
UEGU	0,09	-	-	-	0,09	2,32	-	-	-	-	2,41
UEMU	0,18	-	-	-	0,18	2,17	-	-	-	-	2,35
UEFL	0,01	-	-	-	0,01	2,08	-	-	-	-	2,08
UHMA	-	-	-	-	-	-	-	-	-	-	-
TOTAL (tCO2e)	**4.757.080,54**	**9.340,97**	**34.944,82**	**-**	**4.801.366,33**	**10.231,74**	**26.922,14**	**575,47**	**433,22**	**27.930,83**	**4.839.528,91**

Table 28 – Emissions per GHG 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	4.331.945,39	46,26	68,59	-	5.358,60	12.925,929	13,196	0,698
UTCH	354.317,058	3,696	5,471	-	180,26	11.471,806	1,717	0,617
UTWA	69.850,782	1,246	0,125	-	60,80	11,193	0,991	0,001
UTFE	0,108	194,983	25,998	-	27,16	753,936	2,759	0,042
UTIB	17,283	87,615	11,683	-	51,75	0,059	0,104	0,003
UHCB	42,280	0,007	0,009	-	0,037	27,446	0,168	0,002
UCLA	116,250	39,674	5,295	-	60,71	433,965	0,305	0,024
UHSO	33,273	0,004	0,001	-	2.850,51	66,048	0,422	0,005
PHRO	1,643	0,002	0,000	-	0,09	6,682	0,001	0,001
PHJG	0,664	0,001	0,000	-	0,27	6,870	0,002	0,001
Headquarters	564,083	0,042	0,005	-	146,53	688,350	0,022	0,026
UHPF	8,958	0,082	0,074	-	1.132,56	67,774	0,268	0,005
UHSS	14,107	0,005	0,001	-	311,21	204,416	0,672	0,011
UHSA	39,398	0,007	0,002	-	-	153,600	0,114	0,009
UETR	90,579	0,008	0,0050	-	3,73	18,615	2,195	0,001
UHPP	20,556	0,007	0,0013	-	6,87	47,415	0,008	0,003
UHIT	-	-	-	-	-	-	-	-
UEPS	-	-	-	-	0,94	32,009	0,032	0,004
PHAB	8,153	0,001	0,000	-	10,58	1,543	0,003	0,000
UEBB	6,430	0,000	0,000	-	0,70	0,643	0,018	0,000
UHET	-	-	-	-	-	-	-	-
UETB	-	-	-	-	7,44	-	-	-

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
UTAL	3,269	0,001	0,000	-	7,82	2,437	0,021	0,000
UFCA	-	-	-	-	4,99	-	-	-
ESCSP	-	-	-	-	1,62	1,406	0,000	0,000
UEGU	0,090	-	-	-	2,32	-	-	-
UEMU	0,180	-	-	-	2,17	-	-	-
UEFL	0,006	-	-	-	2,078	-	-	-
UHMA	-	-	-	-	-	-	-	-
TOTAL (tGEE)	**4.757.080,54**	**373,64**	**117,26**	**-**	**10.231,74**	**26.922,14**	**23,02**	**1,45**

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

Units	Scope 1 (tCO2e)					Scope 2 (tCO2e)	Scope 3 (tCO2e)				Total
	CO_2	CH_4	N_2O	SF_6	Total	CO_2	CO_2	CH_4	N_2O	Total	
CTJL	4.331.945,39	1.156,44	20.440,79	-	4.353.542,61	5.358,60	12.925,93	329,91	207,99	13.463,83	4.372.365,04
UTCH	354.317,06	92,41	1.630,28	-	356.039,74	180,26	11.471,81	42,92	183,86	11.698,59	367.918,59
UTWA	69.850,78	31,16	37,35	-	69.919,29	60,80	11,19	24,78	0,35	36,32	70.016,40
UTFE	0,11	4.874,57	7.747,31	-	12.621,98	27,16	753,94	68,97	12,50	835,41	13.484,55
UTIB	11,97	1.517,06	2.411,26	-	3.940,28	35,84	0,04	1,79	0,72	2,55	3.978,67
UHCB	42,28	0,19	2,58	-	45,04	0,04	27,45	4,19	0,72	32,36	77,44
UCLA	116,25	991,85	1.577,90	-	2.686,00	60,71	433,96	7,62	7,22	448,80	3.195,52
UHSO	33,27	0,10	0,28	-	33,65	2.850,51	66,05	10,55	1,39	77,99	2.962,14
PHRO	1,64	0,05	0,04	-	1,73	0,09	6,68	0,04	0,16	6,88	8,71
PHJG	0,66	0,01	0,02	-	0,69	0,27	6,87	0,04	0,18	7,09	8,06
Headquarters	564,08	1,05	1,60	-	566,74	146,53	688,35	0,55	7,64	696,54	1.409,80
UHPF	8,96	2,06	22,04	-	33,05	1.132,56	67,77	6,69	1,48	75,94	1.241,55
UHSS	14,11	0,12	0,36	-	14,59	311,21	204,42	16,81	3,29	224,51	550,31
UHSA	39,40	0,19	0,60	-	40,19	-	153,60	2,86	2,74	159,20	199,39
UETR	90,58	0,19	1,49	-	92,26	3,73	18,62	54,88	0,30	73,79	169,78
UHPP	20,56	0,17	0,40	-	21,12	6,87	47,41	0,21	1,01	48,64	76,64
UHIT	14,74	0,38	1,07	1.620,16	1.636,35	1,82	86,34	10,70	1,40	98,43	1.736,60
UEPS	-	-	-	-	-	0,94	32,01	0,81	1,12	33,94	34,88
PHAB	8,15	0,02	0,13	-	8,30	10,58	1,54	0,08	0,11	1,73	20,62
UEBB	6,43	0,01	0,10	-	6,54	0,70	0,64	0,44	0,02	1,11	8,34
UHET	18,13	1,07	1,59	9,14	29,92	13,32	142,22	0,51	2,76	145,49	188,74
UETB	-	-	-	-	-	7,44	-	-	-	-	7,44
UTAL	3,27	0,03	0,10	-	3,40	7,82	2,44	0,54	0,09	3,06	14,28

Units	Scope 1 (tCO2e)					Scope 2 (tCO2e)	Scope 3 (tCO2e)				Total
	CO_2	CH_4	N_2O	SF_6	Total	CO_2	CO_2	CH_4	N_2O	Total	
UFCA	-	-	-	-	-	4,99	-	-	-	-	4,99
ESCSP	-	-	-	-	-	1,62	1,41	0,00	0,01	1,42	3,04
UEGU	0,09	-	-	-	0,09	2,32	-	-	-	-	2,41
UEMU	0,18	-	-	-	0,18	2,17	-	-	-	-	2,35
UEFL	0,01	-	-	-	0,01	2,08	-	-	-	-	2,08
UHMA	3,55	0,01	0,04	-	3,60	707,17	16,37	2,05	0,29	18,71	729,47
TOTAL (tCO2e)	**4.757.111,64**	**8.669,11**	**33.877,32**	**1.629,30**	**4.801.287,37**	**10.938,15**	**27.167,06**	**587,93**	**437,35**	**28.192,34**	**4.840.417,85**

Table 30 – Emission per GHG 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	4.331.945,39	46,26	68,59	-	5.358,60	12.925,929	13,196	0,698
UTCH	354.317,058	3,696	5,471	-	180,26	11.471,806	1,717	0,617
UTWA	69.850,782	1,246	0,125	-	60,80	11,193	0,991	0,001
UTFE	0,108	194,983	25,998	-	27,16	753,936	2,759	0,042
UTIB	11,970	60,682	8,091	-	35,84	0,041	0,072	0,002
UHCB	42,280	0,007	0,009	-	0,037	27,446	0,168	0,002
UCLA	116,250	39,674	5,295	-	60,71	433,965	0,305	0,024
UHSO	33,273	0,004	0,001	-	2.850,51	66,048	0,422	0,005
PHRO	1,643	0,002	0,000	-	0,09	6,682	0,001	0,001
PHJG	0,664	0,001	0,000	-	0,27	6,870	0,002	0,001
Headquarters	564,083	0,042	0,005	-	146,53	688,350	0,022	0,026
UHPF	8,958	0,082	0,074	-	1.132,56	67,774	0,268	0,005
UHSS	14,107	0,005	0,001	-	311,21	204,416	0,672	0,011
UHSA	39,398	0,007	0,002	-	-	153,600	0,114	0,009
UETR	90,579	0,008	0,0050	-	3,73	18,615	2,195	0,001
UHPP	20,556	0,007	0,0013	-	6,87	47,415	0,008	0,003
UHIT	14,742	0,015	0,004	0,071	1,82	86,341	0,428	0,005
UEPS	-	-	-	-	0,94	32,009	0,032	0,004
PHAB	8,153	0,001	0,000	-	10,58	1,543	0,003	0,000
UEBB	6,430	0,000	0,000	-	0,70	0,643	0,018	0,000
UHET	18,126	0,043	0,005	0,000	13,32	142,224	0,020	0,009
UETB	-	-	-	-	7,44	-	-	-

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
UTAL	3,269	0,001	0,000	-	7,82	2,437	0,021	0,000
UFCA	-	-	-	-	4,99	-	-	-
ESCSP	-	-	-	-	1,62	1,406	0,000	0,000
UEGU	0,090	-	-	-	2,32	-	-	-
UEMU	0,180	-	-	-	2,17	-	-	-
UEFL	0,006	-	-	-	2,078	-	-	-
UHMA	3,551	0,000	0,000	-	707,165	16,367	0,0822	0,0010
TOTAL (tGEE)	**4.757.111,64**	**346,76**	**113,68**	**0,07**	**10.938,15**	**27.167,06**	**23,52**	**1,47**

In 2016, Engie did not provide emissions of Perfluorocarbons (PFCs), Hydrofluorocarbons (HFCs) and Nitrogen Trifluoride (NF3). HFCs were shown in Tables 27 to 29 converted to tCO2e to facilitate visualization.

3.8. Non-GHG Emissions

Leakage includes direct GHG escape in air conditioners, in this case HCFC-22. HCFC-22 is part of GHGs not included in the Kyoto Protocol, so according to the methodology, Engie chooses to calculate these emissions separately for comparison purposes.

Thus, during 2016, Engie provided **426.2 tCO2e** for the operational control approach and **438.18 tCO2e** for the corporate participation approach for HCFC-22 emissions, mainly concentrated at CTJL and UTCH.

Table 31 – Non GHG-Emissions (tCO_2e)

Units	Operational Control		Equity Share	
	tCO2e	%	tCO2e	%
CTJL	202,30	47,47%	202,30	47,47%
PHRO	8,33	1,95%	8,33	1,95%
Headquarters	23,89	5,61%	23,89	5,61%
UCLA	1,81	0,42%	1,81	0,42%
UEMU	5,39	1,27%	5,39	1,27%
UHCB	4,58	1,07%	4,58	1,07%
UHET	0,00	0,00%	21,03	4,93%
UHIT	0,00	0,00%	4,12	0,97%
UHMA	0,00	0,00%	1,57	0,37%
UHPF	2,53	0,59%	2,53	0,59%
UHPP	2,33	0,55%	2,33	0,55%
UHSA	18,10	4,25%	18,10	4,25%
UHSS	18,10	4,25%	18,10	4,25%
UTCH	90,86	21,32%	90,86	21,32%
UTIB	47,97	11,25%	33,22	7,79%
Total	**426,20**	**100,00%**	**438,18**	**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 2016. There is a reduction of 24% in relation to the base year in both approaches and 21% in relation to the year 2015. In 2016, the volume of emissions provided by Engie was not less than 2011 in its historical series.

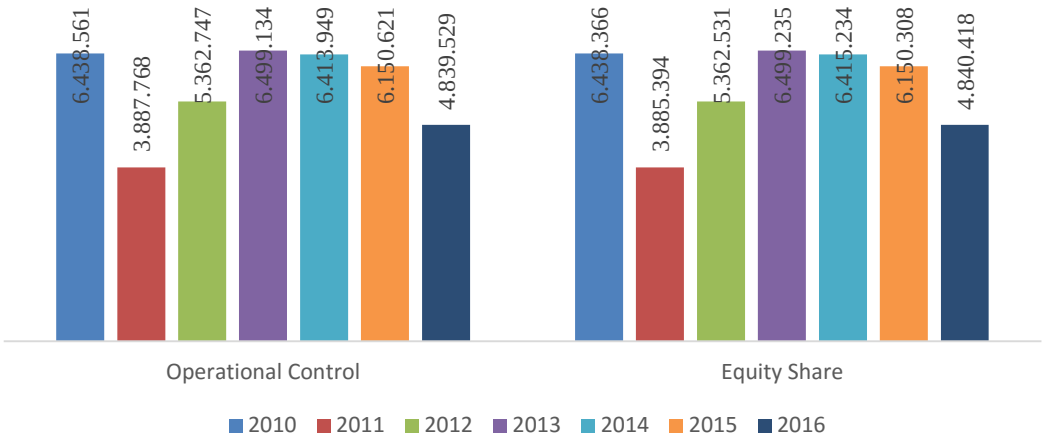


Figure 6: Evolution of the Group total emissions from 2010 to 2016 (tCO2e), according to operational control and equity share approaches

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

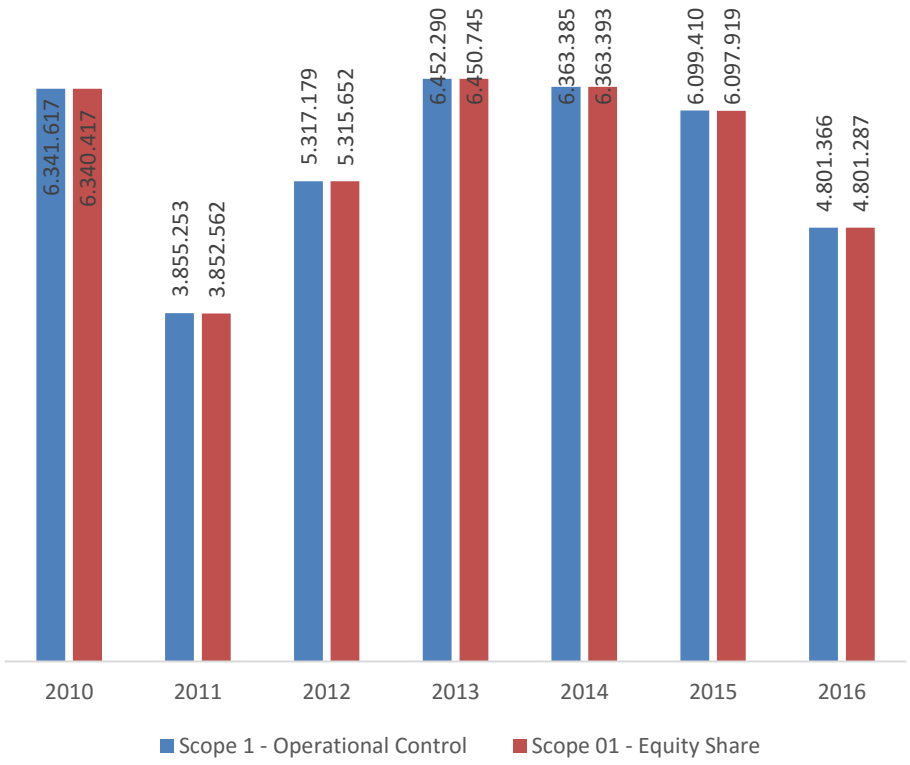


Figure 7: Evolution of the scope 1 emissions from 2010 to 2016 (tCO2e), according to operational control and equity share approaches

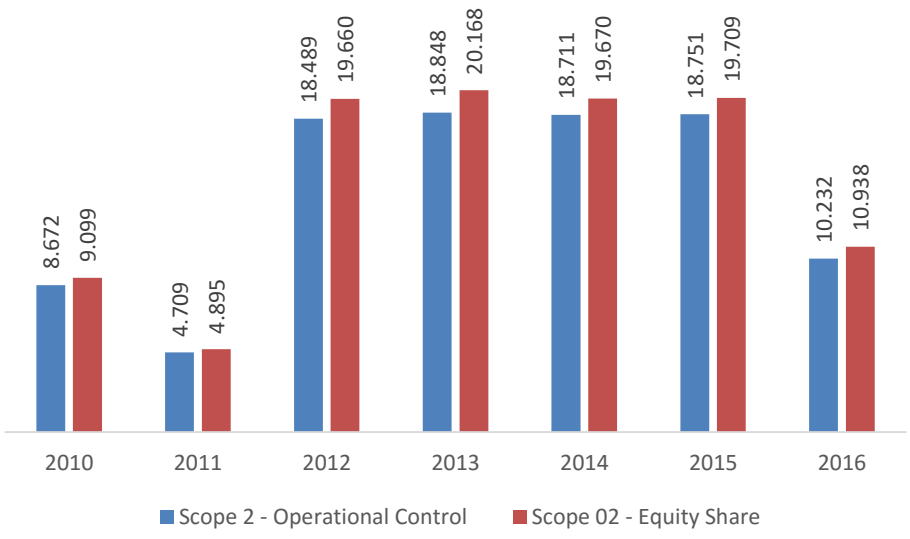


Figure 8: Evolution of scope 2 emissions from 2010 to 2016 (tCO2e), according to operational control and equity share approaches

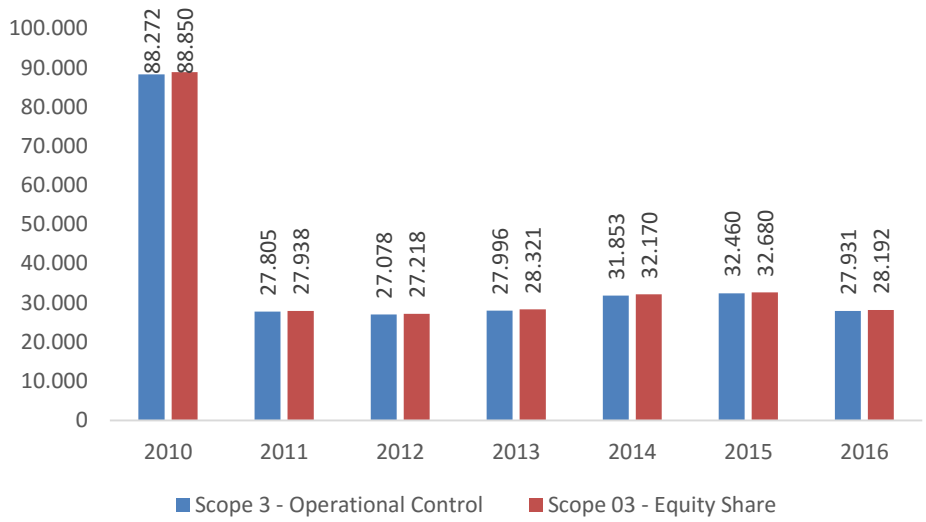


Figure 9: Evolution of scope 3 emissions from 2010 to 2016 (tCO2e), according to operational control and equity share approaches

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 as a whole and, specially, the scope 01 emissions.

In 2016, there was a decrease in the demand for energy generation from the group's thermoelectric power plants, with consequent emission reductions of 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. The SIN emission factor in 2016 showed a fall of 34.4% in 2016 compared to 2015, due

to an improvement in the hydrological environment of the country and the aforementioned lower demand for thermal plants.

Analyzing specifically the variation between 2016 and 2015, table 32 shows the variation of the source-to-source emissions. The main cause of emission reductions in scope 01 and in the entire business, as already mentioned, was the lower demand of thermoelectric power plants, which caused a decrease in coal and natural gas consumption.

Coal consumption at CTJL fell 15.3%, reducing emissions by 12.3%. The consumption of natural gas at UTWA was 92.9% lower, reducing GHG emissions by the same percentage. On the other hand, the consumption of coal at UTCH showed a decrease of 34.2%, reducing emissions by 33.8%.

In Scope 02, the reduction of more than 44% of the scope is concentrated at CTJL, UHSO and UHSS, associating energy consumption reduction to the fall of the average emission factor of the SIN. At UHSO and UHSS, consumption decreased by 44% and 88%, respectively. At CTJL, the reduction is more concentrated in the fall of the emission factor since the reduction of consumption was of 2%.

In Scope 03, the emission reduction of 11.4% is concentrated mainly on diesel consumption reduction reported for upstream and downstream transportation at UTCH (reduction of 11% and 46%, respectively); and at CTJL (15.4% and 7.8%) and only for upstream transportation at UCLA (70%).

Table 32 – Variation in GHG emissions by emission source between 2016 and 2015 (tCO_2e)

Emission Sources	Operational Control				Equity Share			
	Emissions (tCO_2e) - 2016	Emissions (tCO_2e) - 2015	Variation (tCO2e)	Variation (%)	Emissions (tCO_2e) - 2016	Emissions (tCO_2e) - 2015	Variation (tCO2e)	Variation (%)
Scope 1	**4.801.366,33**	**6.099.409,88**	**(1.298.044)**	**-21,28%**	**4.801.287,37**	**6.097.919,26**	**(1.296.632)**	**-21,26%**
Stationary Combustion	4.796.867,41	6.093.182,65	(1.296.315)	-21,27%	4.795.133,36	6.091.658,38	(1.296.525)	-21,28%
Mobile Combustion	536,97	637,11	(100)	-15,72%	555,09	658,51	(103)	-15,70%
Fugitives	574,15	226,73	347	153,23%	2.207,65	236,13	1.972	834,93%
Industrial Processes Emissions	3.360,39	5.345,05	(1.985)	-37,13%	3.360,39	5.345,05	(1.985)	-37,13%
Agricultural Activities	23,66	5,73	18	312,92%	25,81	8,30	18	211,00%
Waste	3,76	12,61	(9)	-70,21%	5,05	12,89	(8)	-60,82%
Scope 2	**10.231,74**	**18.751,32**	**(8.520)**	**-45,43%**	**10.938,15**	**19.709,00**	**(8.771)**	**-44,50%**
Electricity	10.231,74	18.751,32	(8.520)	-45,43%	10.938,15	19.709,00	(8.771)	-44,50%
Scope 3	**27.930,83**	**32.460,20**	**(4.529)**	**-13,95%**	**28.192,34**	**32.679,90**	**(4.488)**	**-13,73%**
Fuel and energy related activities not included in scopes 1 and 2	2,57	39,97	(37)	-93,58%	2,57	39,97	(37)	-93,58%
Transport and Distribution (downstream)	8.788,02	10.414,26	(1.626)	-15,62%	8.788,02	10.414,26	(1.626)	-15,62%
Transport and Distribution (upstream)	17.360,36	19.824,84	(2.464)	-12,43%	17.458,07	19.929,93	(2.472)	-12,40%
Commuting	304,73	458,34	(154)	-33,51%	370,00	498,53	(129)	-25,78%
Business Travel	944,05	915,34	29	3,14%	1.030,41	981,16	49	5,02%
Waste	531,11	807,45	(276)	-34,22%	543,27	816,05	(273)	-33,43%
Total (tCO2e)	**4.839.528,91**	**6.150.621,40**	**(1.311.092,49)**	**-21,32%**	**4.840.417,85**	**6.150.308,16**	**(1.309.890,31)**	**-21,30%**

4. 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 2016, 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.

5. 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 taking into account 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 2016 is presented in table 33.

Table 33 – Consolidated uncertainty Assessment (tCO_2e)

Units	Indirect Measurement	Direct Measurement	Agregate Uncertainty	Uncertainty Assessment
PHAB	+/- 4,1%	+/- 0,0%	+/- 4,1%	*High*
PHRO	+/- 4,2%	+/- 0,0%	+/- 4,2%	*High*
PHJG	+/- 4,7%	+/- 0,0%	+/- 4,7%	*High*
UTCH	+/- 4,9%	+/- 30,0%	+/- 4,9%	*High*
CTJL	+/- 5,1%	+/- 34,1%	+/- 5,1%	*Good*
UHPP	+/- 5,4%	+/- 5,0%	+/- 5,3%	*Good*
UHET	+/- 5,8%	+/- 5,0%	+/- 5,6%	*Good*
UCLA	+/- 6,8%	+/- 15,0%	+/- 6,8%	*Good*
UETB	+/- 7,0%	+/- 0,0%	+/- 7,0%	*Good*
UFCA	+/- 7,0%	+/- 0,0%	+/- 7,0%	*Good*
UHSA	+/- 7,7%	+/- 5,0%	+/- 7,4%	*Good*
ESCSP	+/- 7,9%	+/- 0,0%	+/- 7,9%	*Good*
UHIT	+/- 9,3%	+/- 6,5%	+/- 9,2%	*Good*
UHMA	+/- 11,1%	+/- 40,0%	+/- 10,7%	*Good*
UHCB	+/- 12,4%	+/- 15,0%	+/- 12,3%	*Good*
UHSO	+/- 13,8%	+/- 38,9%	+/- 13,1%	*Good*
HEADQUARTERS	+/- 20,6%	+/- 15,0%	+/- 13,6%	*Good*
UTFE	+/- 14,9%	+/- 30,0%	+/- 14,9%	*Good*
UTAL	+/- 15,1%	+/- 5,0%	+/- 15,1%	*Fair*
UHPF	+/- 16,6%	+/- 40,0%	+/- 16,6%	*Fair*
UHSS	+/- 18,8%	+/- 30,0%	+/- 18,8%	*Fair*
UEBB	+/- 21,4%	+/- 0,0%	+/- 21,4%	*Fair*

Units	Indirect Measurement	Direct Measurement	Agregate Uncertainty	Uncertainty Assessment
UETR	+/- 21,9%	+/- 30,0%	+/- 21,8%	*Fair*
UEFL	+/- 7,0%	+/- 30,0%	+/- 22,2%	*Fair*
UEGU	+/- 7,0%	+/- 30,0%	+/- 29,2%	*Fair*
UEMU	+/- 7,0%	+/- 30,0%	+/- 29,6%	*Fair*
UTWA	+/- 30,4%	+/- 5,0%	+/- 30,4%	*Poor*
UEPS	+/- 31,8%	+/- 0,0%	+/- 31,8%	*Poor*
UTIB	+/- 40,2%	+/- 30,0%	+/- 40,2%	*Poor*
TOTAL	**+/ - 4,6%**	**+/ - 4,8%**	**+/ - 4,6%**	***High***

6. EMISSIONS BALANCE

This section provides an analysis of the relationship between the emissions provided by Engie in 2016 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.

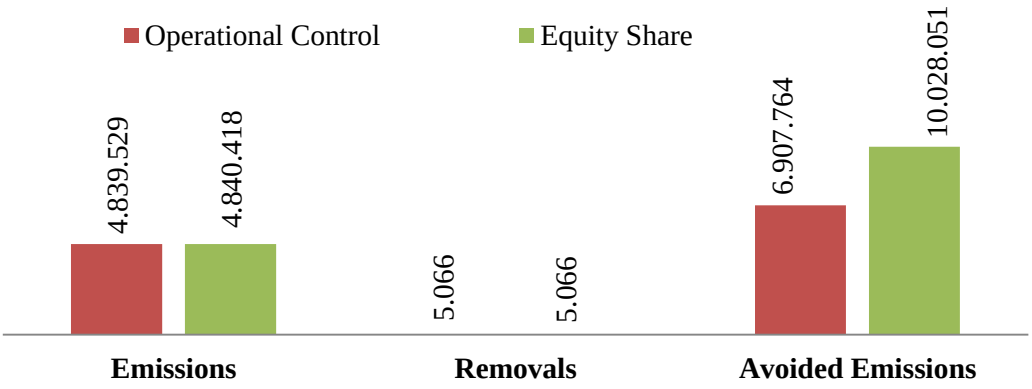


Figure 10: Comparison of emissions, removals and avoided emissions - 2016 (tCO_2e)

Table 34 – Emission balance by the operational control approach (tCO_2e)

Operational Control (tCO2e)				
Units	Emissions (tCO2e)	Emission Reductions/ Avoided Emissions		Balance (tCO2e)
		Planting (tCO2e)	Renewable Energy Generation (tCO2e)	
CTJL	4.372.365,04	35,16	-	**4.372.329,89**
UTCH	367.918,59	-	-	**367.918,59**
UTWA	70.016,40	-	-	**70.016,40**
UTFE	13.484,55	-	112.520,21	**(99.035,65)**
UTIB	5.744,55	-	77.659,83	**(71.915,28)**
UHCB	77,44	-	-	**77,44**
UCLA	3.195,52	-	30.823,68	**(27.628,16)**
UHSO	2.962,14	-	2.982.133,06	**(2.979.170,91)**
PHRO	8,71	-	33.654,89	**(33.646,18)**
PHJG	8,06	-	28.767,43	**(28.759,37)**
Headquarters	1.409,80	-	-	**1.409,80**
UHPF	1.241,55	-	-	**1.241,55**
UHSS	550,31	-	2.846.041,96	**(2.845.491,65)**
UHSA	199,39	5.030,41	-	**(4.831,02)**
UETR	169,78	-	58.164,56	**(57.994,78)**
UHPP	76,64	-	449.843,46	**(449.766,82)**
UHIT	-	-	-	-
UEPS	34,88	-	32.680,23	**(32.645,35)**
PHAB	20,62	-	17.048,22	**(17.027,59)**
UEBB	8,34	-	45.920,24	**(45.911,90)**
UHET	-	-	-	-
UETB	7,44	-	1.529,12	**(1.521,68)**
UTAL	14,28	-	-	**14,28**
UFCA	4,99	-	1.429,92	**(1.424,93)**
ESCSP	3,04	-	-	**3,04**
UEGU	2,41	-	72.617,44	**(72.615,02)**
UEMU	2,35	-	53.548,42	**(53.546,07)**
UEFL	2,08	-	63.381,79	**(63.379,70)**
UHMA	-	-	-	-
Total	**4.839.528,91**	**5.065,57**	**6.907.764,43**	**(2.073.301,09)**

Table 35 – Emission balance by the equity share approach (tCO_2e)

Equity Share				
Units	Emissions (tCO2e)	Emission Reductions/ Avoided Emissions		Balance (tCO2e)
		Planting (tCO2e)	Renewable Energy Generation (tCO2e)	
CTJL	4.372.365,04	35,16	-	**4.372.329,89**
UTCH	367.918,59	-	-	**367.918,59**
UTWA	70.016,40	-	-	**70.016,40**
UTFE	13.484,55	-	112.520,21	**(99.035,65)**
UTIB	3.978,67	-	53.787,20	**(49.808,52)**
UHCB	77,44	-	-	**77,44**
UCLA	3.195,52	-	30.823,68	**(27.628,16)**
UHSO	2.962,14	-	2.982.133,06	**(2.979.170,91)**
PHRO	8,71	-	33.654,89	**(33.646,18)**
PHJG	8,06	-	28.767,43	**(28.759,37)**
Sede	1.409,80	-	-	**1.409,80**
UHPF	1.241,55	-	-	**1.241,55**
UHSS	550,31	-	2.846.041,96	**(2.845.491,65)**
UHSA	199,39	5.030,41	-	**(4.831,02)**
UETR	169,78	-	58.164,56	**(57.994,78)**
UHPP	76,64	-	449.843,46	**(449.766,82)**
UHIT	1.736,60	-	2.613.657,45	**(2.611.920,85)**
UEPS	34,88	-	32.680,23	**(32.645,35)**
PHAB	20,62	-	17.048,22	**(17.027,59)**
UEBB	8,34	-	45.920,24	**(45.911,90)**
UHET	188,74	-	-	**188,74**
UETB	7,44	-	1.529,12	**(1.521,68)**
UTAL	14,28	-	-	**14,28**
UFCA	4,99	-	1.429,92	**(1.424,93)**
ESCSP	3,04	-	-	**3,04**
UEGU	2,41	-	72.617,44	**(72.615,02)**
UEMU	2,35	-	53.548,42	**(53.546,07)**
UEFL	2,08	-	63.381,79	**(63.379,70)**
UHMA	729,47	-	530.501,87	**(529.772,39)**
Total	**4.840.417,85**	**5.065,57**	**10.028.051,12**	**(5.192.698,83)**

The emission reductions provided by the activities of generating clean and renewable energy to the grid and the planting of trees resulted in a positive emission balance for the company. Emission reductions and emission capture exceeded emissions by 2.07 million tCO_2e (43%) in the operational control approach and by 5.1 million tCO_2e (107%) in the equity share approach. These differences between the approaches are

mainly related to the inclusion of Estreito, Itá and Machadinho Hydropower Plants, which produced more than 18 million MWh of clean energy for the National Interconnected System (SIN).

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.

7. 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 the indicators of the enterprises that the company has an equity share other than 100%.

It is noteworthy that UTAL did not generate energy in 2016. Thus, it did not present any indicators

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

Units	tCO2e/NET MWh (DEL - REC)				tCO2e/ NET MWh (DEL)				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	1,14501	0,00141	0,00354	1,14996	1,12584	0,00139	0,00348	1,13071	1,02048	0,00126	0,00316	1,02490
UTCH	1,98687	0,00101	0,06528	2,05316	1,96179	0,00099	0,06446	2,02724	1,49347	0,00076	0,04907	1,54330
UTWA	0,53092	0,00046	0,00028	0,53166	0,53048	0,00046	0,00028	0,53121	0,52414	0,00046	0,00027	0,52487
UTFE	0,04925	0,00011	0,00326	0,05262	0,04918	0,00011	0,00326	0,05254	0,03543	0,00008	0,00234	0,03785
UTIB	0,03216	0,00029	0,00002	0,03248	0,03205	0,00029	0,00002	0,03236	0,02944	0,00027	0,00002	0,02972
UHCB	0,00003	0,00000	0,00002	0,00005	0,00003	0,00000	0,00002	0,00005	0,00003	0,00000	0,00002	0,00005
UCLA	0,03826	0,00086	0,00639	0,04552	0,03812	0,00086	0,00637	0,04536	0,03273	0,00074	0,00547	0,03894
UHSO	0,00000	0,00042	0,00001	0,00044	0,00000	0,00042	0,00001	0,00044	0,00000	0,00042	0,00001	0,00043
PHRO	0,00002	0,00000	0,00009	0,00011	0,00002	0,00000	0,00009	0,00011	0,00002	0,00000	0,00009	0,00011
PHJG	0,00001	0,00000	0,00011	0,00012	0,00001	0,00000	0,00011	0,00012	0,00001	0,00000	0,00011	0,00012
Headquarters	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
UHPF	0,00003	0,00086	0,00006	0,00095	0,00003	0,00086	0,00006	0,00095	0,00003	0,00086	0,00006	0,00094
UHSS	0,00000	0,00004	0,00003	0,00007	0,00000	0,00004	0,00003	0,00007	0,00000	0,00004	0,00003	0,00007
UHSA	0,00005	-	0,00018	0,00023	0,00005	-	0,00018	0,00023	0,00004	-	0,00018	0,00022
UETR	0,00084	0,00003	0,00067	0,00155	0,00084	0,00003	0,00067	0,00155	0,00081	0,00003	0,00065	0,00150
UHPP	0,00002	0,00001	0,00005	0,00007	0,00002	0,00001	0,00005	0,00007	0,00002	0,00001	0,00005	0,00007
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
UEPS	-	0,00002	0,00055	0,00057	-	0,00002	0,00055	0,00057	-	0,00001	0,00054	0,00055
PHAB	0,00021	0,00021	0,00021	0,00021	0,00021	0,00021	0,00021	0,00021	0,00021	0,00021	0,00021	0,00021
UEBB	0,00008	0,00001	0,00001	0,00010	0,00008	0,00001	0,00001	0,00010	0,00007	0,00001	0,00001	0,00009
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

Units	tCO2e/NET MWh (DEL - REC)				tCO2e/ NET MWh (DEL)				tCO2e/GROSS MWh			
	Scope 1	Scope 2	Scope 3	Total	Scope 1	Scope 2	Scope 3	Total	Scope 1	Scope 2	Scope 3	Total
UETB	-	0,00258	-	0,00258	-	0,00250	-	0,00250	-	0,00250	-	0,00250
UTAL	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
UFCA	-	0,00139	-	0,00139	-	0,00136	-	0,00136	-	0,00136	-	0,00136
ESCSP	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
UEGU	0,00000	0,00002	-	0,00002	0,00000	0,00002	-	0,00002	0,00000	0,00002	-	0,00002
UEMU	0,00000	0,00002	-	0,00002	0,00000	0,00002	-	0,00002	0,00000	0,00002	-	0,00002
UEFL	0,00000	0,00002	-	0,00002	0,00000	0,00002	-	0,00002	0,00000	0,00002	-	0,00002
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
Total	**0,19019**	**0,00041**	**0,00111**	**0,19170**	**0,18967**	**0,00040**	**0,00110**	**0,19117**	**0,18391**	**0,00039**	**0,00107**	**0,18537**

Tabela 37 – tCO2e indicators / power generation - Enterprises with Equity share other than 100% (tCO_2e)

Units	tCO2e/NET MWh (DEL - REC)				tCO2e/ NET MWh (DEL)				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	0,032163	0,000293	0,000021	0,032476	0,032050	0,000292	0,000021	0,032362	0,029437	0,000268	0,000019	0,029724
UHIT	0,000275	0,000000	0,000017	0,000292	0,000275	0,000000	0,000017	0,000292	0,000272	0,000000	0,000016	0,000288
UHET	0,000022	0,000009	0,000108	0,000140	0,000022	0,000009	0,000108	0,000140	0,000022	0,000009	0,000106	0,000137
UHMA	0,000003	0,000585	0,000015	0,000604	0,000003	0,000585	0,000015	0,000604	0,000003	0,000582	0,000015	0,000600
Total Equity Share	**0,1426**	**0,00031**	**0,00084**	**0,14377**	**0,14233**	**0,00031**	**0,00083**	**0,14348**	**0,10783**	**0,00024**	**0,00063**	**0,10870**

The following figure shows the evolution of the emission corporate indicator (tCO2e) by net energy generation (DEL-REC). In 2016, the emission indicator reduced 9.37% in the operational control approach and 9.8% in the equity share approach

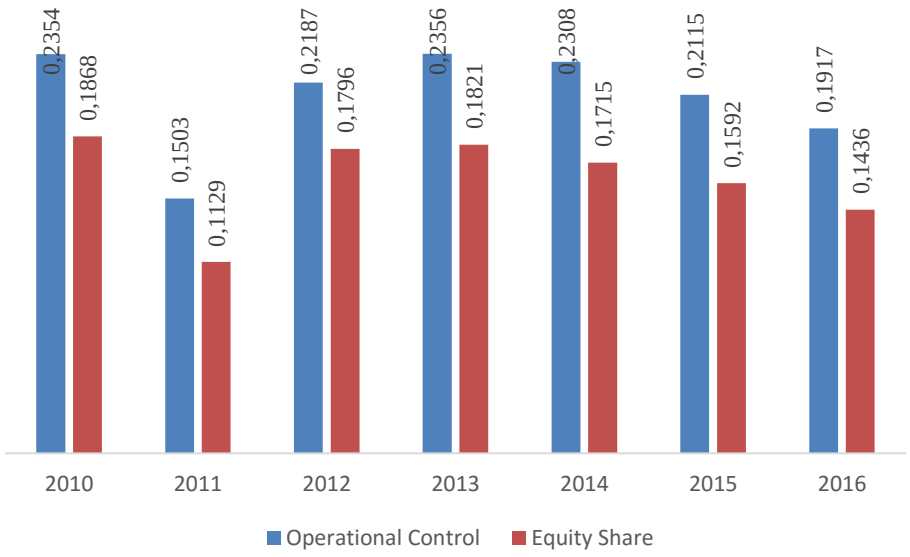


Figure 11: Evolution of the emission corporate indicator (tCO2e) / net energy generation (DEL-REC) (tCO2e)

The indicators for stationary combustion of thermoelectric plants were also calculated, according to the table below, considering their significant participation in the emissions of these plants.

Table 38 – Indicators of GHG emissions from stationary combustion for fossil fuel thermoelectric [1]

Units	tCO2e/NET MWh (DEL - REC)	tCO2e/ NET MWh (DEL)	tCO2e/ GROSS MWh
CTJL	1,14	1,13	1,02
UTCH	1,97	1,94	1,48
UTWA	0,53	0,53	0,52

[1] Boiler emissions were considered.

8. EMISSION REDUCTIONS OPPORTUNITIES

Much of the installed capacity of Engie's generating plant is already coming from renewable energies (86.6%). 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.

The largest emitting source of greenhouse gases from Engie is the stationary combustion of thermal plants. Thus, efforts to reduce emissions should be focused on this activity. Therefore, it is suggested the promotion of Research and Development (R & D) projects in technologies that can make the generation process and thermal energy less polluting. We suggest the development of studies on Carbon Capture and Storage (CCS) technologies.

Researches show that it is possible to capture up to 90% of the CO2 from thermoelectric plants that are released directly into the atmosphere and inject into the soil in depth that can reach 4,000 meters. There are power plants already developing this experience in developed countries and more than 200 patented equipments to make this activity 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 in order to reduce fuel consumption can be an environmentally and economically attractive alternative.

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. In order to do this, 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	Unit	Emission Factors					Reference
		CO2 (kg/un.)	CO2 - Biomassa (kg/un.)	CH4 (kg/un.)	N2O (kg/un.)	CO2e (kg/un)	
Acetylene	ton	0,00	-	0,00000	0,000000	0,003385	FISPQ
Coal 3100 kcal/kg- UTCH	ton	1.220,33	-	0,01270	0,019048	1226,327823	BEN 2016/PCI Engie
Coal kcal/kg - CTJL	ton	1.742,59	-	0,01842	0,027631	1751,287368	BEN 2016/PCI Engie
Liquefied petroleum gas	ton	2.932,48		0,04647	0,004647	2935,023335	ANP 2012
Natural Gas -UTWA	m³	1,47		0,00003	0,000003	1,471876	ANP 2012/PCI Engie
Gasolina Automotiva Pura	Liter	2,24		0,00010	0,000019	2,247193	ANP 2012
Fuel Oil	Liter	3,08	-	0,00012	0,000024	3,088649	ANP 2012/PCI Engie
Pure Diesel Oil	Liter	2,6321	-	0,0001066	0,00002131	2,641107	ANP 2012
Diesel Oil - PCI Engie (CTJL, UTWA, UTCH, UCLA, UTIB, UHET e UHSA)	Liter	2,2110		0,0000895	0,00001790	2,218530	ANP 2012/PCI Engie
Commercial Diesel Oil	Liter	2,6321	2,35	0,0001066	0,00002131	2,641107	BEN 2015
Anidro Ethanol	Liter	-	1,54	0,000067	0,000013	0,005674	ANP 2012
Etanol Hidratado	Liter	-	1,47	0,000064	0,000013	0,005416	ANP 2012
Sugarcane Biomass - UTIB	ton		711,93	0,2198	0,0293	14,228840	BEN2016/PCI - Engie
Sugarcane Biomass - UTFE	ton		692,40	0,2138	0,0285	13,838563	BEN2016/PCI - Engie
Wood - UCLA	ton	-	720,15	0,2039	0,0272	13,197899	MCT 2010

Annex Table 2 – Mobile Combustion - Emission Factors

Fuel	Unit	Emission Factor (kgGEE/un.)				Reference
		CO2	CH4	N2O	tCO2e	
Gasoline	liter	2,212	0,0008	0,00026	2,30922	BEN 2016
Diesel Oil	liter	2,603	0,000139	0,000139	2,647746	BEN 2016
Vehicle Natural Gas	m³	1,999	0,0034	0,00011	2,11668	BEN 2016
Liquefied petroleum gas	kg	2,9325	0,0029	0,00001	3,00728	BEN 2016
Ethanol	liter	1,457	0,0004	0,00001	0,013418	BEN 2016
Biodiesel	liter	2,431	0,000332	0,000020	0,014219	BEN 2016
Anidro Ethanol	liter	1,526	0,0002	0,00001	0,009586	BEN 2016

*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)	0,13509	0,0000026	0,0000043	0,1364352	DEFRA - UK Government conversion factors for Company Reporting. Year: 2016. Version: 1.0.
Medium-distance (500 ≤ d <3.700 km)	0,08168	0,0000004	0,0000026	0,0824537	DEFRA - UK Government conversion factors for Company Reporting. Year: 2016. Version: 1.0..
Short-distance (d < 500 km)	0,09292	0,0000004	0,0000030	0,0938056	DEFRA - UK Government conversion factors for Company Reporting. Year: 2016. Version: 1.0.

Annex Table 4 – SIN Electricity Emission Factors[2]

Month	tCO2/MWh
Jan	0,096
Feb	0,0815
Mar	0,071
Apr	0,0757
May	0,0701
Jun	0,076
Jul	0,0725
Aug	0,0836
Sept	0,0897
Oct	0,0925
Nov	0,1002
Dec	0,0714
Annual Average	**0,0817**

Annex table 5 –CO2, CH4 and N2O emission factor for bituminous and sub-bituminous coal for electricity sector (kg/TJ)3

Gas	Sub-betuminous - Inventories 2013 and 2015
CO_2	96.100
CH_4	1
N_2O	1,5

[2] Source: http://www.mct.gov.br/index.php/content/view/321144.html#ancora

[3] Source: IPCC (2006). Guidelines for National Greenhouse Gas Inventories - Volume 2 – Energy. Chapter 2, page 2.16.

Annex Table 6 – Lower Calorific Value monitored by Engie

Plants	Fuel	GJ/t
UTCH	Coal 3100 kcal / kg	12,7
	Commercial Diesel Oil	35,5
UTFE	Sugarcane Bagasse	7,1
UTIB	Commercial Diesel Oil	35,5
	Sugarcane Bagasse	7,3
CTJL	Coal 4500 kcal / kg	18,4
	Fuel Oil	39,8
	Commercial Diesel Oil	35,5
UCLA	Commercial Diesel Oil	35,5
	Wood Biomass	6,8
UTWA	Natural Gas	35,4
	Commercial Diesel Oil	35,5

Annexa 7 – Evolution of Biodiesel added to Diesel Oil and Ethanol added to Gasoline (2012-2016)

	2012	2013	2014	2015	2016
% Ethanol on Gasoline	20%	23%	25%	26,6%	27%
% biodiesel on Diesel Oil	5%	5%	5,67%	7,0%	7%

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[4]:

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

Where:

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

$N_2O\text{-}N_{Ninputs}$ = 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}

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

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

The process of desulphurization is used for UTE Charqueadas. For the accounting of emissions the emission factor used by the ENGIE Group of 0.2558 tCO2e/t of plaster produced was considered (stoichiometric ratio of plaster, and CASO4.2H2O, and CO2 in the process).

(c) 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.

(d) 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).

Whereas the incinerated waste is classified as "chemical waste" by Engie, the type of waste (i) which best fits to this classification is "clinical waste" ("clinical waste"), defined by the IPCC as chemical and pharmaceutical waste. In addition, as there is no detailed information available for the calculation of CO2 emissions, the default data provided by IPCC (2006) are given in the table below.

Annex Table 8 – Parameters for waste incineration emission reductions calculation

Parameter	Default Value- IPCC
i	Resíduos clínicos (químicos e farmacêuticos)
CF_i	60%
FCF_i	40%
OF_i	100%

Source: IPCC (2006)

As there is no information available about the fraction of dry matter in the waste incinerated (dmi) and there is no default data provided by the IPCC, the value considered was 100% dry in the residue by conservatism.

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 regarded as 0 (zero) in this inventory.

ANEXO III. UNCERTAINTY ASSESSMENT METHODOLOGY

The evaluation of uncertainty of the 2016 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 9 – 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)
Desulphurization process	+/- 15,0%	GHG Protocol (2003)
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 10 – Uncertainty level for activity data[5]

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 11 – Uncertainty level for activity data - Engie[6]

Evidence	Given uncertainty	Uncertainty Assessment	Reference
EMS-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-CA-UTCH-015. Dynamic Balance measurement Bextra. UTCH scale (1%).
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 (natural gas)	+/- 0,50%	High	Meter calibration certificate of UTWA issued by IPT.
SCO-fuel system (wood)	+/- 1,00%	High	Certificate of conformity of UCLA scale issued by Toledo of Brazil

[5] Fonte: GHG Protocol (2003)
[6] Fonte: GHG Protocol (2003)

Evidence	Given uncertainty	Uncertainty Assessment	Reference
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)

*The classification of this uncertainty depends on the type of evidence considered. In General, it is considered +/-40% of uncertainty.

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, 2014). 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 the year 2016 was considered.

However, whereas the margin for the year 2015 had not been published until the time of preparation of this report, the margin value provided by MCTI construction for 2014 was considered. 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

0,2553 × 25% + 0,6227[7] × 75% = 0,5309 tCO_2/MWh

Hidro and Biomass Projects

0, 2553 × 50% + 0,6227[22] × 50% = 0,4390 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

[7] Annual average of operatin margin CO2 emission factor.

year (tCO2e) (tCO_2e);

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[8], it was possible to calculate GHG emission reductions as presented on item 06 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 e UCLA).

b) Sinks by Forest Planting

Removals of CO2 by sinkholes, or CO2 sequestration, are estimated in general from the formulas below[9].

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

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

Onde:

ΔC_G = Biomass Stock, t_C

$A_{i,j}$ = Area, ha

$G_{TOTALi,j}$ = Average Increment, $t_{dry\ matter}$/ha/year

[8] 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.

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

$CF_{i,j}$ =	Carbon fraction in dry matter, t_C/ $t_{dry\ matter}$(default value[10]= 0,47)
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) [11] 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 06 of this report. It is important to mention that only voluntary planting (which does not require legal obligation) were considered in the analysis.

[10] IPCC (2003). Good Practice Guidance for Land Use, Land-Use Change and Forestry.
[11] 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.

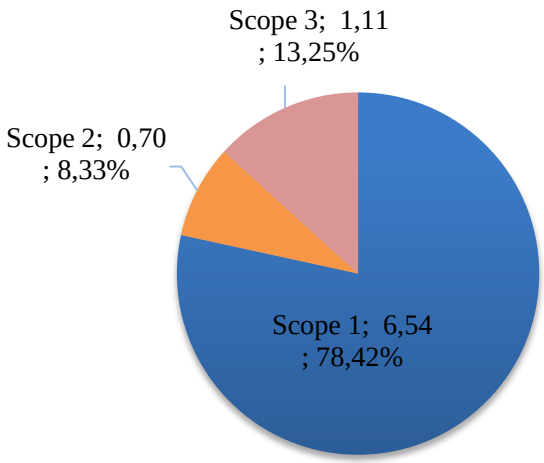
1. Wind Power Plants

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) Beberibe Wind Power Plant – UEBB

UEBB emitted 8.34 tCO_2e during 2016, as presented in the following figure.

Annex Figure 1 - Emissions per Scope (tCO_2e/ %)
Operational Control & Equity Share



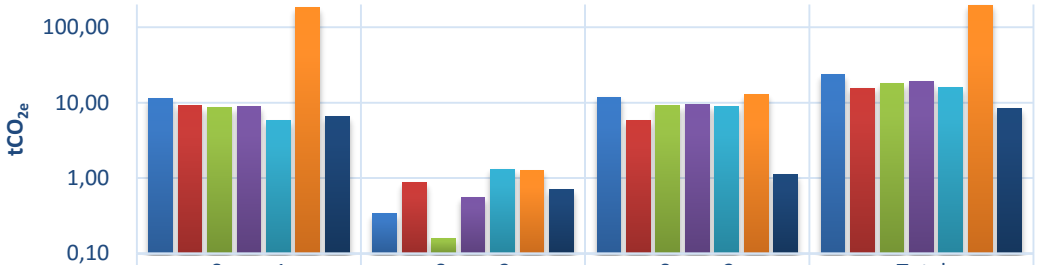
Emission per GHG is presented in the table below.

Annex Table 12 –UEBB Emission per GHG Emissões– 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**6,43**	**0,01**	**0,10**	-	**6,54**	**0,45**
Mobile Combustion	6,43	0,01	0,10	-	6,54	0,45
Scope 2	**0,70**	-	-	-	**0,70**	-
Electricity	0,70	-	-	-	0,70	-
Scope 3	**0,64**	**0,44**	**0,02**	-	**1,11**	**0,16**
Business Travel	0,64	0,01	0,02	-	0,67	0,16
Waste	-	0,43	-	-	0,43	-
Total	**7,77**	**0,45**	**0,13**	-	**8,34**	**0,62**

The following figure presentes UEBB GHG emissions evolution between 2010 to 2016.

Annex Figure 2 - Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



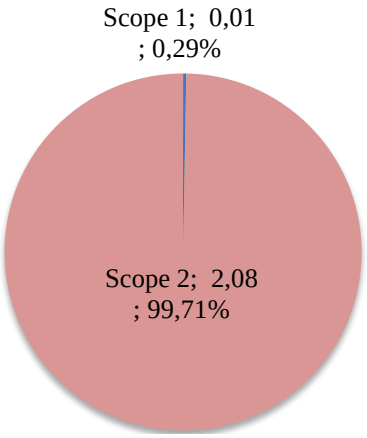
	Scope 1	Scope 2	Scope 3	Total
2010	11,23	0,34	11,85	23,42
2011	9,04	0,87	5,78	15,69
2012	8,61	0,16	9,26	18,03
2013	8,82	0,55	9,43	18,81
2014	5,76	1,32	8,88	15,97
2015	182,75	1,24	12,73	196,72
2016	6,54	0,70	1,11	8,34

In 2016, UEBB reduced 95.76% their emissions compared to 2015, due to emission reductions associated with SF6 (175.6 tCO2e), which not ocurred in 2016.

b) Fleixeiras I Wind Power Plant – UEFL

UEFL emitted 2.08 tCO_2e during 2016, as presented below:

Annex Figure 3 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



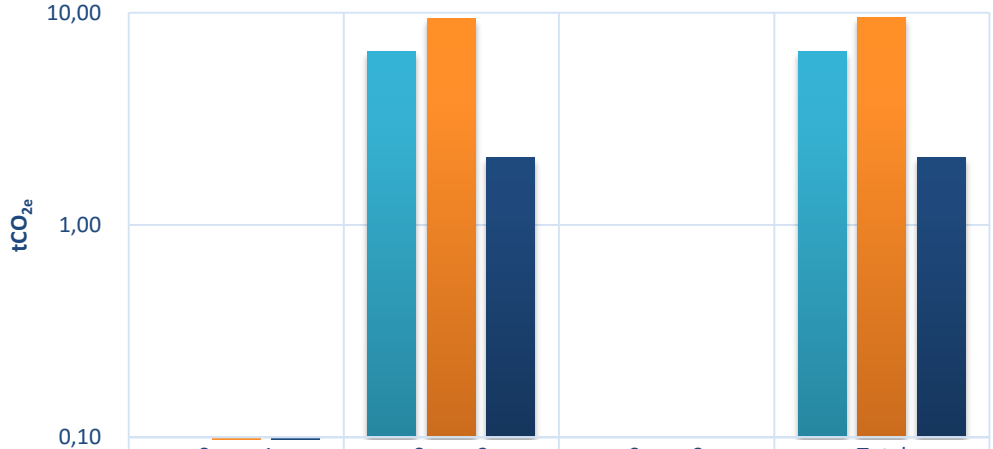
Emissios per GHG is presented in the following table:

Annex Table 13 – UEFL emission per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**0,01**	-	-	-	**0,01**	-
Fugitives	0,01	-	-	-	0,01	-
Scope 2	**2,08**	-	-	-	**2,08**	-
Electricity	2,08	-	-	-	2,08	-
Total	**2,08**	-	-	-	**2,08**	-

The following figure shows UEFL GHG emissions from 2014 to 2016.

Annex Figure 4 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



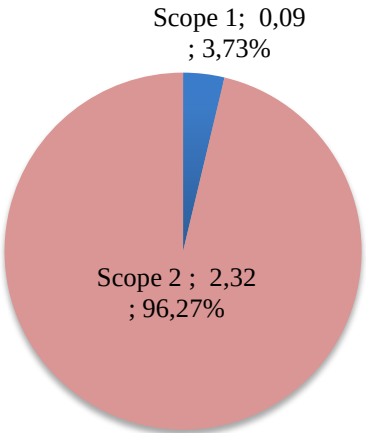
	Scope 1	Scope 2	Scope 3	Total
2014	-	6,58	-	6,58
2015	0,08	9,43	-	9,51
2016	0,01	2,08	-	2,08

In 2016, UEFL reduced 78.09% of their emissions compared to 2015. The main cause is the reduction on scope 02 – electricity, which decreased 77.96%.

c) Guajirú Wind Power Plant – UEGU

UEGU emitted 2.41 tCO2e during 2016, as presented in the following figure.

Annex Figure 5 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



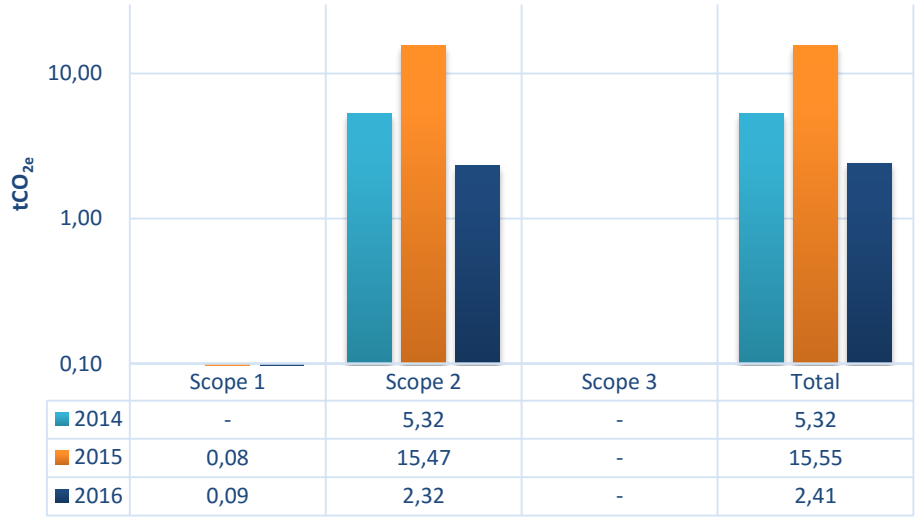
Emissios per GHG are presented at the table below.

Annex Table 14 –UEGU emission per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**0,09**	-	-	-	**0,09**	-
Fugitives	0,09	-	-	-	0,09	-
Scope 2	**2,32**	-	-	-	**2,32**	-
Electricity	2,32	-	-	-	2,32	-
Total	**2,41**	-	-	-	**2,41**	-

The figure below presente UEGU GHG emissions from 2014 to 2016.

Annex Figure 6 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share

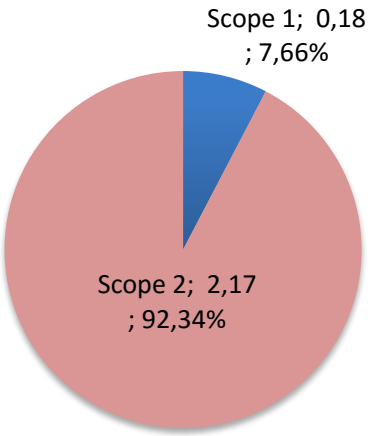


UEGU reduced 84.49% of their emission compared to 2015. This reduction is caused by decrease on electricity consumption (84.98%).

d) Mundaú Wind Power Plant– UEMU

UEMU emitted 2.35 tCO_2e during 2016, as presented in the following figure.

Annex Figure 7 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



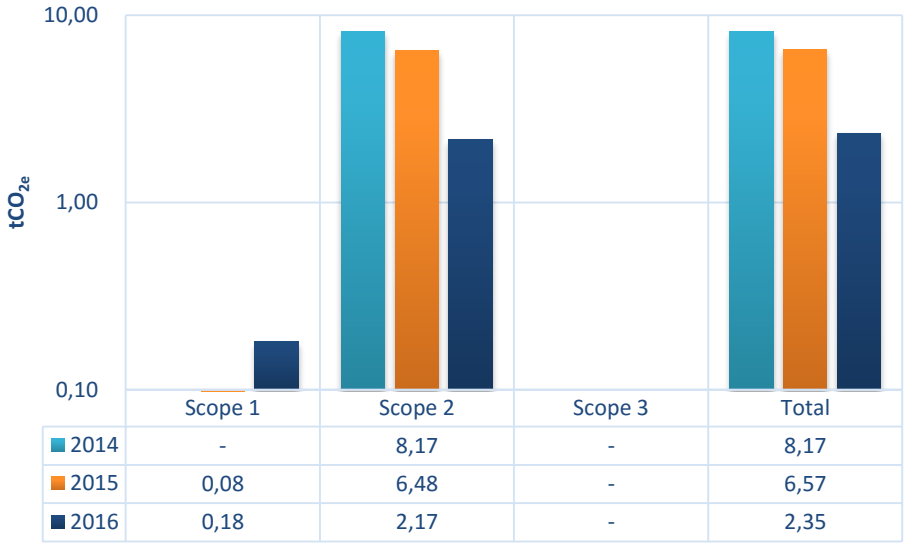
Emissions per GHG are presented on the annex tabel below.

Annex Table 15 – UEMU Emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**0,18**	-	-	-	**0,18**	-
Fugitives	0,18	-	-	-	0,18	-
Scope 2	**2,17**	-	-	-	**2,17**	-
Electricity	2,17	-	-	-	2,17	-
Total	**2,35**	-	-	-	**2,35**	-

The folowing graph shows UEMU GHG emissions from 2014 to 2016.

Annex Figure 8 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share

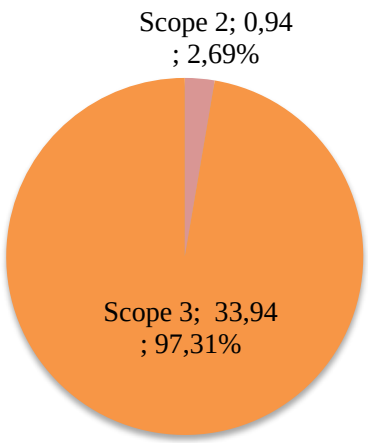


UEMU reduced 64.22% of their emission compared to 2015, due to lower electricity consumption from the grid (66.53%).

e) Usina Eólica Pedra do Sal – UEPS

UEPS emitted 34.88 tCO_2e in 2016, as presented below.

Annex Figure 9 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



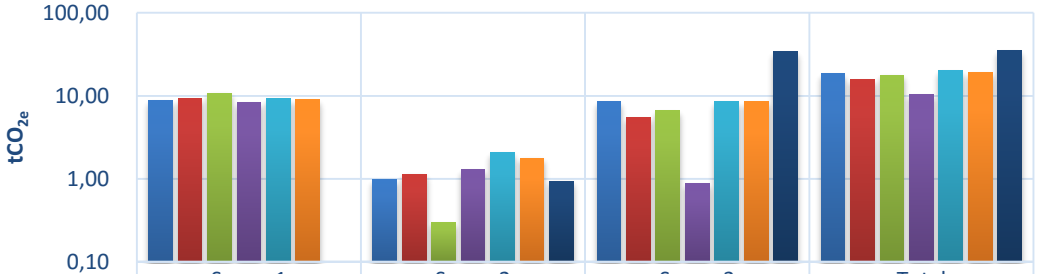
Emissions per GHG are presentd in the following table.

Annex Table 16 – UEPS emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 2	**0,94**	-	-	-	**0,94**	-
Electricity	0,94	-	-	-	0,94	-
Escopo 3	**32,01**	**0,81**	**1,12**	-	**33,94**	**8,03**
Business Travel	31,45	0,32	1,12	-	32,89	8,03
Air Travel	0,56	0,00	0,01	-	0,56	-
Waste	-	0,49	-	-	0,49	-
Total	**32,95**	**0,81**	**1,12**	-	**34,88**	**8,03**

The following figure presentes UEPS emissions from 2010 to 2016.

Annex Figure 10 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



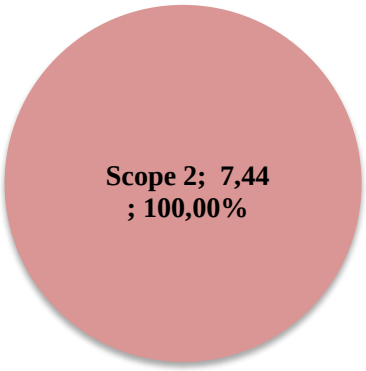
	Scope 1	Scope 2	Scope 3	Total
2010	8,83	0,97	8,52	18,32
2011	9,19	1,14	5,49	15,82
2012	10,82	0,30	6,64	17,76
2013	8,29	1,30	0,87	10,45
2014	9,36	2,09	8,56	20,01
2015	8,94	1,78	8,49	19,20
2016	-	0,94	33,94	34,88

In 2016, a UEPS increased 81.25% their emissions due to travel business with rented cars that were not reported in 2015.

f) Tubarão Wind Power Plant – UETB

UETB emitted 7.44 tCO_2e in 2016, having electricity – scope 2 as unique emission source, as presented in the following figure.

Annex Figure 11 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



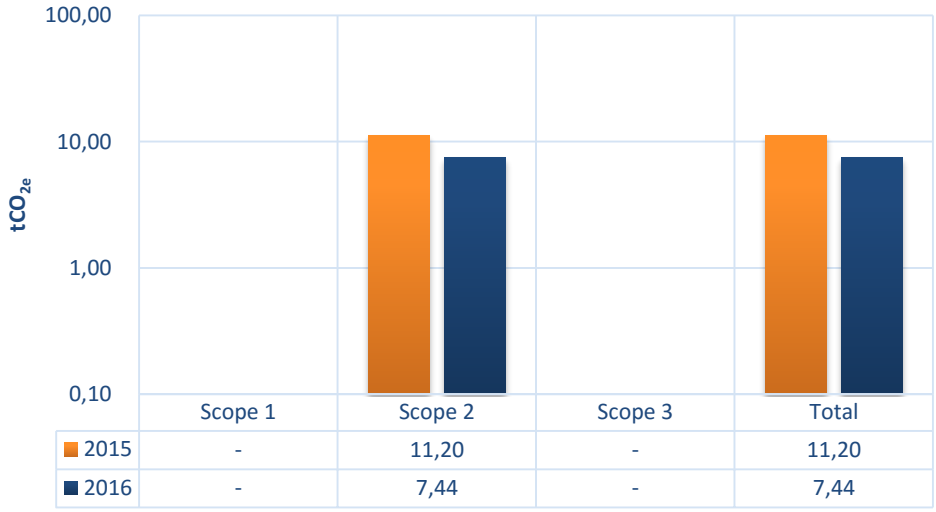
Emissions per GHG are presented in the following table.

Annex Table 17 –UETB GHG Emissions– 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 2	**7,44**	-	-	-	**7,44**	-
Electricity	7,44	-	-	-	7,44	-
Total	**7,44**	-	-	-	**7,44**	-

The figure below shows UETB GHG emissions of 2015 and 2016.

Annex Figure 12 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share

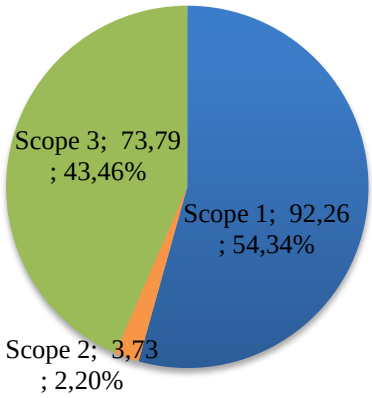


In 2016, UETB reduced 33.54% of their emisions compared to 2015.

g) Trairi Wind Power Plant – UETR

UETR emitted 169.78 tCO_2e during 2016, as presented below.

Annex Figure 13 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



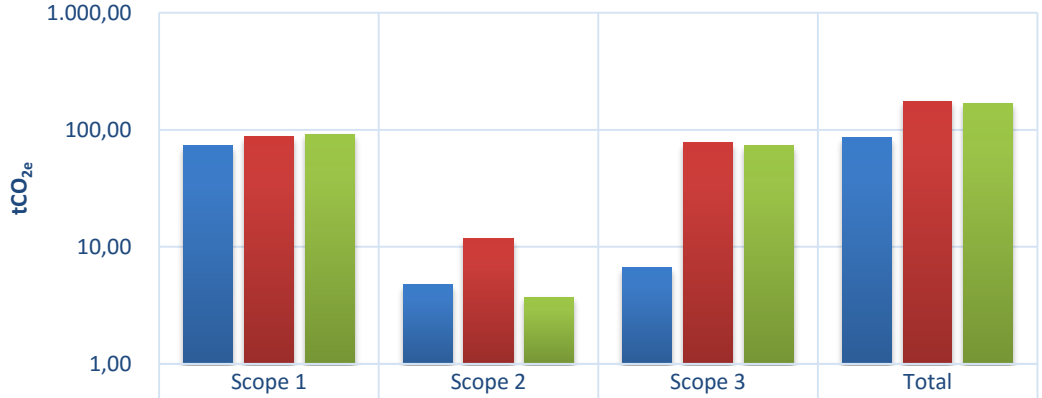
Emissions per GHG are detailed in the table below.

Annex Table 18 – UETR Emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**90,58**	**0,19**	**1,49**	-	**92,26**	7,51
Mobile Combustion	84,54	0,19	1,48	-	86,20	7,11
Stationary Combustion	5,96	0,01	0,02	-	5,98	0,40
Fugitives	0,08	-	-	-	0,08	-
Scope 2	**3,73**	-	-	-	**3,73**	-
Electricity	3,73	-	-	-	3,73	-
Scope 3	**18,62**	**54,88**	**0,30**	-	**73,79**	**1,23**
Waste	-	54,83	-	-	54,83	-
Air Travel	8,44	0,00	0,08	-	8,53	-
Transport and Distribution (Upstream)	7,87	0,02	0,14	-	8,03	0,65
Business Travel	2,30	0,02	0,08	-	2,40	0,59
Total	**112,93**	**55,07**	**1,79**	-	**169,78**	**8,74**

The following figure presents UETR GHG emissions from 2014 to 2016.

Annex Figure 14 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



	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	92,26	3,73	73,79	169,78

In 2016, UETR reduced 3.72% of their emissions comparing to 2015. This fact ocuured due to scope 2 emission reductions (7.99 tCO_2e).

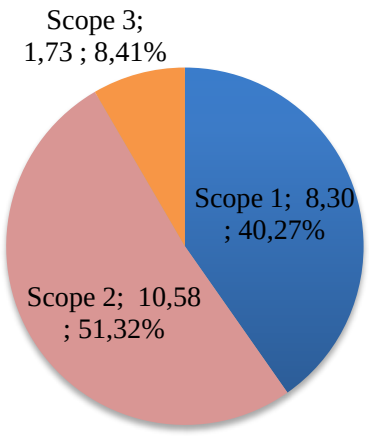
2. Small Hydropower Plants

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. Areia Branca Small Hydropower Plant - PHAB

PHAB emitted 20.62 tCO_2e during 2016 as presented below.

Annex Figure 15 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



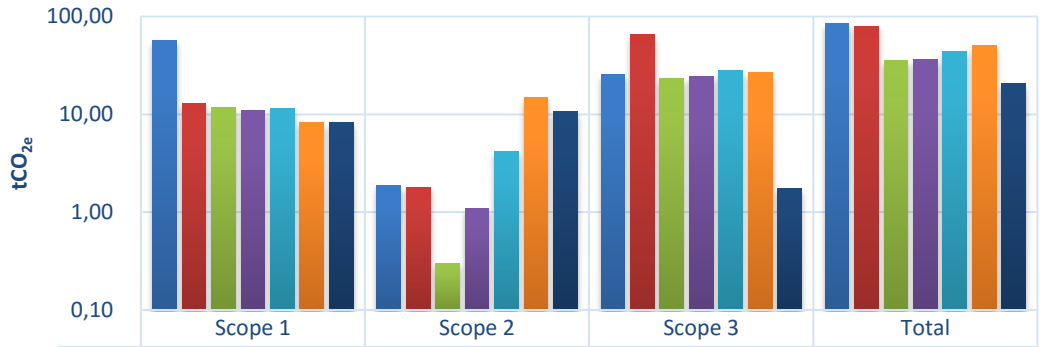
Emissions per GHG are detailed on annex table 19.

Annex Table 19 –PHAB Emissions per GHG– 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**8,15**	**0,02**	**0,13**	-	**8,30**	1,21
Stationary Combustion	1,77	0,00	0,00	-	1,78	0,12
Mobile Combustion	6,38	0,02	0,12	-	6,53	1,10
Scope 2	**10,58**	-	-	-	**10,58**	-
Electricity	10,58	-	-	-	10,58	-
Scope 3	**1,54**	**0,08**	**0,11**	-	**1,73**	**0,39**
Waste	-	0,06	0,06	-	0,12	-
Transport and Distribution (Upstream)	1,54	0,02	0,05	-	1,61	0,39
Total	**20,28**	**0,10**	**0,24**	-	**20,62**	**1,61**

The following figure presents PHAB GHG emissions from 2010 to 2016.

Annex Figure 16 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



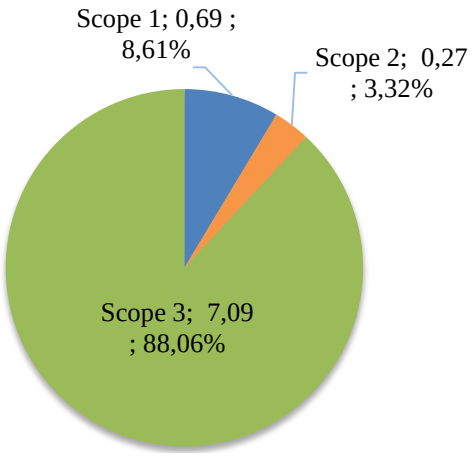
	Scope 1	Scope 2	Scope 3	Total
2010	57,54	1,89	25,57	85,00
2011	12,89	1,81	65,60	80,30
2012	11,78	0,30	23,08	35,16
2013	11,05	1,10	24,22	36,36
2014	11,54	4,16	28,28	43,98
2015	8,30	14,76	27,08	50,14
2016	8,30	10,58	1,73	20,62

PHAB reduced their 58.88% their emissions comparing to 2015, mainly due to emissions reductions on transport and distributions upstream (-94.04%) and electricity from the grid (-28.31%).

b. José Gelazio da Rocha Small Hydropower Plant - PHJG

PHJG emitted 8.06 tCO_2e during 2016, as presented below.

Annex Figure 17 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



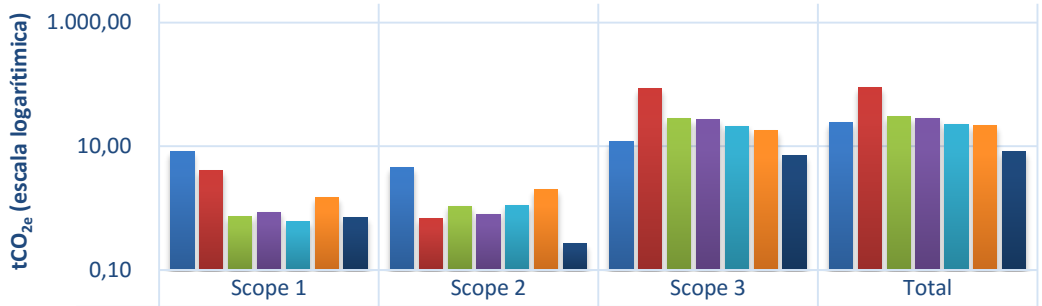
Emissions per GHG are presented as follows.

Annex 20 Table –PHJG emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**0,66**	**0,01**	**0,02**	-	**0,69**	0,08
Stationary Combustion	0,47	0,00	0,00	-	0,47	0,03
Mobile Combustion	0,20	0,00	0,00	-	0,20	0,05
Waste	0	0,01	0,01	-	0,02	-
Scope 2	**0,27**	-	-	-	**0,27**	-
Electricity	0,27	-	-	-	0,27	-
Scope 3	**6,87**	**0,04**	**0,18**	-	**7,09**	**1,28**
Transport and Distribution (Upstream)	6,87	0,04	0,18	-	7,09	1,28
Total	**7,80**	**0,06**	**0,20**	-	**8,06**	**1,36**

PHJG GHG emissions between 2010 and 2016 are presented below.

Annex Figure 18 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



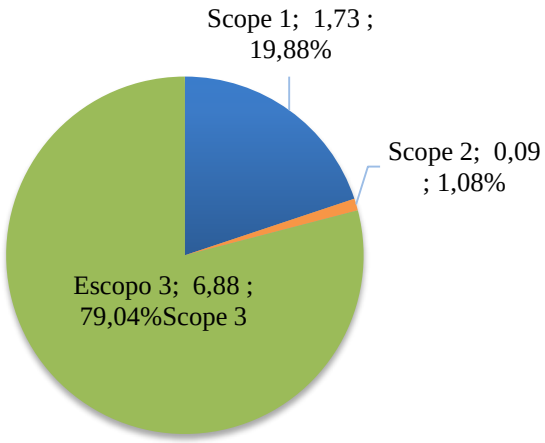
	Scope 1	Scope 2	Scope 3	Total
2010	8,12	4,49	11,81	24,42
2011	4,02	0,67	85,30	89,99
2012	0,72	1,08	28,05	29,86
2013	0,86	0,80	27,02	28,68
2014	0,60	1,12	21,16	22,87
2015	1,47	2,00	18,00	21,46
2016	0,69	0,27	7,09	8,06

In 2016, PHJG reduced 62% of their emissions compared to 2015, mainly due to a decrease on scope 3 emissions (10.9 tCO2e).

c. Small Hidropower Plant Rondonópolis - PHRO

PHRO emitted 8.71 tCO_2e during 2016 as figure below.

Annex Figure 19 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



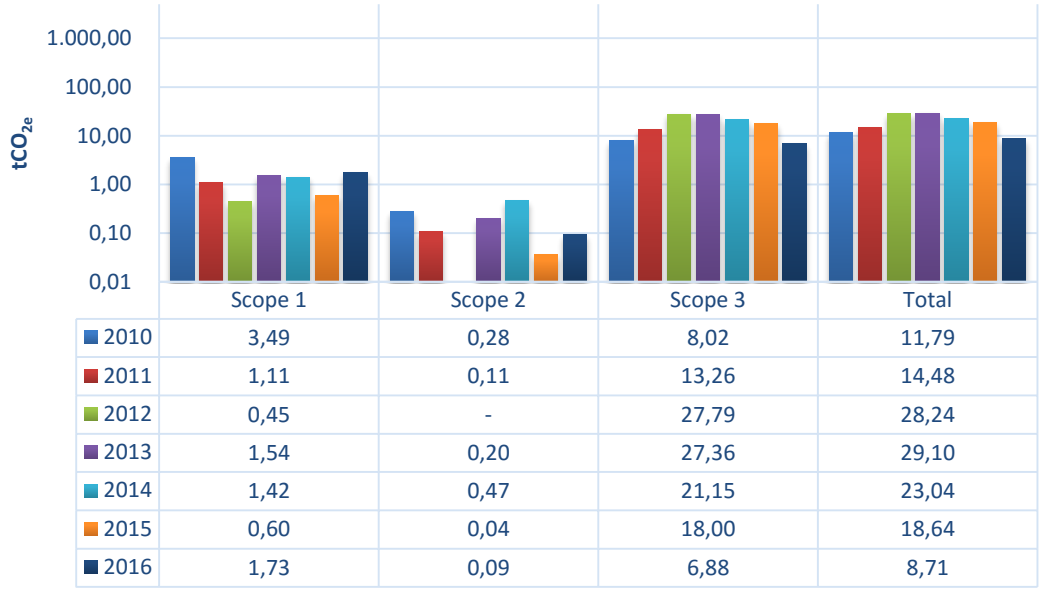
Emissions per GHG are presented on annex table 21.

Annex Table 21 –PHRO Emissions per GHG– 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**1,64**	**0,05**	**0,04**	-	**1,73**	**6,59**
Mobile Combustion	1,45	0,05	0,04	-	1,53	6,57
Stationary Combustion	0,20	0,00	0,00	-	0,20	0,01
Scope 2	**0,09**	-	-	-	**0,09**	-
Electricity	0,09	-	-	-	0,09	-
Scope 3	**6,68**	**0,04**	**0,16**	-	**6,88**	**1,12**
Transport and Distribution (Upstream)	6,68	0,04	0,16	-	6,88	1,12
Total	**8,42**	**0,08**	**0,21**	-	**8,71**	**7,71**

The figure below presentes PHRO GHG emissions from 2010 to 2016.

Annex Figure 20 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



	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

Emissions of PHRO reduced 53% due to a decrease on scope 3 emissions (11.12 tCO2e).

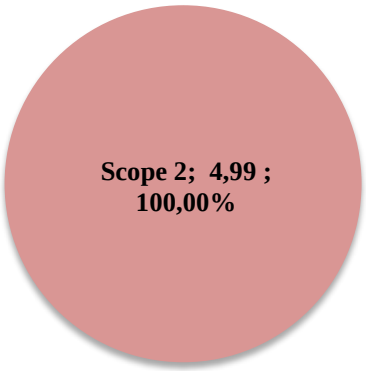
3. Photovoltaic Plant

Engie has one photovoltaic plant with 100% of equity share. Therefore, GHG emissions of this plant are the same in both approach.

a. Cidade Azul Photovoltaic Plant - UFCA

UFCA emitted 4.99 tCO_2e during 2016. Electricity from the grid – scope 2 is the only emission source, as presented below.

Annex Figure 21- Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



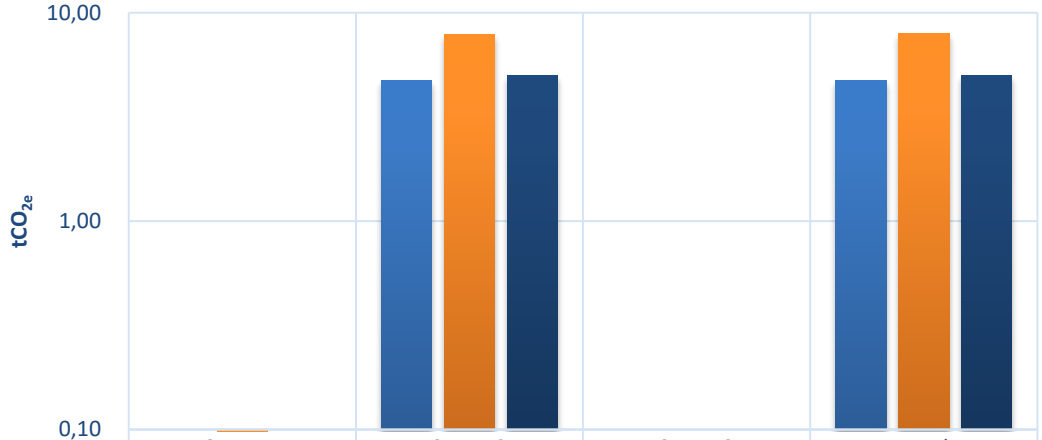
Emissions per GHG are detailed in the following table.

Annex Table 22 –UFCA Emissions per GHG– 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 2	**4,99**	-	-	-	**4,99**	-
Electricity	4,99	-	-	-	4,99	-
Total	**4,99**	-	-	-	**4,99**	-

Figure below presentes UFCA GHG emissions between 2014 and 2016.

Annex Figure 22 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



	Scope 1	Scope 2	Scope 3	Total
2014	-	4,74	-	4,74
2015	0,05	7,91	-	7,96
2016	-	4,99	-	4,99

UFCA reduced 37.37% their emissions comparing to 2015, mainly to lower Brazilian grid emissions factor.

4. Hydropower Plants

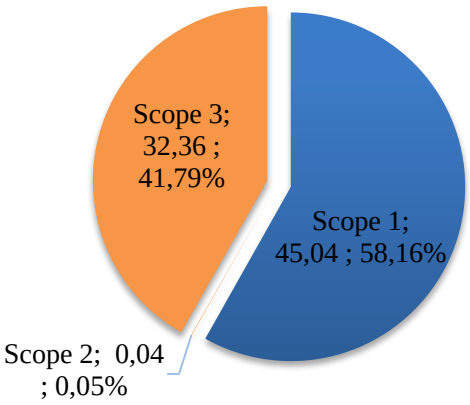
Engie has 100% of equity share over Hydropower plants Cana Brava (UHCB), Passo Fundo (UHPF), Ponte de Pedra (UHPP), Salto Osório (UHSO), Salto Santiago (UHSS) and São Salvador (UHSA). For these plants, GHG emissions of operational control approach are the same as equity share approach.

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 77.44 tCO_2e in 2016, as presented.

Annex Figure 23 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



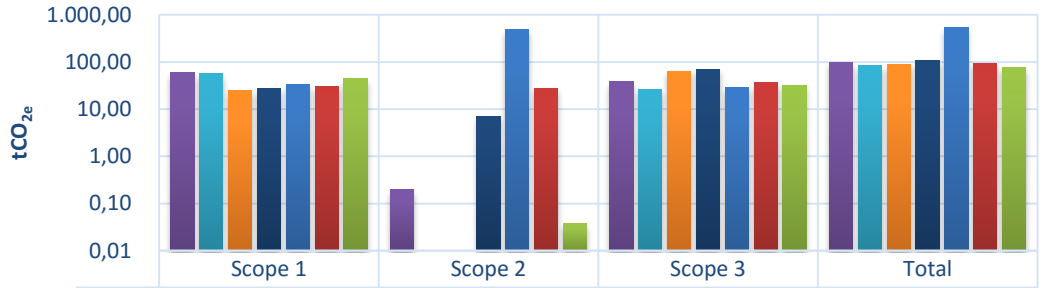
Emissions per GHG are detailed in the table below.

Annex Table 23 –UHCB emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**42,28**	**0,19**	**2,58**	-	**45,04**	**13,28**
Mobile Combustion	37,65	0,18	0,77	-	38,60	13,01
Stationary Combustion	4,04	0,00	0,01	-	4,05	0,27
Fertilizers	-	-	1,79	-	1,79	-
Fugitives	0,59	-	-	-	0,59	-
Scope 2	**0,04**	-	-	-	**0,04**	-
Electricity	0,04	-	-	-	0,04	-
Scope 3	**27,45**	**4,19**	**0,72**	-	**32,36**	**5,37**
Commuting	22,47	0,17	0,66	-	23,30	5,21
Air travel	4,35	0,00	0,04	-	4,40	-
Waste	-	4,02	-	-	4,02	-
Business Travel	0,62	0,01	0,02	-	0,65	0,16
Total	**69,76**	**4,38**	**3,30**	-	**77,44**	**18,65**

UHCB GHG emissions from 2010 to 2016 are presented below.

Annex Figure 24 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



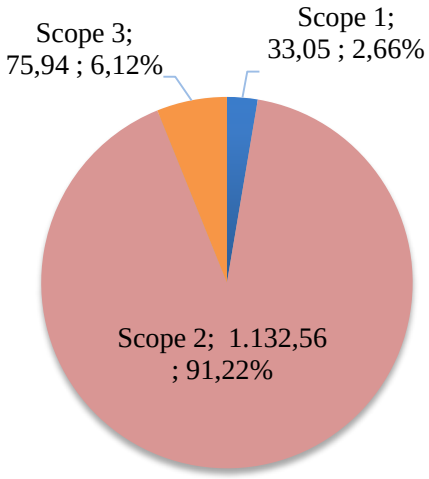
	Scope 1	Scope 2	Scope 3	Total
2010	60,85	0,20	38,58	99,63
2011	56,18	-	25,74	81,92
2012	24,38	-	64,29	88,67
2013	27,75	6,83	70,79	105,37
2014	34,09	487,51	28,99	550,58
2015	29,97	28,24	37,26	95,46
2016	45,04	0,04	32,36	77,44

UHCB reduced 18.88% of their emissions in 2016, mainly due to reductions on scope 02 (- 99.87%).

b. Passo Fundo Hydropower Plant– UHPF

UHPF emitted 1,241.55 tCO_2e in 2016. Emissions per scope are presented below.

Annex Figure 25 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



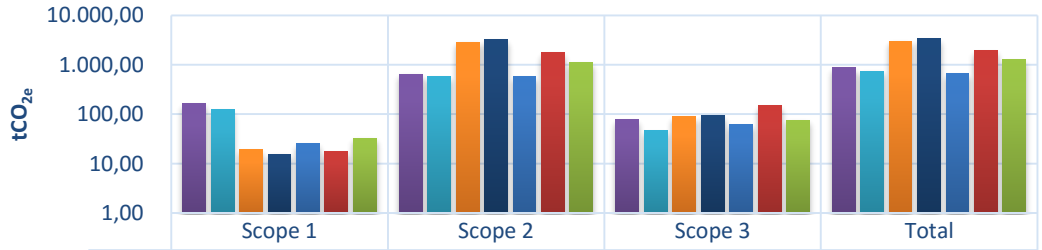
Emissions per GHG are detailed on the table below.

Annex Table 24 –UHPF Emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**8,96**	**2,06**	**22,04**	-	**33,05**	**3,78**
Fertilizers	-	-	21,68	-	21,68	-
Mobile Combustion	8,29	0,03	0,14	-	8,46	3,75
Waste	-	2,02	0,21	-	2,23	-
Stationary Combustion	0,49	0,00	0,00	-	0,49	0,03
Fugitives	0,182	-	-	-	0,18	-
Scope 2	**1.132,56**	-	-	-	**1.132,56**	-
Electricity	1.132,56	-	-	-	1.132,56	-
Scope 3	**67,77**	**6,69**	**1,48**	-	**75,94**	**8,49**
Commuting	38,13	0,06	0,61	-	38,80	2,68
Transport and Distribution (Upstream)	29,13	0,22	0,86	-	30,21	5,81
Waste	-	6,41	-	-	6,41	-
Air travel	0,52	0,00	0,00	-	0,52	-
Total	**1.209,29**	**8,75**	**23,51**	-	**1.241,55**	**12,27**

UHPF GHG emissions from 2010 to 2016 are presented in the following figure.

Annex Figure 26 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



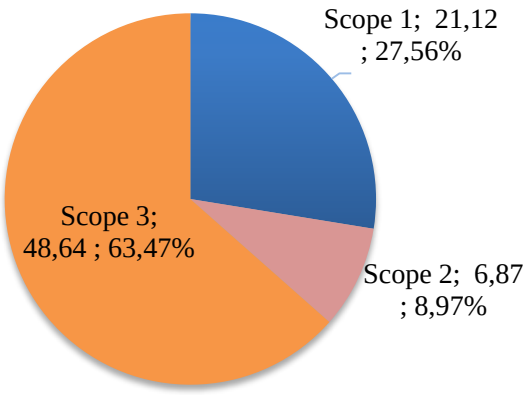
	Scope 1	Scope 2	Scope 3	Total
2010	160,97	644,58	79,56	885,11
2011	124,60	570,73	47,24	742,57
2012	19,35	2.883,34	88,83	2.991,52
2013	15,55	3.226,38	92,25	3.334,19
2014	25,02	574,82	61,04	660,88
2015	17,91	1.730,16	150,38	1.898,45
2016	33,05	1.132,56	75,94	1.241,55

UHPF reduced 34.60% their emission compared to 2015. Main variations were emission reductions on escopo 2, (597.60 tCO_2e; -34.54%), and commuting (94.72 tCO_2e; -70.94%).

c. Ponte de Pedra Hydropower Plant – UHPP

UHPP emitted 76.64 tCO_2e during 2016, as presented on figure below.

Annex Figure 27 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



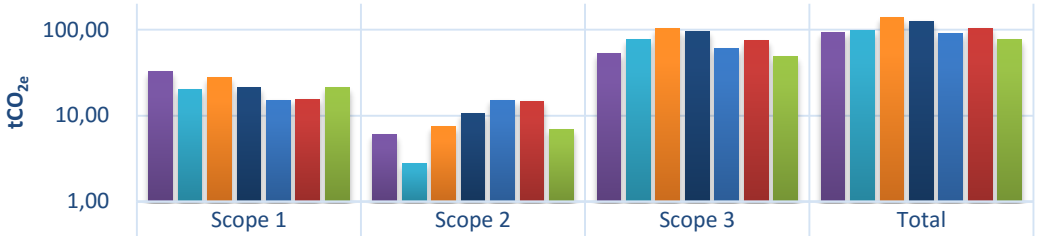
Emissions per GHG are detailed in the following table.

Annex Table 25 – UHPP GHG Emissions – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**20,56**	**0,17**	**0,40**		**21,12**	**17,42**
Mobile Combustion	16,90	0,16	0,39		17,45	17,24
Stationary Combustion	2,80	0,00	0,01		2,81	0,19
Fugitives	0,86	-	-		0,86	
Scope 2	**6,87**	-	-		**6,87**	
Electricity	6,87	-	-		6,87	
Scope 3	**47,41**	**0,21**	**1,01**		**48,64**	**7,58**
Transport and Distribution (Upstream)	34,65	0,18	0,84		35,67	5,65
Air Travel	10,96	0,00	0,10		11,07	
Commuting	1,81	0,03	0,07		1,90	1,93
Total	**74,84**	**0,38**	**1,41**		**76,64**	**25,00**

The following figure presents UHPP GHG emissions between 2010 and 2016.

Annex Figure 28 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



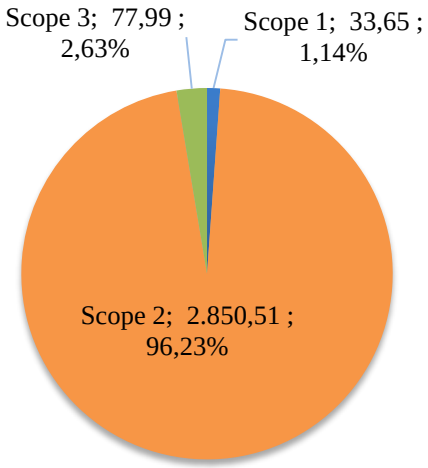
	Scope 1	Scope 2	Scope 3	Total
2010	32,93	5,96	52,87	91,76
2011	20,01	2,79	75,92	98,72
2012	27,92	7,45	103,42	138,78
2013	21,46	10,52	94,08	126,06
2014	15,16	15,14	61,07	91,38
2015	15,52	14,84	74,43	104,78
2016	21,12	6,87	48,64	76,64

UHPP reduced 26.86% their emission compared to 2015, due to emission reductions on transport and distribution upstream, which felt 24.49 tCO_2e (-40.71%) and scope 2 emissions that decreased 7.97 tCO_2e (-53.69%).

d. Salto Osório Hydropower Plant – UHSO

UHSO emitted 2,962.14 tCO_2e during 2016, concentrated on escopo 02, as presented below.

Annex Figure 29 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



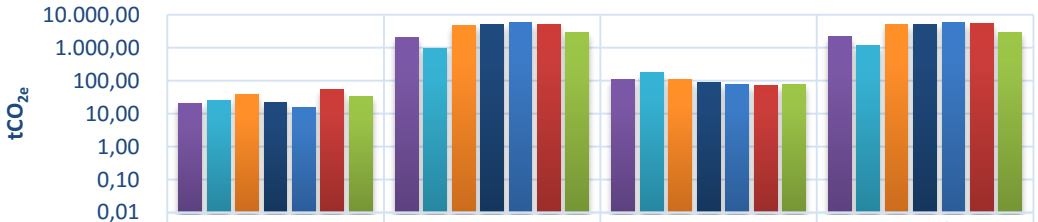
Emissions per GHG are detailed below.

Tabela Anexa 26 –UHSO Emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**33,27**	**0,10**	**0,28**	-	**33,65**	**10,44**
Fugitives	17,51	-	-	-	17,51	-
Mobile Combustion	14,90	0,09	0,27	-	15,26	10,38
Stationary Combustion	0,86	0,00	0,00	-	0,86	0,06
Fertilizers	0	-	0,01	-	0,01	-
Scope 2	**2.850,51**	-	-	-	**2.850,51**	-
Electricity	2.850,51	-	-	-	2.850,51	-
Scope 3	**66,05**	**10,55**	**1,39**	-	**77,99**	**12,74**
Commuting	53,90	0,16	1,04	-	55,10	5,44
Transport and Distribution (Upstream)	9,94	0,12	0,33	-	10,39	7,30
Waste	-	10,27	-	-	10,27	-
Air Travel	2,21	0,00	0,02	-	2,23	-
Total	**2.949,83**	**10,64**	**1,67**	-	**2.962,14**	**23,18**

The following figure shows UHSO GHG emissions from 2010 to 2016.

Annex Figure 30 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



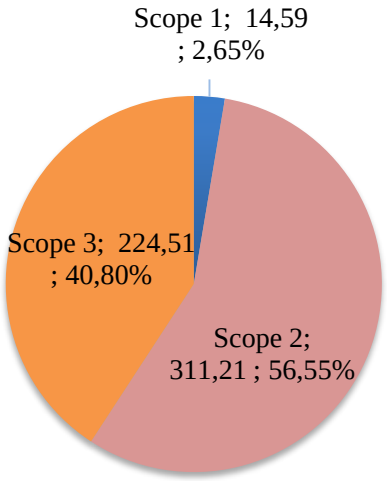
	Scope 1	Scope 2	Scope 3	Total
2010	20,34	2.010,32	111,44	2.142,10
2011	25,79	985,06	180,16	1.191,01
2012	38,90	4.841,48	112,94	4.993,32
2013	21,41	5.103,7990	88,65	5.213,86
2014	15,68	5.837,95	75,02	5.928,66
2015	52,14	5.298,14	71,24	5.421,52
2016	33,65	2.850,51	77,99	2.962,14

UHSO reduced 45.36% compared to 2015, mainly due to scope 2 emissions reductions, which fell 2,447.63 tCO_2e (-46.2%).

e. Hydropower Plant Salto Santiago – UHSS

UHSS emitted 550.31 tCO_2e during 2016 as presented on table below.

Annex Figure 31 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



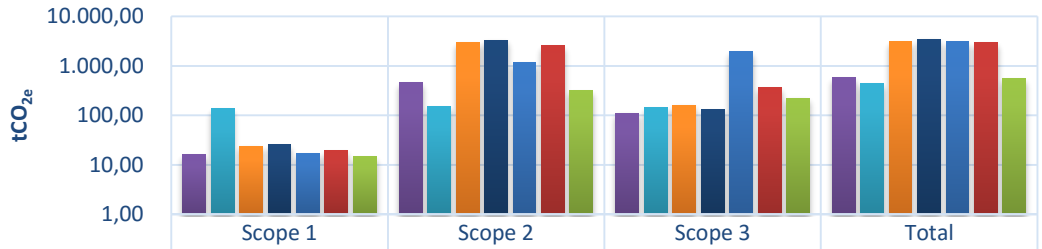
Emissions per GHG are shown on table below.

Annex table 27 –UHSS emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**14,11**	**0,12**	**0,36**	-	**14,59**	**16,74**
Mobile Combustion	11,31	0,12	0,22	-	11,65	16,61
Stationary Combustion	1,97	0,00	0,01	-	1,98	0,13
Fugitives	0,83	-	-	-	0,83	-
Fertilizers	0	-	0,13	-	0,13	-
Scope 2	**311,21**	-	-	-	**311,21**	-
Electricity	311,21	-	-	-	311,21	-
Scope 3	**204,42**	**16,81**	**3,29**	-	**224,51**	**27,93**
Transport and Distribution (Upstream)	132,07	0,22	2,14	-	134,43	10,60
Commuting	56,81	0,20	1,02	-	58,03	16,68
Waste	-	16,37	-	-	16,37	-
Air Travel	12,99	0,00	0,12	-	13,11	-
Stationary Combustion	2,55	0,00	0,01	-	2,57	0,65
Total	**529,73**	**16,93**	**3,65**	-	**550,31**	**44,68**

The figure below presents UHSS GHG emissions between 2010 and 2016.

Annex Figure 32 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



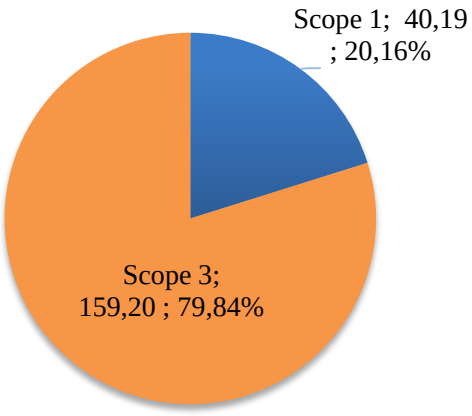
	Scope 1	Scope 2	Scope 3	Total
2010	15,78	469,07	111,20	596,05
2011	135,11	151,99	145,24	432,34
2012	24,09	2.938,79	163,23	3.126,11
2013	25,58	3.352,19	128,78	3.506,55
2014	16,94	1.182,46	1.973,33	3.172,73
2015	19,91	2.603,50	360,48	2.983,89
2016	14,59	311,21	224,51	550,31

UHSS reduced 81.56% their emissions due to scope 02 emissions fall comparing to 2015 (2,292.29 tCO_2e ;88.05%).

f. São Salvador Hidropower Plant – UHSA

UHSA emitted 199.39 tCO_2e in 2016, as presented in the following figure.

Annex Figure 33 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



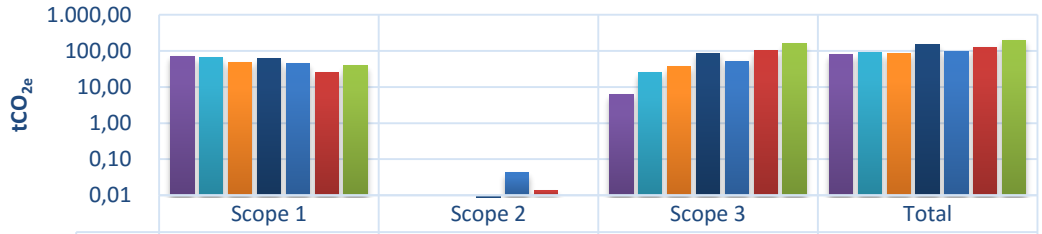
Emissions per GHG are the detailed on following table.

Annex Table 28 –UHSA Emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**39,40**	**0,19**	**0,60**	-	**40,19**	**19,24**
Mobile Combustion	30,50	0,19	0,60	-	31,28	19,24
Fugitives	8,26	-	-	-	8,26	-
Stationary Combustion	0,65	0,00	0,00	-	0,65	-
Scope 3	**153,60**	**2,86**	**2,74**	-	**159,20**	**13,47**
Transport and Distribution (Upstream)	108,61	0,25	1,93	-	110,79	9,40
Commuting	33,40	0,05	0,54	-	33,99	2,35
Transport and Distribution (downstream)	4,62	0,05	0,16	-	4,83	1,18
Air Travel	4,52	0,00	0,04	-	4,56	-
Waste	0,31	2,48	-	-	2,79	-
Business Travel	2,14	0,02	0,08	-	2,24	0,55
Total	**193,00**	**3,04**	**3,35**	-	**199,39**	**32,72**

Figure below presente UHSA GHG emissions form 2010 to 2016.

Annex Figure 34 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



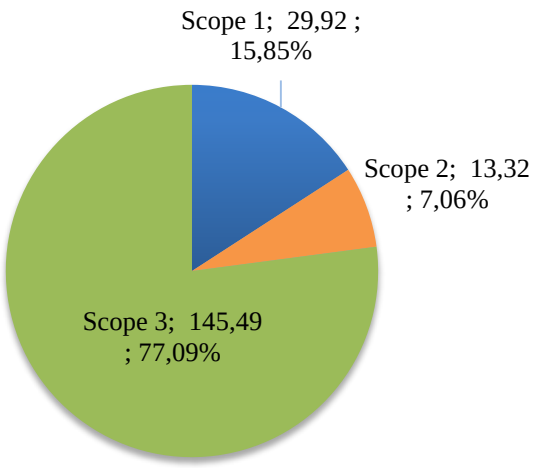
	Scope 1	Scope 2	Scope 3	Total
2010	72,73	-	6,13	78,86
2011	64,52	-	24,46	88,98
2012	47,29	-	35,92	83,21
2013	61,36	0,0003	87,60	148,97
2014	45,48	0,04	52,30	97,83
2015	25,68	0,01	101,29	126,98
2016	40,19	-	159,20	199,39

UHSA increased 57.02% their emissions compared to 2015. Main emissions sources responsible for this growth were transport and distribution upstream (37.29 tCO_2e; 50.7%), commuting, (16.25 tCO_2e; 91.6%) and mobile combustion (10.96 tCO_2e; 53.9%).

g. Hydropower Plant Estreito – UHET

UHET emitted 188.74 tCO_2e during 2016, considering Engie equity share (40.07%). Emissions per scope is presented below.

Annex Figure 35 - Emissions per scope (tCO_2e/ %)
Equity Share



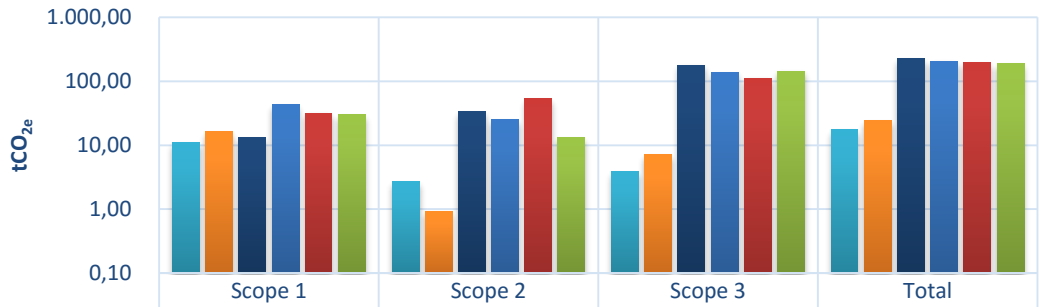
Emissions per GHG are detailed below.

Annex Table 29 – UHET Emissions per GHG – 2016 (tCO2e)

Emissions Source	Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**18,13**	**1,07**	**1,59**	**9,14**	**29,92**	**2,94**
Stationary Combustion	9,94	0,01	0,03	-	9,98	-
SF6	-	-	-	9,14	9,14	-
Mobile Combustion	8,19	0,05	0,20	-	8,44	2,94
Fertilizers	0	-	1,36	-	1,36	-
Waste	0	1,01	-	-	1,01	-
Escopo 2	**13,32**	-	-	-	**13,32**	-
Electricity	13,32	-	-	-	13,32	-
Escopo 3	**142,22**	**0,51**	**2,76**	-	**145,49**	**14,14**
Transport and Distribution (Upstream)	81,76	0,48	2,11	-	84,35	13,35
Air Travel	53,21	0,01	0,50	-	53,71	-
Business Travel	4,22	0,02	0,10	-	4,34	0,58
Commuting	3,04	0,00	0,05	-	3,09	0,21
Total	**173,67**	**1,58**	**4,35**	**9,14**	**188,74**	**17,08**

Figure below presents UHET GHG Emissions between 2011 and 2016.

Annex Figure 36 -Total emissions and emissions per scope (tCO_2e) Equity Share



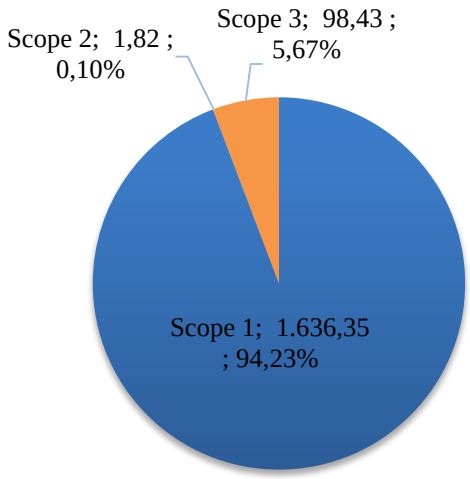
	Scope 1	Scope 2	Scope 3	Total
2011	10,92	2,69	3,88	17,49
2012	16,26	0,92	7,12	24,30
2013	13,30	33,57	179,97	226,84
2014	43,38	24,92	138,11	206,41
2015	32,06	53,09	112,20	197,35
2016	29,92	13,32	145,49	188,74

UHET reduced 4.36% of their emissions comparing to 2015, due to lower scope 2 emissions (39.77 tCO2e; 74,9%), despite the increase in other emissions sources, mainly transport and distribution upstream (growth of 25.13 tCO_2e ; 42.44%).

h. Itá Hydropower Plant – UHIT

UHIT emitted 1,736.60 tCO_2e in 2016, considering Engie equity share of 68.99%. GHG emissions are concentrated on scope 1, as shown on figure below

Annex Figure 37 - Emissions per scope (tCO_2e/ %)
Equity Share



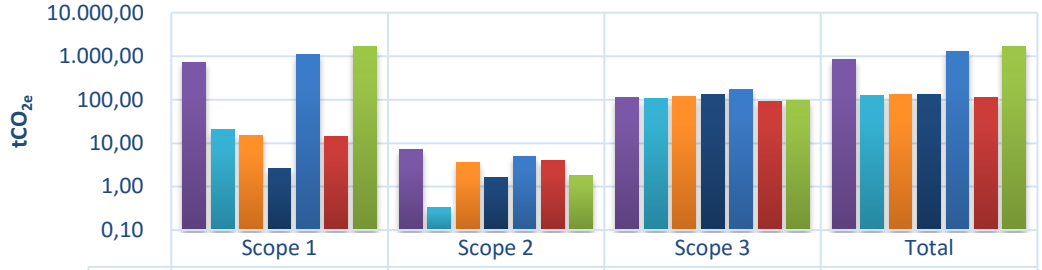
Emissions per GHG are detailed on the following table.

Annex Table 30 – UHIT emissions per GHG – 2016 (tCO2e)

Emission Sources	Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**14,74**	**0,38**	**1,07**	**1.620,16**	**1.636,35**	**8,84**
SF6	-	-	-	1.620,16	1.620,16	-
Mobile Combustion	12,04	0,09	0,26	-	12,39	8,84
Fugitives	2,70	-	-	-	2,70	-
Fertilizers	0	-	0,80	-	0,80	-
Waste	0	0,28	-	-	0,28	-
Stationary Combustion	0,00	0,00	0,00	-	0,00	0,00
Scope 2	**1,82**	-	-	-	**1,82**	-
Electricity	1,82	-	-	-	1,82	-
Scope 3	**86,34**	**10,70**	**1,40**	-	**98,43**	**5,98**
Commuting	47,60	0,07	0,76	-	48,44	3,35
Air Travel	25,37	0,01	0,24	-	25,62	-
Transport and Distribution (Upstream)	10,97	0,07	0,31	-	11,35	2,02
Waste	-	10,52	-	-	10,52	-
Business Travel	2,41	0,02	0,09	-	2,52	0,61
Total	**102,90**	**11,07**	**2,46**	**1.620,16**	**1.736,60**	**14,82**

The figure below shows UHIT GHG emissions between 2010 and 2016.

Annex Figure 38 -Total emissions and emissions per scope (tCO_2e)
Equity Share



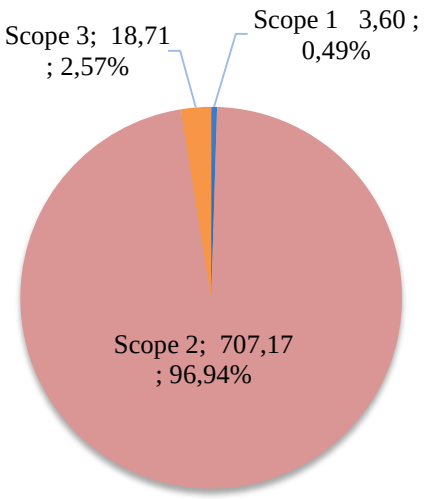
	Scope 1	Scope 2	Scope 3	Total
2010	737,66	7,10	113,11	857,87
2011	20,44	0,33	106,56	127,33
2012	15,50	3,56	116,12	135,18
2013	2,62	1,62	130,18	134,43
2014	1.137,84	5,00	169,09	1.311,93
2015	13,94	4,07	92,95	110,96
2016	1.636,35	1,82	98,43	1.736,60

In 2016, UHIT increased signficantly their emissions compared to 2015. This increase (1,625.64 tCO_2e) is directly related to SF6 emissions (1,620.16 tCO_2e) which did not happen in 2015.

i. Hydropower Plant Machadinho – UHMA

UHMA emitted 729.47 tCO_2e in 2016, considering Engie equity share of 19.29%. GHG emissions are more concentraded on scope 2 as presented in the following figure.

Annex Figure 39 - Emissions per scope (tCO_2e/ %)
Equity Share



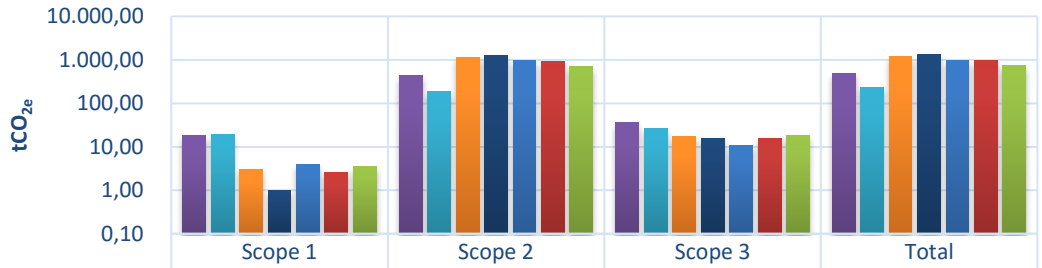
Emissions per GHG are presented in the table below.

Annex Table 31 – UHMA Emissions per GHG– 2016 (tCO2e)

Emission Sources	Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**3,55**	**0,01**	**0,04**	-	**3,60**	**0,73**
Mobile Combustion	2,03	0,01	0,04	-	2,08	0,73
Fugitives	1,52	-	-	-	1,52	-
Stationary Combustion	0,00	0,00	0,00	-	0,00	0,00
Scope 2	**707,17**	-	-	-	**707,17**	-
Electricity	707,17	-	-	-	707,17	-
Scope 3	**16,37**	**2,05**	**0,29**	-	**18,71**	**1,42**
Commuting	13,51	0,02	0,22	-	13,74	0,95
Transport and Distribution (Upstream)	2,69	0,02	0,07	-	2,78	0,45
Waste	-	2,02	-	-	2,02	-
Air Travel	0,11	0,00	0,00	-	0,11	-
Business Travel	0,06	0,00	0,00	-	0,06	0,02
Total	**727,08**	**2,06**	**0,33**	-	**729,47**	**2,15**

Figure below shows UHMA GHG emisions from 2010 to 2016.

Annex Figure 40 -Total emissions and emissions per scope (tCO_2e) Equity Share



	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

UHMA reduced 23.26% of the emissions compared to 2015, mainly due to scope 2 emissions reductions (24.12%).

5. Thermoelectric Plants

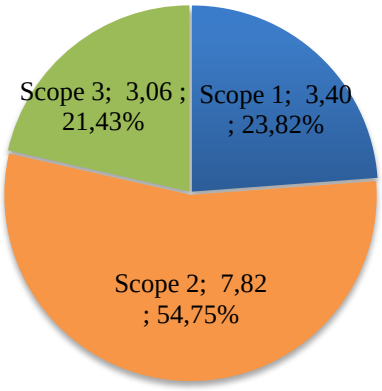
Engie has 100% of equity share over thermoelectric plants Alegrete (UTAL), Charqueadas (UTCH), Ferrari (UTFE), Jorge Lacerda (CTJL), Lages (UCLA) and Willian Arjona (UTWA). For these entrepreneurships, GHG emissions for equity share approach are the same as operational control approach.

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 Alegrete – UTAL

UTAL emitted 14.28 tCO2e in 2016, as presented below.

Annex Figure 41 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



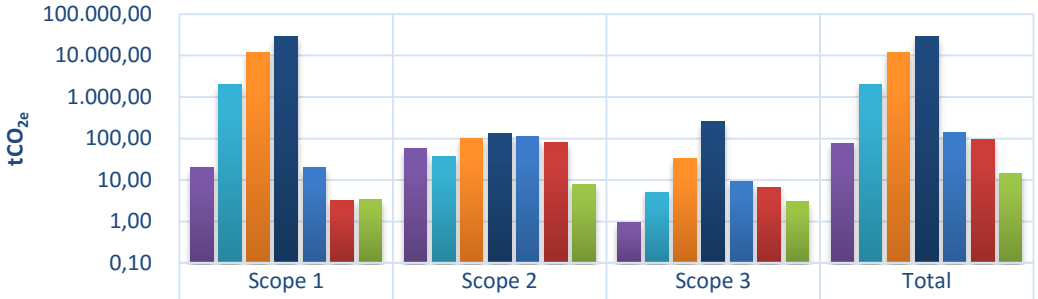
Emissions per GHG are detailed on table below.

Annex Table 32 –UTAL Emissions per GHG – 2016 (tCO2e)

Fonte de Emissão	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomassa
Scope 1	**3,27**	**0,03**	**0,10**	-	**3,40**	**0,72**
Mobile Combustion	3,25	0,03	0,10	-	3,38	0,72
Fugitives	0,02	-	-	-	0,02	-
Scope 2	**7,82**	-	-	-	**7,82**	-
Electricity	7,82	-	-	-	7,82	-
Scope 3	**2,44**	**0,54**	**0,09**	-	**3,06**	**0,62**
Business Travel	2,44	0,02	0,09	-	2,55	0,62
Waste	-	0,51	-	-	0,51	-
Total	**13,52**	**0,56**	**0,19**	-	**14,28**	**1,34**

The figure below shows UTAL GHG emissions between 2010 and 2016.

Annex Figure 42 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



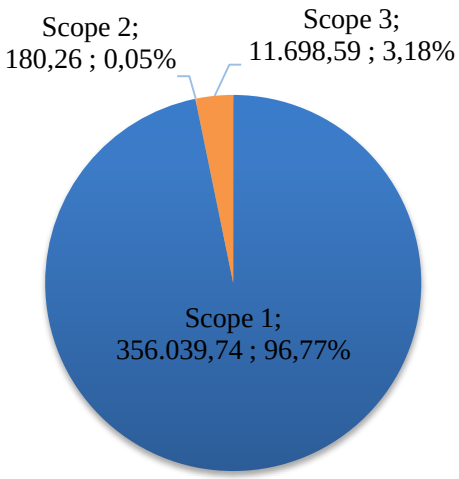
	Scope 1	Scope 2	Scope 3	Total
2010	19,88	57,11	0,95	77,94
2011	1.973,67	36,34	5,12	2.015,13
2012	11.715,88	96,74	33,72	11.846,35
2013	28.455,67	132,19	256,93	28.844,79
2014	19,68	112,97	9,09	141,75
2015	3,20	82,08	6,48	91,76
2016	3,40	7,82	3,06	14,28

UTAL reduced 84.4% their emissions, due to scope 02 emission reductions (decrease of 90.4%).

b. Charqueadas Thermoelectric Plant– UTCH

UTCH emitted 367,918.59 tCO_2e in 2016 as presented below.

Annex Figure 43 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



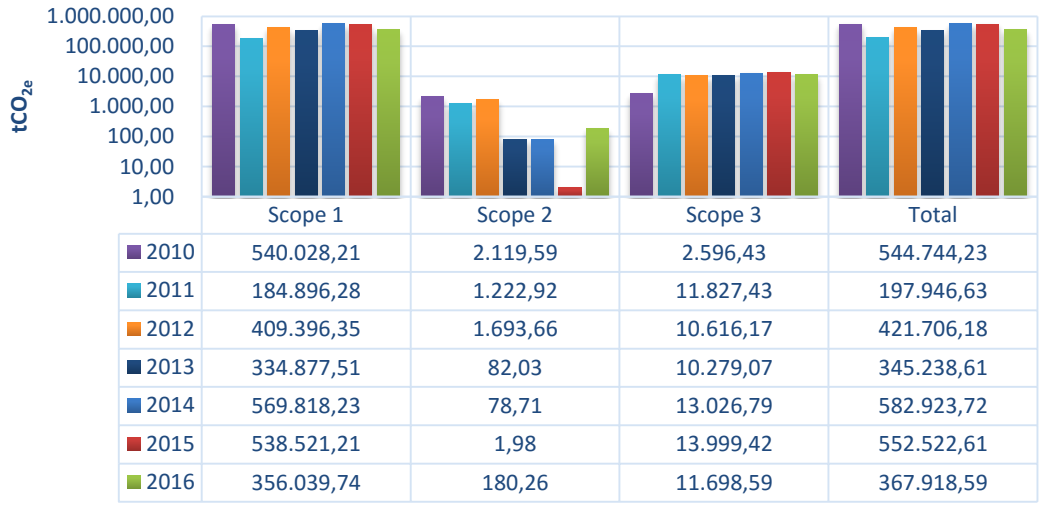
Emissions per GHG are presente on table below.

Annex Table 33 –UTCH Emissions per GHG – 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**354.317,06**	**92,41**	**1.630,28**	-	**356.039,74**	**2,47**
Stationary Combustion	350.943,04	92,31	1.629,90	-	352.665,25	-
Process	3.360,39	-	-	-	3.360,39	-
Mobile Combustion	13,43	0,09	0,38	-	13,90	2,47
Fugitives	0,20	-	-	-	0,20	-
Scope 2	**180,26**	-	-	-	**180,26**	-
Electricity	180,26	-	-	-	180,26	-
Scope 3	**11.471,81**	**42,92**	**183,86**	-	**11.698,59**	**805,89**
Transport and Distribution (Upstream)	10.325,03	16,21	165,52	-	10.506,76	725,80
Transport and Distribution (Downstream)	1.127,23	1,77	18,07	-	1.147,07	79,24
Waste	-	24,90	-	-	24,90	-
Air Travel	16,21	0,01	0,15	-	16,37	-
Business Travel	3,33	0,03	0,12	-	3,48	0,85
Total	**365.969,13**	**135,32**	**1.814,14**	-	**367.918,59**	**808,36**

The figure below shows UTCH GHG emissions between 2010 and 2016.

Annex Figure 44 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



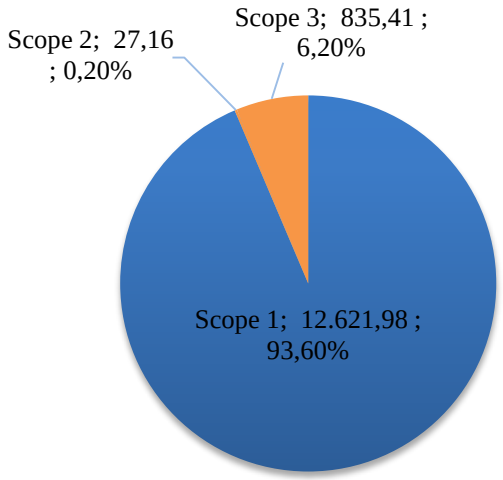
	Scope 1	Scope 2	Scope 3	Total
2010	540.028,21	2.119,59	2.596,43	544.744,23
2011	184.896,28	1.222,92	11.827,43	197.946,63
2012	409.396,35	1.693,66	10.616,17	421.706,18
2013	334.877,51	82,03	10.279,07	345.238,61
2014	569.818,23	78,71	13.026,79	582.923,72
2015	538.521,21	1,98	13.999,42	552.522,61
2016	356.039,74	180,26	11.698,59	367.918,59

UTCH reduced 33,41% their emissions compared to 2015, due to lower electricity generation and, consequently, lower coal consumption (-33.41%).

c. Thermoelectric Plant Ferrari – UTFE

UTFE emitted 13,484.55 tCO_2e during 2016, with higher concentration on scope 1, as presented below.

Annex Figure 45 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



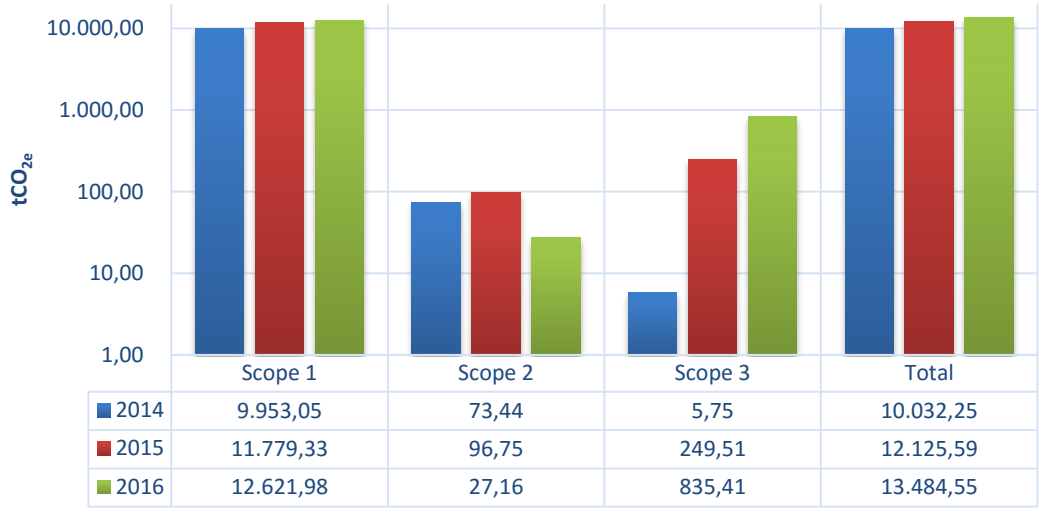
Emissions per GHG are presented below.

Annex Table 34 –UTFE Emissions per GHG– 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**0,11**	**4.874,57**	**7.747,31**	-	**12.621,98**	**631.527,12**
Stationary Combustion	-	4.874,57	7.747,31	-	12.621,88	631.527,12
Fugitives	0,11	-	-	-	0,11	-
Scope 2	**27,16**	-	-	-	**27,16**	-
Electricity	27,16	-	-	-	27,16	-
Scope 3	**753,94**	**68,97**	**12,50**	-	**835,41**	**53,00**
Transport and Distribution (Upstream)	753,94	1,18	12,09	-	767,21	53,00
Waste	-	67,79	0,41	-	68,20	-
Total	**781,20**	**4.943,54**	**7.759,81**	-	**13.484,55**	**631.580,12**

The figure below shows UTFE GHG emissions from 2014 to 2016.

Annex Figure 46 - Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



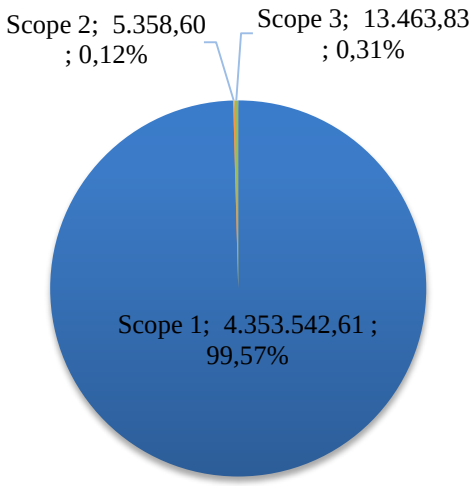
	Scope 1	Scope 2	Scope 3	Total
2014	9.953,05	73,44	5,75	10.032,25
2015	11.779,33	96,75	249,51	12.125,59
2016	12.621,98	27,16	835,41	13.484,55

UTFE increased 11.21% their emissions compared to 2015. Emissions from (I) stationary combustion were higher (842.60 tCO_2e; 7.15%) and (II) transport and distribution upstream – scope 3 (517.69 tCO_2e; 207.48%).

d. Thermoelectric Complex Jorge Lacerda – CTJL

CTJL emitted 4,372,365.04 tCO_2e during 2016 with concentration on coal combustion, main emission source of the group.

Annex Figure 47 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



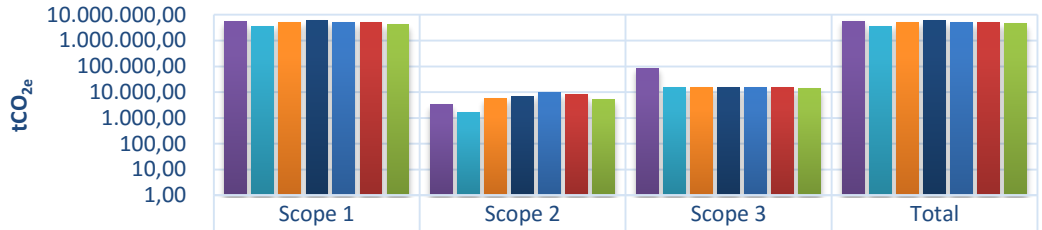
CTJL emissions per GHG are detailed on table below.

Annex Table 35 – CTJL emissions per GHG– 2016 (tCO2e)

Emission Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**4.331.945,39**	**1.156,44**	**20.440,79**	-	**4.353.542,61**	**19,00**
Stationary Combustion	4.331.804,65	1.155,65	20.437,77	-	4.353.398,07	-
Mobile Combustion	122,04	0,79	3,02	-	125,85	19,00
Fugitives	18,69	-	-	-	18,69	-
Fertilizers	-	-	0,002	-	0,002	-
Scope 2	**5.358,60**	-	-	-	**5.358,60**	-
Electricity	5.358,60	-	-	-	5.358,60	-
Scope 3	**12.925,93**	**329,91**	**207,99**	-	**13.463,83**	**915,40**
Transport and Distribution (Downstream)	7.503,87	11,84	120,42	-	7.636,12	528,65
Transport and Distribution (Upstream)	5.251,21	8,60	84,84	-	5.344,64	375,52
Waste	-	309,05	-	-	309,05	-
Air Travel	93,95	0,04	0,89	-	94,87	-
Commuting	45,46	0,07	0,73	-	46,26	3,20
Business Travel	31,45	0,32	1,12	-	32,89	8,03
Total	**4.350.229,92**	**1.486,35**	**20.648,78**	-	**4.372.365,04**	**934,40**

CTJL GHG emisisons between 2010 and 2016 is presented as follows.

Annex Figure 48 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



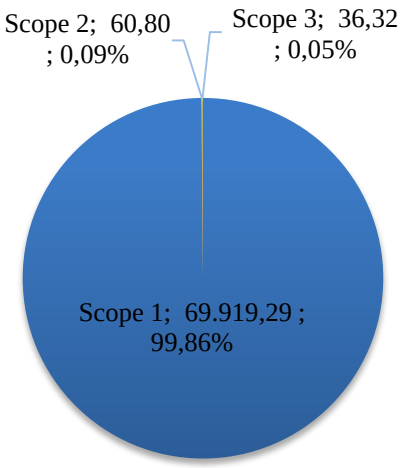
	Scope 1	Scope 2	Scope 3	Total
2010	5.574.077,71	3.199,20	84.399,55	5.661.676,46
2011	3.654.967,06	1.616,55	14.346,65	3.670.930,26
2012	4.856.278,09	5.755,72	14.796,04	4.876.829,86
2013	5.874.984,89	6.517,50	15.158,22	5.896.660,61
2014	5.141.350,52	9.781,26	14.681,80	5.165.813,58
2015	4.971.560,84	8.289,22	15.155,49	4.995.005,55
2016	4.353.542,61	5.358,60	13.463,83	4.372.365,04

CTJL emissions decreased 12.4% compared to 2015, due to lower electricity generation and consequently lower coal consumption (-15,3%).

e. Thermoelectric Plant William Arjona – UTWA

UTWA emitted 70,016.40 tCO_2e, concentrated on gas natural combustion, as shown on figure and table below.

Annex Figure 49 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share

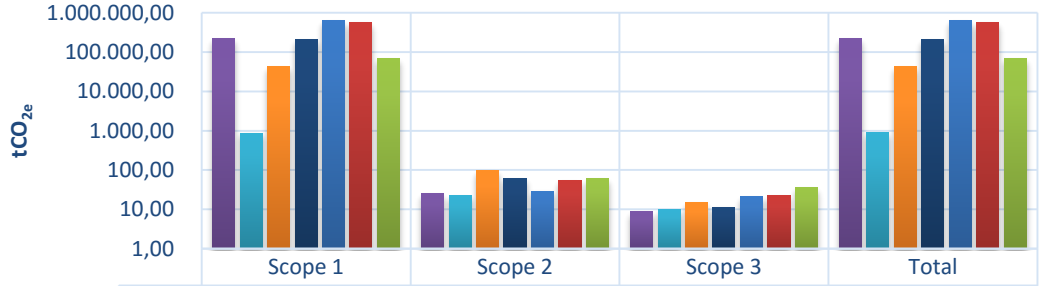


Annex Table 36 –UTWA emissions per GHG– 2016 (tCO2e)

Emissions Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**69.850,78**	**31,16**	**37,35**	-	**69.919,29**	**1,52**
Stationary Combustion	69.836,94	31,13	37,11	-	69.905,17	-
Mobile Combustion	13,60	0,03	0,24	-	13,86	1,52
Fugitives	0,25	-	-	-	0,25	-
Scope 2	**60,80**	-	-	-	**60,80**	-
Electricity	60,80	-	-	-	60,80	-
Scope 3	**11,19**	**24,78**	**0,35**	-	**36,32**	**2,38**
Waste	-	24,69	-	-	24,69	-
Commuting	8,96	0,09	0,32	-	9,37	2,29
Ait Travel	1,86	0,00	0,02	-	1,88	-
Business Travel	0,37	0,00	0,01	-	0,39	0,09
Total	**69.922,77**	**55,94**	**37,70**	-	**70.016,40**	**3,90**

UTWA GHG emissions from 2010 to 2016 can been seen in the next figure.

Annex Figure 50-Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



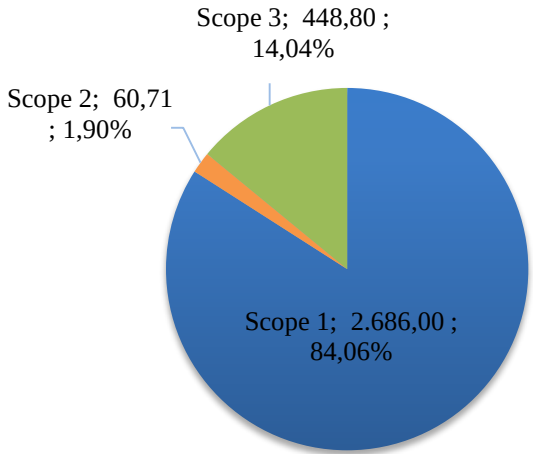
	Scope 1	Scope 2	Scope 3	Total
2010	215.824,64	25,49	8,65	215.858,78
2011	880,12	22,32	9,79	912,23
2012	42.757,33	94,82	14,51	42.866,66
2013	203.818,47	62,08	11,36	203.891,92
2014	633.336,66	29,38	20,79	633.386,83
2015	567.105,56	53,79	22,02	567.181,37
2016	69.919,29	60,80	36,32	70.016,40

UTWA reduced 87.66% of their emissions compared to 2015, due to lower consumption of natural gas (-92%).

f. Lages Cogeneration Plant – UCLA

UCLA emitted 3,195.52 tCO_2e during 2016, as presented below.

Annex Figure 51 - Emissions per scope (tCO_2e/ %)
Operational Control & Equity Share



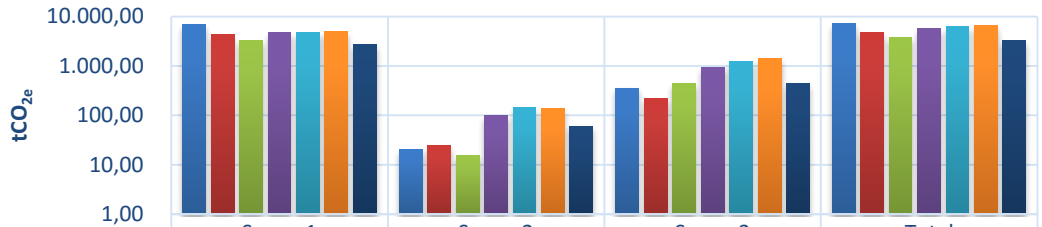
Emissions per GHG and sources can been seen in the following table.

Annex Table 37 –UCLA emissions per GHG – 2016 (tCO2e)

Emissions Sources	Operational Controle and Equity Share Emissions (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**116,25**	**991,85**	**1.577,90**	-	**2.686,00**	**140.119,98**
Stationary Combustion	2,78	991,66	1.576,08	-	2.570,52	140.110,11
Mobile Combustion	113,29	0,19	1,82	-	115,30	9,87
Fugitives	0,18	-	-	-	0,18	-
Scope 2	**60,71**	-	-	-	**60,71**	-
Electricity	60,71	-	-	-	60,71	-
Scope 3	**433,96**	**7,62**	**7,22**	-	**448,80**	**32,95**
Transport and Distribution (Upstream)	387,34	0,61	6,21	-	394,16	27,23
Commuting	36,98	0,17	0,84	-	37,99	4,99
Air Travel	6,79	0,00	0,06	-	6,85	-
Waste	-	6,81	-	-	6,81	-
Business Travel	2,86	0,03	0,10	-	2,99	0,73
Total	**610,93**	**999,47**	**1.585,12**	-	**3.195,52**	**140.152,93**

UCLA GHG emissions from 2010 to 2016 are presented below.

Annex Figure 52 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



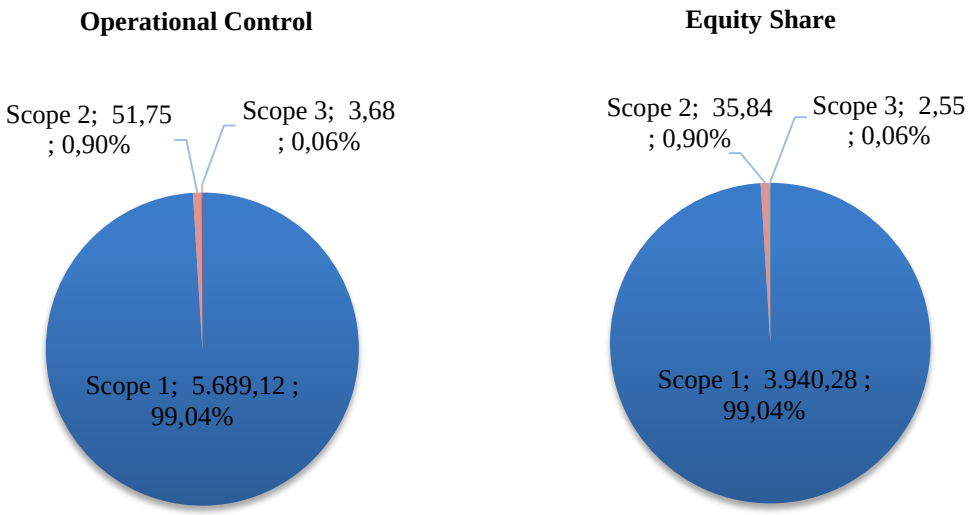
	Scope 1	Scope 2	Scope 3	Total
2010	6.874,85	20,45	355,12	7.250,42
2011	4.378,23	24,76	214,07	4.617,06
2012	3.296,34	15,55	444,97	3.756,86
2013	4.717,54	99,93	915,02	5.732,49
2014	4.750,27	144,11	1.240,06	6.134,44
2015	4.934,80	137,15	1.386,55	6.458,50
2016	2.686,00	60,71	448,80	3.195,52

UCLA reduced 50.5% in 2016. Emissions sources that contribute to emission reductions were stationary combustion (fall of 2,187.48 tCO_2e; 45.97%) and transport and distribution upstream (933.10 tCO_2e; 70.30%).

g. Thermoelectric Plant Ibitiúva – UTIB

UTIB emitted 5,744.55 tCO_2e using operational control approach and 3,978.67 tCO_2e using equity share approach. GHG emissions are presented below.

Annex Figure 53 – Emissions per scope (tCO2e/ %) – Operational Control and Equity Share



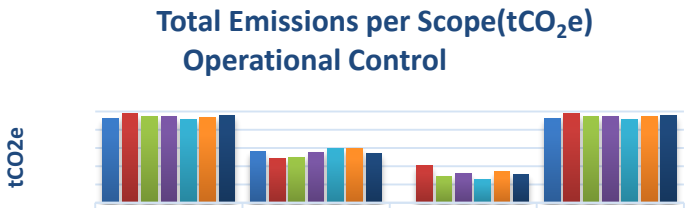
Emissions per GHG and sources are detailed on the following table.

Annex Table 38 –UTIB Emissions per GHG – 2016 (tCO2e)

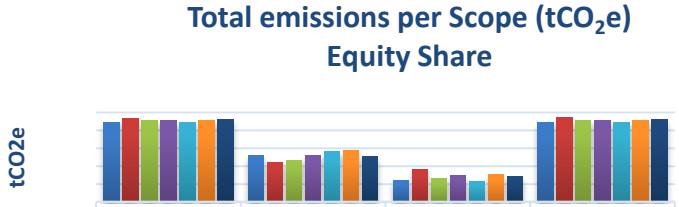
Emissions Sources	Emissions per Operational Control (tCO_2e)						Emissions per Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**17,28**	**2.190,38**	**3.481,46**	-	**5.689,12**	**283.773,78**	**11,97**	**1.517,06**	**2.411,26**	-	**3.940,28**	**196.541,72**
Stationary Combustion	1,99	2.190,32	3.481,16	-	5.673,47	283.768,36	1,38	1.517,02	2.411,05	-	3.929,44	196.537,96
Mobile Combustion	15,25	0,05	0,26	-	15,56	5,42	10,56	0,04	0,18	-	10,77	3,76
Fertilizers	-	-	0,04	-	0,04	-	-	-	0,03	-	0,03	-
Fugitives	0,05	-	-	-	0,05	-	0,03	-	-	-	0,03	-
Scope 2	**51,75**	-	-	-	**51,75**	-	**35,84**	-	-	-	**35,84**	-
Electricity	51,75	-	-	-	51,75	-	35,84	-	-	-	35,84	-
Scope 3	**0,06**	**2,59**	**1,04**	-	**3,68**	**424,47**	**0,04**	**1,79**	**0,72**	-	**2,55**	**293,99**
Waste	0,06	1,14	-	-	1,20	-	0,04	0,79	-	-	0,83	-
Transport and Distribution (Upstream)	-	1,45	1,04	-	2,48	424,47	-	1,00	0,72	-	1,72	293,99
Total	**69,09**	**2.192,97**	**3.482,49**	-	**5.744,55**	**284.198,25**	**47,85**	**1.518,85**	**2.411,97**	-	**3.978,67**	**196.835,71**

UTIB GHG emissions between 2010 and 2016 for both approaches are presented below.

Annex Figure 54 – Emissions per scope (tCO2e/ %) – Operational Control and Equity Share 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



	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

UTIB increased 12.32% their emissions using operational control approach, as well as equity share approach. This increase is related to stationary combustion in both approaches (683.23 tCO_2e;13.69% using operational control and 473.20 tCO_2e; 13.69% using equity share approach).

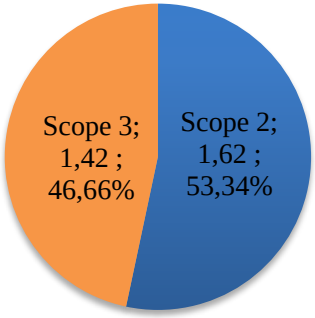
6. Offices

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 3.04 tCO_2e during 2016, as presented below.

Annex Figure 55 - Emissions per Scope (tCO_2e/ %) Operational Control & Equity Share



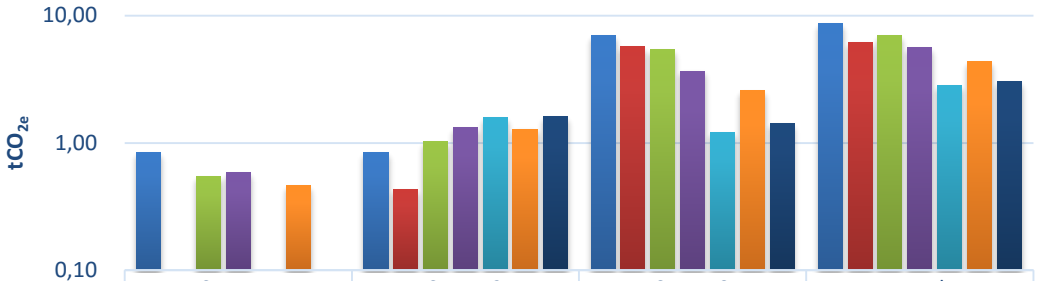
Emissions per GHG are detailed on the following table.

Annex Table 39 –ESCSP emissions per GHG– 2016 (tCO2e)

Emissions Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 2	**1,62**	-	-	-	**1,62**	-
Electricity	1,62	-	-	-	1,62	-
Scope 3	**1,41**	**0,00**	**0,01**	-	**1,42**	-
Air Travel	1,41	0,00	0,01	-	1,42	-
Total	**3,03**	**0,00**	**0,01**	-	**3,04**	-

ESCSP emissions from 2010 to 2016 are presented below.

Annex Figure 56 -Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



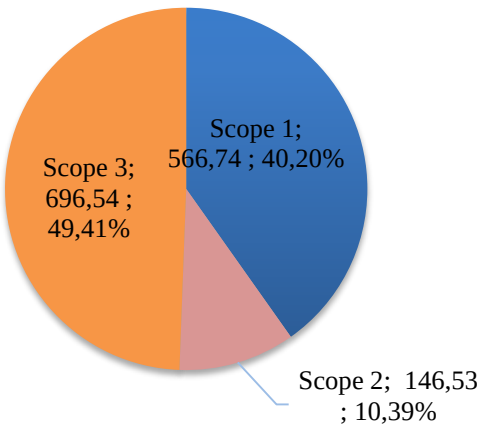
	Scope 1	Scope 2	Scope 3	Total
2010	0,84	0,84	6,95	8,63
2011	-	0,43	5,72	6,15
2012	0,54	1,02	5,42	6,98
2013	0,58	1,32	3,68	5,59
2014	-	1,60	1,21	2,80
2015	0,46	1,29	2,59	4,34
2016	-	1,62	1,42	3,04

ESCSP reduced 29.94% its emissions comparing to 2015, due to air travel emissions reductions (- 45,26%).

b. Engie Office in Florianópolis - Headquarters

Engie Headquarters emitted 1,409.80 tCO_2e in 2016, as follows.

Annex Figure 57 - Emissions per Scope (tCO_2e/ %)
Operational Control & Equity Share



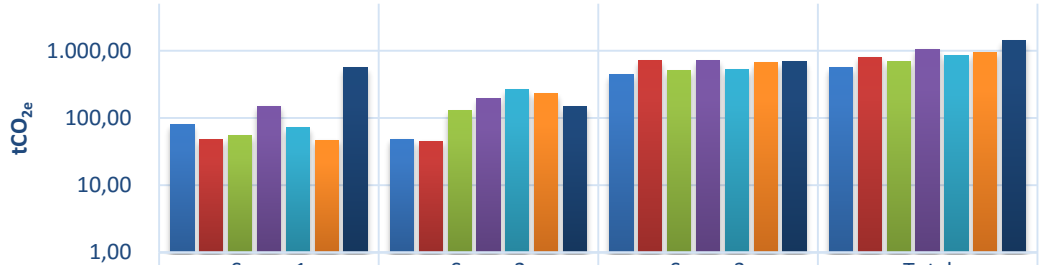
Emissions per GHG are detailed as follows.

Annex Table 40 – Headquarters emissions per GHG – 2016 (tCO2e)

Emissions Sources	Emissions per Operational Control and Equity Share (tCO_2e)					
	CO_2	CH_4	N_2O	SF_6	Total	Biomass
Scope 1	**564,08**	**1,05**	**1,60**	-	**566,74**	7,12
Fugitives	526,07	-	-	-	526,07	-
Mobile Combustion	24,29	0,24	0,86	-	25,40	6,20
Stationary Combustion	13,72	0,01	0,04	-	13,77	0,92
Waste	-	0,79	0,71	-	1,50	-
Scope 2	**146,53**	-	-	-	**146,53**	-
Electricity	146,53	-	-	-	146,53	-
Scope 3	**688,35**	**0,55**	**7,64**	-	**696,54**	**11,28**
Air Travel	644,15	0,11	6,07	-	650,33	-
Business Travel	44,20	0,44	1,57	-	46,21	11,28
Waste	-	-	-	-	-	-
Total	**1.398,96**	**1,60**	**9,24**	-	**1.409,80**	**18,40**

Headquarters emissions from 2010 to 2016 can be seen in the following figure

Annex Figure 58 - Total emissions and emissions per scope (tCO_2e)
Operational Control and Equity Share



	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

Headquarters emisisons increased 47.94% due to fugitives emisions from air-conditioning.

ANNEX VI. UHET, UHIT AND UHMA TOTAL EMISSIONS

This annex shows total 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 2,517.18 tCO2e, with concentration on SF6 fugitive emissions, as presented below.

Annex Table 41 – UHIT Total Emissions per GHG and Source

Emission Sources	Equity Share Emissions (tCO_2e)					
	CO2	CH4	N2O	SF6	Total	Biomass
Scope 1	**21,37**	**0,54**	**1,55**	**2.348,40**	**2.371,86**	**8,84**
SF6	-	-	-	2.348,40	2.348,40	-
Mobile Combustion	17,45	0,13	0,38	-	17,96	12,81
Fugitives	3,92	-	-	-	3,92	-
Fertilizers	-	-	1,17	-	1,17	-
Waste	-	0,41	-	-	0,41	-
Stationary Combustion	0,00	0,00	0,00	-	0,00	0,00
Scope 2	**2,64**	-	-	-	**2,64**	-
Electricity	2,64	-	-	-	2,64	-
Scope 3	**125,15**	**15,51**	**2,02**	-	**142,68**	**5,98**
Commuting	68,99	0,11	1,11	-	70,21	4,85
Air Travel	36,77	0,01	0,35	-	37,13	-
Transport and Distribution (Upstream)	15,90	0,11	0,45	-	16,46	2,93
Waste	-	15,24	-	-	15,24	-
Business Travel	3,49	0,04	0,12	-	3,65	0,89
Total	**149,16**	**16,05**	**3,57**	**2.348,40**	**2.517,18**	**14,82**

- **Total Results - UHET**

UHET emitted 469.46 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

Emissions Source	Equity Share Emissions (tCO2e)					
	CO2	CH4	N2O	SF6	Total	Biomass
Scope 1	**45,24**	**2,68**	**3,96**	**22,80**	**74,68**	**7,35**
Stationary Combustion	24,81	0,03	0,06	-	24,90	-
SF6	-	-	-	22,80	22,80	-
Mobile Combustion	20,43	0,13	0,50	-	21,06	7,35
Fertilizers	-	-	3,40	-	3,40	-
Waste	-	2,52	-	-	2,52	-
Escopo 2	**33,25**	-	-	-	**33,25**	-
Electricity	33,25	-	-	-	33,25	-
Escopo 3	**354,94**	**1,27**	**6,88**	-	**363,09**	**35,29**
Transport and Distribution (Upstream)	204,04	1,19	5,27	-	210,50	33,32
Air Travel	132,78	0,02	1,25	-	134,05	-
Business Travel	10,53	0,05	0,24	-	10,82	1,44
Commuting	7,58	0,01	0,12	-	7,71	0,53
Total	**433,43**	**3,95**	**10,84**	**22,80**	**471,02**	**42,63**

- **Total Results - UHMA**

UHMA emitted 3,781.62 tCO2e, with emissions concentrated on scope 2.

Annex Table 43 – UHMA total emissions per GHG and source

Emission Sources	Equity Share Emissions (tCO2e)				
	CO2	CH4	N2O	Total	Biomassa
Scope 1	**18,41**	**0,05**	**0,20**	**18,65**	**3,78**
Mobile Combustion	10,51	0,05	0,20	10,76	3,78
Fugitives	7,89	-	-	7,89	-
Stationary Combustion	0,00	0,00	0,00	0,00	0,00
Scope 2	**3.665,97**	-	-	**3.665,97**	-
Electricity	3.665,97	-	-	3.665,97	-
Scope 3	**84,85**	**10,65**	**1,51**	**97,00**	**7,34**
Commuting	70,02	0,11	1,12	71,25	4,92
Transport and Distribution (Upstream)	13,94	0,08	0,37	14,39	2,34
Waste	-	10,45	-	10,45	-
Air Travel	0,57	0,00	0,01	0,57	-
Business Travel	0,32	0,00	0,01	0,33	0,08
Total	**3.769,22**	**10,70**	**1,70**	**3.781,62**	**11,12**

ANNEX VII. GLOBAL WARMING POTENTIAL

Annex Table 44 – 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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