GHG Inventory

Quantification and reporting of greenhouse gas emissions in accordance with the Corporate GHG Protocol

8th April 2020

Contents:

Introduction

The purpose of this document is to analyse and report on the Greenhouse Gas (GHG) emissions produced by the Enel Group's activities, relating to the generation and distribution of electricity and the sale of electricity and gas.
The reporting of emissions is carried out in accordance with the international Greenhouse Gas Protocol – published by the World Business Council for Sustainable Development and World Resource Institute – and with the GRI standard (Global Reporting Initiative), and has been made public as part of Enel's Sustainability Report, which constitutes the consolidated non-financial Declaration (www.enel.com/investors/sustainability).

On the path to complete decarbonisation by 2050, Enel has provided a roadmap with medium-term objectives, certified by the Science Based Targets initiative (SBTi), with an expected 70% reduction in direct greenhouse gas emissions per kWh by 2030 compared to 2017 levels. It has also undertaken to reduce its indirect emissions associated with the sale of natural gas on the retail market by 16% by 2030, compared to 2017 data.

For the sake of transparency, Enel has responded to the CDP (former Carbon Disclosure Project) for several years and was placed on the 2019 A List.

Boundaries and calculation method

Organisational boundaries

Direct and indirect greenhouse gas emissions are reported based on the Group's financial consolidation scope. For the list of Companies included in the inventory, please refer to the list in Annex 1. Environmental data is collected for thermoelectric, renewable and nuclear plants, for photovoltaic panel production plants, for all distribution activities and for the Enel sites in its countries of operation.
The data is consolidated for the various activities at 100% of their value, regardless of Enel's percentage of ownership, except for the nuclear sector for which data is reported based on criteria in proportion to ownership.

Operating boundaries

Listed below are the GHG emission sources broken down into 1,2 and 3 scopes:

Scope 1

- combustion of fossil fuels in electricity generation activities;
- combustion of fossil fuels in generators used for electricity generation and distribution activities;
- combustion of fossil fuels in vehicles under the Company's control;
- SF_6 losses in electricity generation and distribution activities;
- HFCs gas losses from cooling systems;
- NF_3 losses from the production of solar panels;

- combustion of fuels for heating offices and canteens.

Scope 2

- consumption of electricity purchased by the network for civil use (electronic equipment, heating, lighting) or for electricity generation in thermoelectric and hydroelectric plants and for distribution. Since 2016, all supplies of electricity for the offices and Italian generation sites come from renewable sources. This supply includes the issue of green certificates by the competent authority.
- dissipation of energy from network losses relating to non-owned transmission systems and distribution losses from the network under the Enel's operational control.

Scope 3

Listed below are the sources in question divided into the categories of the GHG Protocol:

- Category 3. Fuels and energy-related activities (not included in Scope 1 and 2): fugitive emissions during the mining of coal used in thermoelectric power plants
- Category 4. Transportation and distribution upstream of the energy generation: coal transportation by land and sea, transportation of fuels, raw materials and waste on wheels
- Category 11. Use of sold goods: emissions due to the use in retail of electricity and gas by end customers.

Reference year and base year

This report refers to the GHG analysis and quantification for the calendar year 2019. The base year, which is used to monitor emission performance, is 2017.

Enel aims to reduce CO_2 emissions (Scope 1) by 70% by 2030 from the base year 2017 (certificated Science Based Target Initiative) per kWh_{eq} in line with the Group's strategy which plans to increase capacity from renewable sources and gradually phase out coal-fired plants, enabling an increase in zero-emission generation. With this mind, the CO_2eq emissions in the base year are not recalculated. With reference to the GHG inventory, the value of the emissions will be recalculated in the future, when necessary, for changes in assets for sale as indicated in the GHG protocol.

Enel has set a further goal, certified by SBTi, to achieve a 16% reduction in absolute indirect emissions associated with the consumption of gas by end customers by 2030 compared to the base year 2017 (Scope 3 category).

Inventory recalculation in the reference year

Following an expansion of the calculation basis for Scope1, 2 and 3, greenhouse gas emissions for 2017 were recalculated for the sake of methodological alignment. The following actions were taken:

- CO_2eq emissions from CH_4 and N_2O generated from the combustion of fossil fuels and derivatives in thermal power plants, by the company's fleet, in power generators, offices for heating and the canteen service, were included into Scope 1.

- Emissions caused by dissipated energy due to losses from the transmission system and Enel's distribution network were reported under Scope 2.
- The mapping of Scope 3 was increased, reporting the emissions relating to the use of energy and gas by end-users for the Enel market

No recalculations were made for changes in scope.

Calculation method

Environmental data for the generation and distribution of electricity is collected on an annual basis in an internal database called EDEN (Enel Data on Environment). The data was entered for technology directly from the various organisational levels responsible for the data (plant or country). As soon as any data is entered it undergoes formal controls and consistency assessments and subsequent series of validations.
The Group's GHG emissions are calculated centrally, except for CO_2 emissions from thermoelectric generation, which are collected directly from plants and submitted annually for certification by the relevant bodies by country (for Italy, Spain and Portugal, verified emissions are registered in the European Union registry which includes all countries participating in the EU ETS).

The fuel emission factors used for calculations are those required by the IPCC guidelines (Intergovernmental Panel on Climate Change): 2006 IPCC Guidelines for National Greenhouse Gas Inventories https://www.ipcc-nggip.iges.or.jp/public/2006gl/

The GWP figures (Global Warming Potential) refer to the 'Global Warming Potential values' document of the GHG Protocol, Fifth Assessment Report (AR5 – 100 year) https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf

The CO_2 specific emissions are a component of the calculation of the energy emissions from the network calculated on the basis of the national production mix and the energy dissipated due to technical network losses. The calculation is carried out by multiplying the country-specific emission factors by the quantity of energy withdrawn / dissipated in the country and adding all the contributions. A similar calculation is made for scope 3 emissions, use of electricity by end users, for the portion of the sold electricity that exceeds the energy produced in the country by Enel, whose emissions are already accounted for in scope 1.

The country-specific emissions, expressed in CO_2/kWh, used in the calculations of Scope 2 and Scope 3 are taken from the Enerdata provider, which reports the best estimates/updates on the current figures for the previous year (-1). Where this is not available, the specific emission for year (-2) is considered valid.

Qualitative estimation of uncertainty

Scope 1

Emissions from thermal, coal, oil, gas and combined cycle plants account for over 99% of the value for Scope 1. The plants are located in Europe (Italy, Spain, Portugal) and South America (Argentina, Brazil, Chile, Colombia and Peru). 49.5% of direct CO_2 emissions from thermoelectric generation is subject to the Emission

Trading EU ETS Directives and over 94% of these emissions come from Class C plants (emissions over 500,000 t CO_2 per year, Commission Regulation (EU) No. 601/2012).

The CO_2eq emissions for the generation of CH_4 and methane are calculated based on the fuels in the EDEN database. The fuel amounts used in power plants are subject to metrological checks also for billing purposes.

For the other CO_2 emission values (losses and refills of refrigerant gases and SF_6) the basis for calculation is the data put into EDEN using the IPCC emission factors (Fifth Assessment Report (AR5 - 100 year) and GWP of the GHG Protocol.

Scope 2

To calculate the energy taken from the network or from energy dissipation due to distribution network and transmission system losses, the level of uncertainty is key (fiscal measuring device).

The technical network losses, due to the heat generated by the passage of electric current in a conductor (Joule effect), are not calculated by means of an energy balance mechanism as is the case for total losses (technical and commercial) but with recognized standards with minimum degree of uncertainty.

Measures are also implemented to manage / decrease the associated uncertainty through periodic internal reviews of the process of managing business data and the results obtained.

The application of these considerations allows to minimize the error associated with the calculation of direct and indirect emissions.

Scope 3

Calculations related to the extraction and transport of coal and those relating to the transport of fuels, raw materials and waste are based on assumptions constructed with the use of all the possible relevant information. The details of the assumptions are reported annually in the notes of the numerical annex of the Environmental Sustainability of the Sustainability Report. This approach was selected in consideration of the high number of plants and countries in which Enel operates.

The calculation of the emissions deriving from the use of electricity and gas sold by Enel in the retail market is quantified on the basis of Enel's certified sales values, the uncertainty of which is instrumental (tax counters). IPCC factors are used in the calculations (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 1.4, page 1.24).

Results

Scope 1 Emissions

In 2019, direct emissions (Scope 1) amount to 69.981.902 tCO_{2eq}.

The share of emissions from the thermal power generation sector amounted to 69.398.339 tCO_2 and accounts for more than 99% of the total value of Scope 1.

		2019	2017
CO_2 emissions from electricity generation and heat	(mln t)	69.39	105.20

The high decrease in the value of CO_2 emissions from thermoelectric sources compared to the base year is mainly due to the lower coal production (-47%) compared to 2017 compared to an overall decrease in thermoelectric production of 27% in two years .

The indicator relating to specific CO_2 emissions from the overall net production is the result of the ratio between total emissions from thermal generation (t), which is undergoing the verification, and the Group's total production of heat expressed in energy units.

For 2019, this ratio amounts to 296 g/kWh_{eq}.

Scope 1 also includes the CO_2 emissions generated during the petrol and diesel combustion process in the engines of vehicle controlled by the Company and by the combustion of diesel in generators used in energy generation technologies, as well as in electricity distribution activities. The combustion processes from fossil fuels also include the generation of **N_2O** (GWP=265) and **CH_4** (GWP=28) expressed as a CO_2 equivalent. These figures were not included in the 2017 and 2018 reporting, and have been recalculated also for the previous two years. For 2019, the sum of the two components totalled 279.921 tCO_{2eq}

Other direct CO_2 equivalent emissions originated from the **leakage to the atmosphere of SF_6** (GWP=23,500), which occurs mainly within the scope of electricity Distribution and, secondarily in energy power plants. The quantities released to the atmosphere in 2019 for the entire scope of the Group amount to 8,367 kg and 197 $ktCO_{2eq}$, of which Distribution accounts for 82,5%. As regards Scope 1, Enel considers the emissions of leakage to the atmosphere of gases and refrigerant gas mixtures calculated by applying the average GWP value of the gas . The emissions of these substances in 2019 correspond to 7.976 tCO_{2eq}
As of 2019, reporting also covered emissions from **NF_3** losses amounting to 10t CO_{2eq} in the year for the production of photovoltaic panels.

Scope 2 emissions

Scope 2 emissions relate to indirect emissions deriving from the generation of electricity purchased and consumed by the Company. Scope 2 includes the CO_2 emissions associated with **electricity consumption** taken from the network for civil use or for energy generation in thermoelectric and hydroelectric plants. Since 2016, all supplies of electricity for the offices and Italian generation sites come from renewable sources. This supply includes the issue of green certificates by the competent authority. In 2019, a volume of energy equal 198.6 GWh had supply green certificates for supplies for offices. The calculation of Scope 2 for the consumption of energy taken from the network is shown with a double view: location-based amounting to 1.547 $MtCO_{2eq}$; and market-based calculated using the residual mix values for Europe, amounting to 2.301 $MtCO_{2eq}$ (the market-based calculation did not take into account the Italian share for supplies from renewable sources).

Emissions from energy acquired by the network (Scope 2, location based)	(mln t eq)	**1.547**	**1.498**
Emissions from energy acquired by the network (Scope 2, market based)	(mln t eq)	**2.301**	**2.194**

The market based scope 2 shows a greater increase between the two years compared to the location based for the increase in the country-specific emissions of the residual mix in 2019 compared to 2017.

In compliance with the GHG protocol directives, as of this year, this category includes **indirect emissions deriving from dissipated energy emissions from technical losses from Enel's distribution network** and from the transmission system, calculated for all countries of operation for 2017-2019. With its business, the Group covers the entire generation and sales chain in Europe (Italy and Spain) and in five Latin American countries (Argentina, Brazil, Colombia, Chile and Peru). To calculate emissions, it has been assumed that the vertical

chain of activities takes place within the country. The emissions caused by the losses were calculated based on the part of energy that exceeds the share produced in the country in question, so as to avoid any double counting of emissions already included in Scope 1. In 2019, the total value of Scope 2 for distribution network losses equalled approximately 3,818 $MtCO_{2eq}$.

		2019	2017
Emissions from dissipated energy due to network losses	(mln t eq)	**3.818**	**3.505**

Scope 3 emissions

Scope 3 emissions are generated as a consequence of Company activities and do not derive from controlled or owned sources. These indirect emissions concern Enel's entire value chain, from generation and transportation through to the sale of energy.

Electricity generation activities

CO_2eq emissions resulting from the energy generation of thermal plants have been estimated for all countries of operation, with a particular focus on coal-fired generation.

The emissions fall into the following Scope 3 categories of the GHG Protocol:

Category 3. Fuel and energy related activities (not included in scope 1 or 2)

In this group, the fugitive methane emissions from coal during the mining stage has been estimated for the amount used by coal-fired power plants over the year reported as CO_2eq (GWP = 28).

		2019	2017
Coal mining	(mln t eq)	3.329	5.903

The decrease in value in 2019 compared to 2017 is due to the lower use of coal due to the reduction in coal thermal production.

Category 4. Upstream transportation and distribution

This category includes the reporting of emissions due to the transportation of used fuels (coal, diesel oil, fuel oil, biomass), consumables (e.g. chemical compounds) for the operation of plants and the transportation of waste. For coal, the share of emissions relating to transportation by land (train) and sea (ship) has been calculated; trucks were taken into account for other transportation. For all calculations, basic assumptions were made regarding the length of the trip, the emissions of the mode of transport used and its frequency.

		2019	2017
Coal transportation by sea	(mln t eq)	0.454	0.805
Coal transportation by train	(mln t eq)	0.215	0.381
Transportation of fuels (diesel, biomass, WDF)	(mln t eq)	0.009	0.011
Transportation of raw materials and waste	(mln t eq)	0.014	0.028

The decrease in values in 2019 compared to 2017 is due to the lower coal and thermoelectric production which led to a lower use of fuels and raw materials, with a lower production of waste.

Electricity and gas market activities: the emissions deriving from the use of electricity and gas by end customers in the retail market were calculated.

Category 11- Use of the sold products

In 2019, Enel expanded the categories used to account for Scope 3 emissions and has recalculated the 2018 and 2017 values for its entire operational scope during those two years. As a result, a calculation is provided for the emissions relating to the gas and electricity market in Europe and the electricity market in Europe and Latin America generated during the final phase of use of the products sold to end customers.

Retail gas market: Enel operates in this market in Europe (Italy, Spain and Romania). The emission value resulting from the combustion of natural gas is calculated based on the energy value (TWh) of gas sold, multiplied by its emission factor (source: IPCC x CO_2, N_2O and CH_4).

Retail electricity market: With its business, Enel covers the entire generation and sales chain in Europe (Italy and Spain) and in five Latin American countries (Argentina, Brazil, Colombia, Chile and Peru). To calculate emissions, it has been assumed – as already described for emissions from network losses under Scope 2 – that the vertical chain of activities takes place within the same country. The emissions of the share sold and produced by the company have not been included in the calculation since they already fall under Scope 1. The share for the fraction sold but not produced by country was calculated by multiplying the energy amount by the specific country-level emission (source: Enerdata). Emissions from network losses are not included in the calculation since they are reported under Scope 2.

		2019	2017
Use of products sold by end users: electricity market	(mln t eq)	28.975	25.460
Use of products sold by end users: gas market	(mln t eq)	23.923	25.290

Exclusions

This reporting was based on a materiality criterion, with the following exceptions:

- Companies belonging to the business line of Enel X
- The calculation of the Scope 1 emissions of biogenic carbon emissions from the decomposition of organic matter in hydro-electric dams
- The calculation of the Scope 3 emissions relating to lignite (which became marginal after leaving the scope of Slovak plants in 2016)

The GHG inventory statements for 2019 were audited by DNV GL, with a reasonable level of certainty for Scope 1, Scope 2 and Scope 3 emissions, limited to the sale of natural gas, and with a limited level of certainty for the other Scope 3 emissions included in the inventory's scope of application. The audit was conducted according to Standard ISO 4064-3 for the compliance of Greenhouse Gas (GHG) Inventories with the WBCSD/WRI Corporate accounting and Reporting Standard (GHG Protocol). This activity also included an analysis of GHG emissions for the base year 2017 (previously verified by the DNV in 2018 with a limited level of certainty).

DNV·GL

VERIFICATION STATEMENT

Statement No:
10000366419-Assessment Services-DNV GL-ITA

First Issuance Date:
8 April 2020

Statement Validity:
8 April 2020 – 7 April 2021

DNV GL Business Assurance has verified, in accordance with the Standard ISO 14064-3, the Greenhouse Gas (hereinafter "GHG") emissions of the organization

ENEL SpA

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reported in the GHG inventory descriptive document entitled "Quantificazione e rendicontazione delle emissioni di gas a effetto serra secondo lo standard corporativo 'The Greenhouse Gas Protocol' del anno 2019" (hereinafter "the GHG Inventory Report") issued in April 2020 by ENEL SpA using a financial control consolidation approach and relative to the direct and the indirect activities below reported carried out worldwide by the Group companies described in the aforementioned GHG Inventory Report.

Based on our verification process procedures, DNV GL states that:
- the aforementioned GHG Inventory Report has been issued by ENEL SpA in compliance with the revised edition of "The Greenhouse Gas Protocol" corporate standard. The report covers the reporting period from the 1 January 2019 to 31 December 2019 with the following results (values rounded to tons):

GHGs (tons CO_{2-eq})	2019							2017
	CO_2	CH_4	N_2O	NF_3	SF_6	HFCs	TOTAL	BASELINE
DIRECT EMISSIONS (SCOPE1)	69,496,843	33,081	242,171	18	196,620	7,976	69,981,582	105,561,618
From Electricity Power Generation	69,398,339	37,936	241,985	---	36,260	5,167	69,717,877	105,723,612
From Electricity Distribution	7,948	9	17	---	162,299		170,273	159,668
From Real Estate	89,757	1,135	170	---	---	2,102	93,164	87,438
From Other Activities	---	---	---	18	71	705	787	0
ENERGY INDIRECT EMISSIONS (SCOPE2)								
From electricity purchased from the grid (location based)	1,547,236	---	---	---	---	---	1,547,236	1,497,912
From electricity purchased from the grid (market based)	2,300,688	---	---	---	---	---	2,300,688	2,194,024
From losses on the distribution grid (retail market)	1,331,846	---	---	---	---	---	1,331,846	1,161,933
From losses on the distribution grid (third parties)	2,029,110	---	---	---	---	---	2,029,110	1,975,106
From losses on the transmission grid (retail market)	457,194	---	---	---	---	---	457,194	368,353
OTHER INDIRECT EMISSIONS (SCOPE3)	53,565,785	3,328,734	13,617				56,918,186	57,876,885
Cat.3 Fuel and Energy related activities	---	3,328,734	---	---	---	---	3,328,734	5,962,568
Cat.4 Upstream transportation and distribution	691,508	---	---	---	---	---	691,508	1,224,310
Cat.11 electricity sold in the retail market	28,975,364	---	---	---	---	---	28,975,364	25,690,118
Cat.11 natural gas sold in the retail market	23,898,841	10,658	13,017	---	---	---	23,922,588	25,289,889
TOTAL EMISSIONS (Location Based)	128,427,214	3,367,815	255,788	18	196,620	7,976	132,254,823	168,841,808
TOTAL EMISSIONS (Market Based)	123,188,666	3,367,815	255,788	18	196,620	7,976	133,088,275	169,537,920

- Scope 1 and Scope 2 emissions and Scope 3 emission associated to use of natural gas sold in the retail market provide, in DNV GL opinion and with the qualification listed in the annex of this Statement, a balanced representation of GHG emissions associated to the reported activities of the organisation in the reporting period.
- with regards to the Scope 3 emissions not associated to use of natural gas sold in the retail market, nothing has come to our attention showing that what reported by the organization is not a balanced representation of GHG emissions associated to the reported activities carried out by third parties in the reporting period

Place and date:
Vimercate 8 April 2020

For the issuing DNV GL office:
DNV GL – Business Assurance

Zeno Beltrami
Management Representative

Annex 1

List of Companies within the scope of the inventory

Note: Group companies with thermoelectric, nuclear and renewable energy production plants, photovoltaic panels production, and offices in the countries of operational presence relating to energy production and distribution activities fall within the perimeter.

Central Dock Sud Sa
Condensa
Edesur
e-distribuzione S.p.A.
Emgesa
Endesa SA
Enel Cien SA
Enel Distribución Ceará
Enel Distribución Goias
Enel Distribución Perú
Enel Distribución Río
Enel Distribución Sao Paulo
Enel Distributie Banat
Enel Distributie Dobrogea
Enel Distributie Muntenia
Enel Generación Costanera S.A.
Enel Generación El Chocon S.A.
Enel Generación Fortaleza
Enel Generación Perú SAA
Enel Generación Piura SA
Enel Green Power Brasil partecipacoes Ltda
Enel Green Power Cachoeira Dourada SA
Enel Green Power Chile Ltda
Enel Green Power Costa Rica S.A.
Enel Green Power Espana SL
Enel Green Power Guatemala, S.A.
Enel Green Power Hellas Sa
Enel Green Power India Privated Limited
Enel Green Power Mexico S de RL de CV
Enel Green Power North America Development LCC
Enel Green Power Panama SA
Enel Green Power Romania Srl
Enel Green Power RSA (Pty) Ltd
Enel Green Power SpA
Enel Green Power Volta Grande S.A.
Enel Produzione IT