GHG Inventory

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

12th April 2022

INDICE

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 declared by 2040, Enel has provided a roadmap with medium-term objectives, certified by the Science Based Targets initiative (SBTi), with an expected 80% 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 55% by 2030, compared to 2017 data and to reduce the specific emissions deriving from the production and sale of energy by approximately 80% (target that combines the emissions of scope 1 with scope 3) compared to the base year 2017.

For the sake of transparency, Enel has responded to the CDP (former Carbon Disclosure Project) for several years and was placed on the 2021 A List.

BOUNDARIES AND CALCULATION METHODS

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
- Combustion of fuels for heating offices and canteens
- CH4 leakage in in gas-fired thermoelectric power plants
- SF_6 losses in electricity generation and distribution activities
- HFCs gas losses from cooling systems
- NF_3 losses from the production of solar panels
- Transportation of fuel (LNG and coal) on vessels under own operational control
- CH_4 emissions from the decomposition of organic matter in hydroelectric basins

Scope 2

Electricity purchased from the grid - Production of electricity purchased by the network for civil use (electronic equipment, heating, lighting) or for electricity generation in own thermoelectric and hydroelectric plants and for distribution.
Technical losses from the grid - Dissipation of energy from network losses relating to non-owned transmission systems and distribution losses from the network under the Enel's operational control (Joule effect).

Scope 3

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

Category 1. Purchase of goods and services - Emissions from supply chain **Category 3. Fuels and energy-related activities** (not included in Scope 1 and 2): - Coal: fugitive emissions during the mining and transportation by sea of coal used in thermoelectric power plants - Natural Gas: fugitive emissions from the extraction and transport, liquefaction and regasification, of gas used in thermoelectric plants and sold on the retail market - Gasoil and Biomass: transportation on wheels - Electricity market: emissions due to the production of the electricity sold in the retail market **Category 4. Transportation and distribution upstream of the energy generation**: - Raw materials and waste transportation on wheels **Category 11. Use of sold goods**: - Emissions due to the use of gas sold in the retail market by end customers.

Reference year and base year

This report refers to the GHG analysis and quantification for the calendar year 2021.
Due to the relevant and significant assessments and introductions of new sources in the GHG inventory in 2021 compared to previous years and being 2021 a year of economic recovery after the global pandemic that started in 2020, it was considered to consider 2021 as the year reference basis for the analysis of indicators relating to scopes 1, 2 and 3.

Inventory recalculation in the reference year

2021 is the base year of reference for future analyses and there are no recalculations with respect to the inventory.

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). Starting this year, the emissions subject to the Emission Trading Scheme of Chile are also included in this classification.

Within scope 1, emissions from methane leakages, fugitive emissions of biogenic methane from the basins of hydroelectric plants and emissions from transport of coal and LNG under direct operational control are reported for 2021 and for the previous two years:

- methane leakages in gas fired thermoelectric plants (as primary or secondary fuel). In Italy they are assessed starting from the values measured and calculated with the LDAR (Leak detection and repair) methodology. For the other countries an estimated value was reported, assessed on the base of data of the Italian plants proportionate on the gas consumption relative to the plants of the other countries.
- fugitive emissions of biogenic methane from hydroelectric plant basins are calculated using the IPCC method, while the areas of the basins have been extracted from the Enel GIS portal

- the calculation of the emissions related to the transport of coal and LNG by sea is based on the actual route of the transport of fossil fuel.

Scope 1, scope 2 (for the portion of energy purchased from the network) and some scope 3 emissions are calculated directly in Eden through calculation formulas based on primary data collected annually.

For scope 3, emissions deriving from the extraction of gas transportation by ship or by land and emissions from the supply chain are reported for 2021 and the previous two years:

- Extraction and transportation of gas emissions calculation is based on both the volumes of gas used in Enel's thermoelectric plants and the volumes sold on the retail gas market.

- Supply Chain Scope 3 emissions are calculated using the following method:

- for main supplies: data from suppliers through EPD (Environmental Product Declaration) or ISO CFP 14067 certifications or from international databases based on LCA methodology (76% of total supplies)
- for supply tails: from the average emissions of the economic sector to which they belong
- for works: sustainable construction site data (wind / solar plants)
- for services: average value of GHG emissions declared by a selection of suppliers through the ISO CFP 14064 certification.

For the calculations, parameters available in Eden updated / checked annually are used:

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 both the emissions of the purchased energy from the network calculated on the basis of the national production mix and from the energy dissipation due to technical network losses. A similar calculation is made for scope 3 emissions, use of electricity sold in the retail market, 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 calculation is made by multiplying the country-specific emission factors by the amount of energy withdrawn / dissipated / sold in the country and adding all the contributions.

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.

The residual mix emission factors used for the *market-based* calculation are available at the link: https://www.aib-net.org/ for Europe. For the other countries of presence, the *location-based* emission factor was used.

Qualitative estimation of uncertainty

Scope 1

Emissions from thermal, coal, oil, gas and combined cycle plants (CO_2, N_2O e CH_4) account for over 99% of the value for Scope 1. The plants are located in Europe (Italy, Spain, Portugal), in Russia and South America (Argentina, Brazil, Chile, Colombia and Peru). 63% of direct CO_2 emissions from thermoelectric generation is subject to the Emission Trading Directives: at European level (Italy, Spain and Portugal for a total of 53% of total direct CO2 emissions in 2021) or national (Chile, 10%).

The CO_2eq emissions for the generation of CH_4 and N_2O are calculated based on the fuels in the EDEN database on annual base. The fuel amounts used in power plants are subject to metrological checks also for billing purposes.

For the other CO_2 emission values (leakages 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 of the activity data is instrumental (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).

The calculation of emissions relating to the extraction and transportation of gas is based on the volumes of gas used within Enel's thermoelectric plants and volumes sold on the retail gas market. The calculation model uses *location-based* secondary factors deriving from literature and applications based on existing contracts.

With reference to the supply chain emissions, it is possible to qualitatively assess a low level of uncertainty for the estimate of the emissions of the strategic categories, based on the average of the data obtained directly from suppliers through EPD (Environmental Product Declaration) or ISO CFP 14067 certifications; an average level of uncertainty can be assessed for the categories estimated through international databases based on LCA methodologies and a medium / high level of uncertainty can be reported for the tail categories

be estimated using the average emission factors of the economic sector to which they belong. The emissions of the works have been estimated starting from data from sustainable construction sites and can be evaluated with an average level of uncertainty. The emissions of the service have been estimated from the organization's ISO CFP 14064 certification data and can be assessed with a medium / low level of uncertainty.

RESULTS

Scope 1 Emissions

In 2021, direct emissions (Scope 1) amount to **51,570,265** tCO_{2eq}.

The share of emissions from the power generation sector accounts for more than 99% of the total value of Scope 1. CO2 direct emissions from the thermal power generation sector are 50,556,332 tCO_2.

The indicators relating to the Group's specific CO2 emissions are as follows:
- The ratio between total emissions from thermoelectric plants, which is undergoing the verification, and the Group's total production including heat (expressed in energy units).
For 2021, this ratio amounts to **222** g/kWh.
- The ratio between total emissions from scope1, which is undergoing the verification, and the Group's total production including heat (expressed in energy units).
For 2021, this ratio amounts to **227** g/kWh.

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 (equal to 319,055 tCO_2).
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. For 2021, the sum of the two components totalled 159,838 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 2021 for the entire scope of the Group amount to 6,075.4 kg and 142.773 tCO_{2eq}, of which Distribution accounts for 78%. 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 2021 correspond to 10,221 $tCO_{2eq.}$
As of 2021, reporting also covered emissions from **NF_3** leakages amounting to 14t CO_{2eq} in the year for the production of photovoltaic panels.
Starting from 2021, additional sources of direct emissions were introduced in the inventory:
- CH4 leakages in gas-fired thermoelectric plants
- transport of coal and LNG under direct operational control
- methane emissions from hydroelectric basins
The sum of the three items is equal to 382,031 tCO_{2eq}.

CO2 emissions from biomass combustion, not included in scope 1, are equal to 125,878t CO_2.

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, in Italy all supplies of electricity for the offices and for some Italian generation sites come from renewable sources. This supply includes the issue of green certificates by the competent authority. In 2021, a volume of energy equal 173.405 GWh had supply green certificates for supplies for offices. The calculation of Scope 2 for the consumption of energy taken from the network (equal to 5,964 GWh) is shown with a double view: *location-based* amounting to 1,336,669 tCO_{2eq}, and *market-based* calculated using the residual mix values for Europe, amounting to 2,351,000 tCO_{2eq} (the *market-based* calculation did not consider the Italian share for supplies from renewable sources).

In compliance with the GHG protocol directives, 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. 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. The calculation of Scope 2 for the consumption of energy taken from the network is shown with a double view: *location-based* amounting to 2,966,515 tCO_{2eq}, and *market-based* calculated using the residual mix values for Europe, amounting to 4,763,150 $tCO_{2eq.}$

Scope 3 emissions

Scope 3 emissions are generated because 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.

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

Category 1. Purchase of goods and services: This category includes emissions from the supply chain for supplies, works and services. Emissions for the year 2021 amounted to 11,689,711 tCO_{2eq}.

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

In this category the emissions in the extraction and transport phase of the main fuels used (coal and gas) have been reported, together with gas-oil, fuel-oil and biomass.

Coal

Fugitive emissions of methane from coal occurring during extraction and during transport by ship were estimated for the quantity used by the coal-fired power plants in the year reported in CO2eq (GWP = 28).

The calculation of the emissions related to the transport by ship is based on the actual journeys of the transport of the fossil fuel. The total value of fugitive emissions during extraction and subsequent transport is equal to 1,241,415 tCO_{2eq}.

Natural gas

For this fuel, emissions from extraction and transport were calculated both for the gas consumed within the thermoelectric power plants for the production of energy and sold to customers in the retail market. The transport includes both transport by ship (LNG loads, with the liquefaction and regasification phase) and by pipeline. CO2eq emissions include both the share of CH_4 and N_2O (GWP = 265). The 2021 value is equal to 9,999,000 tCO_{2eq}.

Diesel, fuel oil and biomass

Emissions related to on wheels transport of the three fuel types were calculated. For all calculations, assumptions were made regarding the duration of the journey, the emissions of the vehicle used and the frequency of the transport. The overall value is equal to 5,270 tCO_{2eq}.

Sale of electricity in the retail market

Emissions generated in the production phase of the energy purchased for sale in the retail electricity market also fall into this category. Enel covers the entire production and sales chain in Europe (Italy and Spain) and in five Latin American countries (Argentina, Brazil, Colombia, Chile and Peru). For the emission calculation it was assumed, as already described for the emissions of grid losses attributed to purpose 2, that the vertical chain of activities takes place within the same country. Therefore, emissions are calculated for the share of energy sold exceeding the share produced in the country and are equal to 23,959,121 tCO_{2eq}. The emissions from grid losses were not included in the calculation as they are already reported in scope 2.

Category 4. Upstream transportation and distribution

Emissions deriving from the transport of consumables (eg chemical compounds) for the operation of its plants and the transport of waste on wheels have been reported in this category. The basic assumptions are the same already reported in category 3.

The overall value is equal to 4,032 tCO_{2eq}.

Category 11- Use of the sold products

Calculation is provided for the emissions relating to the gas 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) and South America (Chile and Colombia). 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 for CO_2, N_2O and CH_4). In 2021 this value is equal to 22,250,950MtCO_{2eq}.

Exclusions

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

- Companies belonging to the business line of Enel X

The GHG inventory statements for 2021 were audited by DNV , 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).

The total emissions subject to verification are shown below:

GHGs (tons CO2-eq)	2021						
	CO2	CH4	N20	NF3	SF6	HFCs	TOTAL
DIRECT EMISSIONS (SCOPE1)	**50,931,716**	**385,711**	**99,830**	**14**	**142,773**	**10,221**	**51,570,265**
From Electricity Power Generation	50,643,542	385,251	98,139	14	31,152	10,221	51,168,319
From Electricity Distribution	208,331	239	451	-	111,621	-	320,642
From Real Estate	79,843	221	1,239	-	-	-	81,303
ENERGY INDIRECT EMISSIONS (SCOPE2)							
Location based							**4,303,184**
From electricity purchased from the grid	-	-	-	-	-	-	1,336,669
From losses on the distribution grid	-	-	-	-	-	-	2,966,515
Market based							**7,114,150**
From electricity purchased from the grid	-	-	-	-	-	-	2,351,000
From losses on the distribution grid	-	-	-	-	-	-	4,763,150
OTHER INDIRECT EMISSIONS (SCOPE3)							**69,149,498**
Cat.1 Purchased goods and service	11,689,711	-	-	-	-	-	11,689,711
Cat.3 Fuel and Energy related activities	34,131,751	1,073,055	-	-	-	-	35,204,806
Cat.4 Upstream transportation and distributior	4,032	-	-	-	-	-	4,032
Cat.11 natural gas sold in the retail market	22,228,937	9,906	12,107	-	-	-	22,250,950
TOTAL EMISSIONS (Location Based)							**125,022,948**
TOTAL EMISSIONS (Market Based)							**12,7833,913**

STATEMENT

DNV Business Assurance (DNV) has been commissioned by the management of ENEL SpA to carry out an independent verification of its Greenhouse Gas (GHG) emissions relative to the 2021 calendar year.

Verified GHG Emissions

Greenhouse Gas Emissions	t CO_{2eq}
Direct (Scope 1) GHG Emissions (*)	51 570 265
Energy Indirect (Scope 2) GHG Emission (Located Based)	4 303 184
Energy Indirect (Scope 2) GHG Emission (Market Based)	7 114 150
Other Indirect (Scope 3) GHG Emissions	69 149 498
of which use of natural gas sold in the retail market	22 250 950
CO_2 biogenic from biomass combustion (**)	125 878

(*) it includes CH_4 and N_2O biogenic emissions from combustion

(**) direct CO_2 biogenic emissions are reported separately as per §4 of The GHG Protocol

Assurance Opinion

Based on the verification process conducted by DNV as explained in the annex of this statement:

- we provide a reasonable assurance of Scope 1, Scope 2 and the Scope 3 GHG emissions associated to use of natural gas sold in the retail market of ENEL GHG Inventory *as* DNV found to be
  - materially correct.
  - a fair representation of GHG emissions information; and
  - in accordance with the Verification Criteria
- we provide a limited assurance of the remaining Scope 3 GHG Emissions of ENEL GHG Inventory as no evidence was found showing to be
  - not materially correct.
  - not a fair representation of GHG emissions information; and
  - not in accordance with the Verification Criteria

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO 14065
VERIFICATION BODY

DNV Business Assurance USA, Inc.
12 April 2022

Digitally signed by David Tellez
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Lead Verifier	Technical Reviewer	Approver
Francisco Zamarron	**Shruthi Bachamanda**	**David Tellez**

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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
Condensa
Edesur
e-distribuzione
Emgesa
Endesa
Enel Cien
Enel Distribución Ceará
Enel Distribución Chile
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
Enel Generación Chile
Enel Generación El Chocon
Enel Generación Fortaleza
Enel Generación Perú
Enel Generación Piura
Enel Green Power Brasil partecipacoes Ltda
Enel Green Power Cachoeira Dourada
Enel Green Power Chile Ltda
Enel Green Power Costa Rica
Enel Green Power Espana
Enel Green Power Guatemala
Enel Green Power Hellas
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
Enel Green Power Romania
Enel Green Power RSA (Pty)
Enel Green Power SpA
Enel Green Power Volta Grande
Enel Produzione IT
Enel Servizi