



## **INVENTORY OF CO2 EMISSIONS OF RED ELÉCTRICA DE ESPAÑA, SAU: SCOPE AND METHODOLOGY.**

### **1. Scope of the inventory**

#### **Organisational boundaries**

The calculation of the emissions of Red Eléctrica de España, SAU (hereinafter REE) is performed under the criteria of operational control. The inventory solely applies to activities in Spain.

#### **Operational boundaries**

Emissions associated with the activities and facilities of REE are quantified taking into consideration the following scopes:

##### **Scope 1: Direct Greenhouse gas emissions (GHG)**

Those that occur from sources controlled or owned by the Company:

- Stationary combustion: derived from the combustion of fuels used in diesel generators (No other stationary combustion source exists in the Company).
- Mobile Combustion: those derived from fuel consumption by fleet vehicles.
- Fugitive Emissions: SF6 gas leaks and leaks of refrigerant gases from air conditioning equipment.

##### **Scope 2: Electricity indirect GHG emissions.**

- Electricity consumption
- Electricity losses in the transmission grid



### Scope 3: Other indirect GHG emissions

- Emissions associated with purchased goods and services
- Emissions associated with business travel.
- Emissions from downstream transportation and distribution (internal logistics, subcontracted to an external company)
- Emissions from employees commuting to the workplace (Head offices: Moraleja + Albatros)

## **2. Calculation methods**

### **2.1 Direct emissions: SCOPE 1**

#### **2.1.1 Emissions from fuel consumption for emergency generators**

In many of REE's substations and some buildings (work centres) there are diesel generating sets available in order to guarantee the power supply in case of a power outage.

- Calculation method:

This is calculated based on the running hours and the power of the generator sets (Apparent power).

Apparent power (KVA) \* power factor (0.8) = Effective power (kw)

Effective power\*running hours = energy generated (kWh)

*Emission factor used: 0.2628 kg CO2/kWh (Source: factor published by GENCAT)*



### 2.1.2 Emissions associated with fuel consumption of fleet vehicles

Only vehicles owned by REE are considered fleet vehicles.

- Calculation method:

The calculation is performed using the following formula: Total litres of fuel consumed (per type) x emission factor (according to type)

*Emission factor:* based on the indications “Business travel Service Sector V2”. GHG Protocol Tools.

### 2.1.3 SF6 Emissions

SF6 gas is a dielectric gas used in electricity substations. It is mainly found in switchgear and Gas Insulated Substations (GIS).

- Calculation method:

The calculation is performed using the following formula:

Total SF6 leaks = leaks from the in-service equipment + Leaks from derived from accidents.

Leaks from in-service equipment = amount of SF6 installed x emission factor

*Emission factor:* This uses the factors adopted for SF6 emission calculations performed under the framework of the Voluntary Agreement between the Ministry of Environment, the Spanish National Association of Manufacturers of Capital Goods (SERCOBE), the Spanish Electricity Industry Association (UNESA) and REE to limit the emissions of sulphur hexafluoride, signed in March 2008.

CO2 emissions: to convert from SF6 emissions to CO2 the GWP over 100 years published in the 2007 IPCC fourth assessment report shall be used: 22800



#### **2.1.4 Fugitive emissions associated with the use of air conditioning**

Air conditioning units are located both in buildings and substations.

- Calculation method:

The calculation is performed based on the gas refills made during the year (gas refilled = gas leaked).

Refills per type of refrigerant gas x GWP.

GWP over 100 years published in the 2007 IPCC Fourth Assessment Report shall be used.

## **2.2 Indirect emissions. SCOPE 2**

### **2.2.1 Emissions associated with electricity use**

These are emissions associated with electricity consumption in the various facilities.

- Calculation method:

It is calculated by multiplying the electricity consumption by the average emission factor of the Spanish energy system in the year for which the inventory is being drafted.

*Emission factor:* calculated by REE according to the methodology developed by the Demand-side Management Department of REE. The Spanish peninsular emission factor is considered for all cases.



## **2.2.2 Emissions associated with transmission grid losses**

The transmission of electricity inevitably involves grid losses in such a way that in order to satisfy a determined final consumption it is necessary to have a somewhat higher generation. There are various reasons and factors contributing to these losses with the Joule Effect being the most important of them.

The amount of losses that occur is related to the location of the generation points relative to those of consumption, the amount of energy demanded in the year, the generation mix, the international exchanges and the shape of the demand curve(\*).

To calculate the emissions, only those transmission losses related to the Spanish peninsular electricity system are considered.

- Calculation method:

Transmission grid losses x average peninsular emission factor for the year for which the inventory is calculated.

Transmission grid losses: Those published in the daily electricity balance for 31 December of the year to be calculated.

*Emission factor:* the factor calculated by REE is considered, as in section 2.2.1

(\*) None of these factors is controllable by REE since the Company cannot make decisions in relation to these factors. REE must meet the operational procedures set out by the regulator and said procedures do not allow the system to operate based on criteria of reducing transmission grid energy losses.

## **2.3 Indirect emissions. SCOPE 3.**

### **2.3.1 Emissions from purchased goods and services**

These correspond to the emissions associated with goods and services purchased by REE.



- Calculation method:

An estimated calculation is performed based on the emission factors (t CO<sub>2</sub> / Euro) per supplier, which are multiplied by the volume of spending per supplier for the corresponding year.

### **2.3.2 Emissions associated with business travel**

Emissions associated with business travel via air and rail (high-speed train and long distance train) are contemplated.

- Calculation method:

The methodology of the International Civil Aviation Organisation is used for the case of air travel.

For rail travel, the emission factors per km provided by RENFE (Spanish National Railway Network) in its 2007 environmental report shall apply.

### **2.3.3 Emissions associated with downstream transportation and distribution (internal transportation of materials, logistics)**

These are the emissions associated with the transportation of materials between the various facilities of REE. These transportations are carried out by a contracted company.

- Calculation method:

The calculation of emissions is based on the litres of diesel consumed in the activities of REE.



### **2.3.4 Emissions associated with employees commuting to and from the Head Office**

Emissions associated with the employees commuting to and from the Head Offices (include Moraleja and Albatros).

- Calculation method:

The tool indicated by the Andalusian Emissions Offset System (SACE) is used.