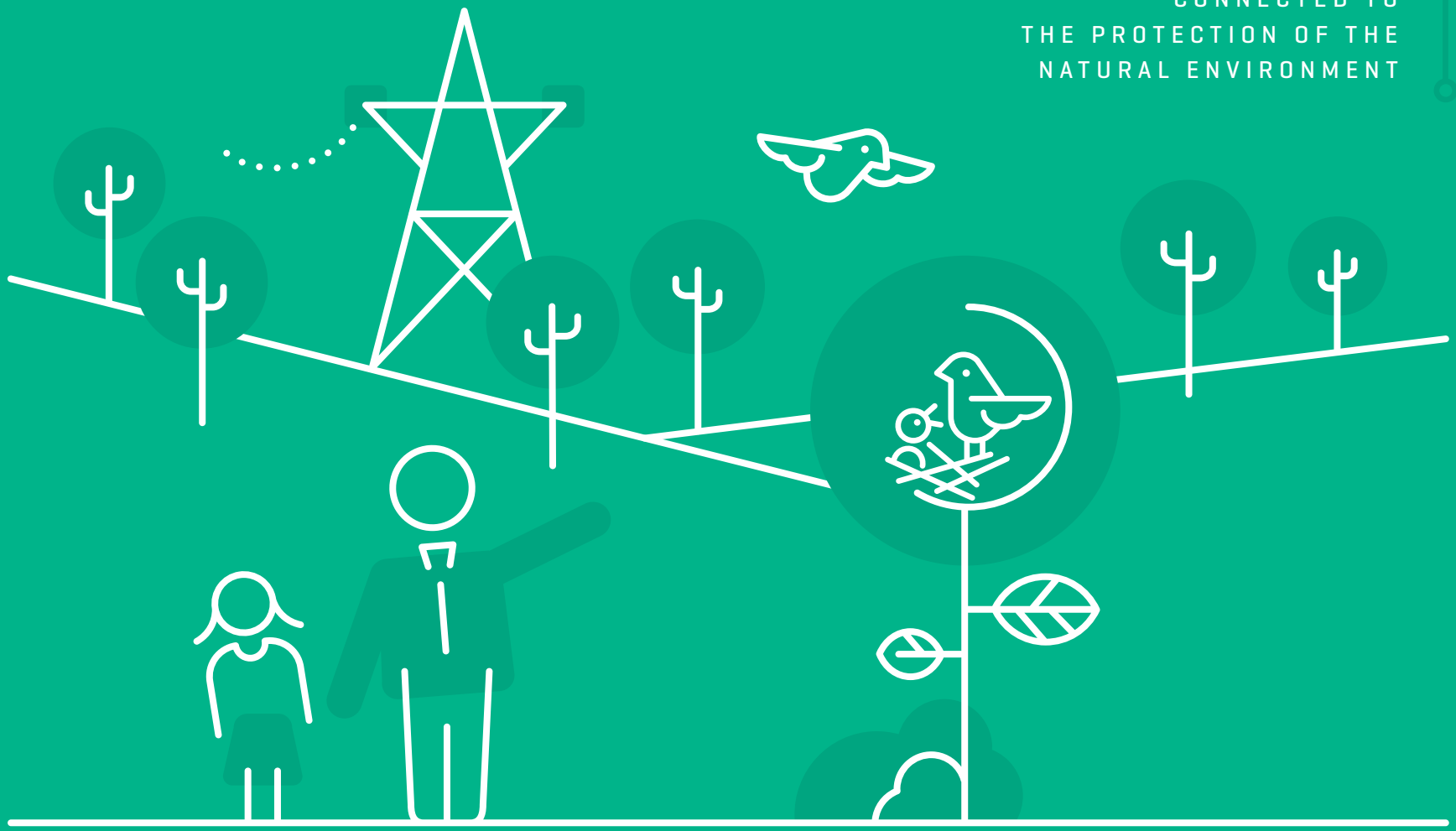
# 10 THE ENVIRONMENT

CONNECTED TO THE PROTECTION OF THE NATURAL ENVIRONMENT



# CORNERSTONES OF OUR ENVIRONMENTAL COMMITMENT

Maximum respect for the natural environment and its protection

## INTEGRATION INTO THE ENVIRONMENT

We make our facilities compatible with the environment, through dialogue with stakeholders and the implementation of preventive and corrective measures to minimise potential impacts on the environment.

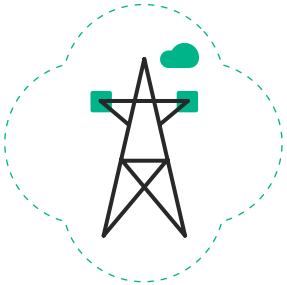
**Environmental assessment** of all projects
***Hábitat* Project** (2015-2020)

## ENVIRONMENTAL MANAGEMENT

Red Eléctrica undertakes all its activities following strict environmental criteria in accordance with the principles adopted in its environmental policy.

**ISO 14001** Certification and EMAS Register
**87 % fulfilment** of the 2016 environmental programme

## ENVIRONMENTAL EXPENDITURE 2016



**23**
MILLION
EUROS

## CLIMATE CHANGE

Red Eléctrica contributes to the fight against climate change by providing solutions in the execution of its business activities, and through its commitment to the efficient use of energy.

**40.8 % of demand** covered using renewable energies
**1,907 tonnes of $CO_2$** avoided in 2016

## BIODIVERSITY

Biodiversity conservation has always been an essential principle of our environmental policy and business strategy.

**3,040 km of electricity** lines marked with bird-saving devices (3% more than in 2015)
**1.8 million euros of investment** in the Red Eléctrica Forest initiative (2009-2016)

# OUR ENVIRONMENTAL COMMITMENT / G4-DMA

**Red Eléctrica** undertakes all its activities taking into account environmental protection, in accordance with the principles set out in its environmental policy, among which are included the commitment to the prevention of pollution and the principle of precaution. / G4-14

The main environmental impacts of Red Eléctrica are those derived from the presence of facilities in the territory, therefore the Company works hard to make them compatible with the environment, considering their entire life cycle and paying particular attention to biodiversity conservation.

In addition, Red Eléctrica is committed to a sustainable energy model, thus acquiring a specific commitment to climate change and energy efficiency.

## Management system

**In order to continuously** improve its environmental performance and processes, Red Eléctrica has an environmental management system certified in accordance with **ISO 14001** and which has been registered, since October 2001, under the Community Eco-management and Audit Scheme **(EMAS)**. An environmental programme is defined annually that sets out the various objectives derived from the strategies of the Company and that establishes the specific actions required for its fulfilment.

For 2017, in order to boost environmental activities, the decision has been taken to broaden the scope of the programme and therefore, the Environmental Plan 2017 has been drawn up and approved by senior management. This plan, which has a global scope and is transversal across the entire company, encompasses all the activities with an environmental component that will be undertaken throughout the year, including measures to improve the environment, objectives linked to legal requirements, environmental management activities, communication and innovation.

## Organisational structure

**Red Eléctrica's commitment** to the environment, stems from senior management, who establish the environmental policy and implement the measures for compliance with environmental requirements, with

EVOLUTION OF THE FULFILMENT OF THE ENVIRONMENTAL PROGRAMME


**ENVIRONMENTAL PROGRAMME** 2016

**87**
%
FULFILMENT

**Three percentage points higher than in 2015**

the Chairman being the person who assumes the maximum environmental responsibility.

The involvement of all organisational units and the commitment of the entire workforce are fundamental in environmental management. To provide technical support, there is a specific environment department which has 35 experts located at the head offices and in the territories where the facilities are located.

## Environmental expenditure

**Red Eléctrica allocates** important financial resources for environmental protection. In 2016, a total of 22.65 million euros was earmarked for environmental matters. Of this, 2.98 million corresponded to activities associated with the implementation of new projects (investment): environmental impact studies, preventive and corrective measures, works supervision and environmental improvement measures. The remaining 19.67 million was allocated to environmental improvements associated with facilities in service, biodiversity protection and conservation projects, activities related to climate change and energy efficiency, communication, training, R&D+i projects and other expenses.

**ENVIRONMENTAL PROTECTION**

**22.6**
**MILLION**
EUROS EARMARKED FOR ENVIRONMENTAL MATTERS

## Supply chain
### / G4-DMA / G4-EN33

**Red Eléctrica requires** all those suppliers with a major environmental impact (providers of services that can generate direct impacts on the environment, and equipment suppliers whose manufacturing process is resource-intensive) to have an environmental management system that has been documented or certified by a third party.

In order to improve the environmental performance of the supply chain, since 2015 work has been underway to adjust the requirements that are requested from the various suppliers to the impacts (real or potential) of each supplier. In 2015, the impacts of each one of the services contracted were identified and in 2016, tests were conducted on a significant group of suppliers. These tests have allowed us to determine the baseline situation and adjust the specific requirements in each case. It is foreseen that the results of this project will be incorporated into the supplier qualification process in 2017.

The environmental requirements regarding training and specifications for the execution of work form part of the contractual documentation for those services where it has been identified as necessary. In the case of the activities with the greatest potential impact, such as construction, renovation of facilities and some maintenance activities, a part of the cost of the work is dependent on the result of the environmental certification of the work, which involves extensive monitoring of the established environmental requirements.

In addition, the Company has begun to assess the environmental performance of suppliers and whose result is taken into account in its overall assessment, but which may also be grounds for their disqualification.

Moreover, since 2011 Red Eléctrica has worked on calculating the carbon footprint of all its suppliers.

**ENVIRONMENTAL EXPENDITURE** M€

# INTEGRATION OF FACILITIES INTO THE ENVIRONMENT / G4-DMA

**The principal measure** for reducing and even avoiding the undesirable effects of Red Eléctrica's facilities on the environment and in the local communities is the selection of their location. For this reason, the Company conducts a detailed study of the territory and works in coordination with the public administration and key stakeholders in the definition of the siting of substations and the routes the electricity lines will follow.

In addition, Red Eléctrica establishes the appropriate preventive and corrective measures to be applied when performing construction or maintenance work, in order to reduce, as far as possible, the potential impacts these activities may have on the territory.

The best tool to carry out the definition of the best Project and the appropriate preventive and corrective measures is the Environmental Impact Assessment procedure, which the majority of Red Eléctrica's projects are submitted to by law. However, when the law does not require a regulated procedure, the Company also conducts an assessment of an environmental nature and establishes a voluntary communication with the competent authorities.

**The definition of the siting of substations and the routes the electricity lines will follow is undertaken in coordination with the public administration and the key stakeholder groups.**

ENVIRONMENTAL **ASSESSMENT**

DEFINITION OF THE **BEST ALTERNATIVE** AND THE PREVENTIVE AND CORRECTIVE MEASURES FOR ALL PROJECTS

To guarantee the implementation and effectiveness of the measures defined, programmes of environmental monitoring are undertaken. These are applied during the construction of the facilities and during their first years of functioning and facilitate the definition of new measures in cases where it may be deemed necessary. For facilities undergoing maintenance, the Company carries out periodic inspections to verify compliance with environmental standards and to identify the necessary improvement measures.

Among the preventive and corrective measures applied, of note are the ones designed to protect habitats and species (measures to protect biodiversity) and those aimed at reducing potential effects on the socioeconomic environment. All these measures are described in detail in the following sections of this chapter.

## DEVELOPMENT AND IMPLEMENTATION PHASES

### FOR TRANSMISSION GRID INFRASTRUCTURE / G4-SO1

#### Infrastructure proposal

*(Drawn up by REE)*

**Environmental Feasibility Study:**

- Analysis of all proposals from an environmental point of view.
- Only includes environmentally feasible projects.

#### Transmission grid planning

*(Drawn up by MINETUR)*

**Strategic environmental assessment of plans and programmes.**

**Public participation of stakeholder groups (SGs)** through the submission of comments or arguments.

#### Project design

*(New facilities and modifications)*

**Prior dialogue with stakeholders** before defining the project (Autonomous Communities, local councils and NGOs).

**Environmental Impact Assessment.**

1 Prior consultation with SGs.
2 Defining the alternative of least impact .
3 Public information. Submission of arguments by SGs.
4 Proposal for preventive and corrective measures.
5 Publication of results. Environmental authorisation.

#### Construction or modification of facilities

**Implementation of preventive and corrective measures.**

**Environmental monitoring** (monitoring of preventive and corrective measures).

**Monitoring the work of contractors** regarding compliance with environmental requirements.

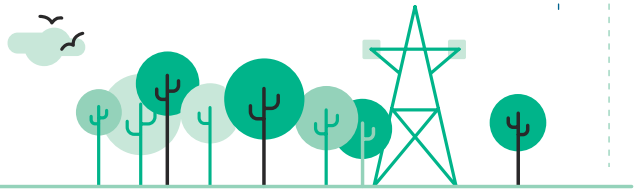
**Environmental certification of works** taking into account compliance with environmental requirements.

#### Maintenance

**Environmental monitoring programmes** in the initial years of operation of a facility.

**Periodic inspections** of facilities to verify compliance with standards and identify improvement measures.

**Application of environmental improvement measures.**



# SOCIO-ECONOMIC ENVIRONMENT / G4-SO2

## Social aspects are integrated into the environmental assessment which is performed during the design of facilities.

**The presence** of electricity infrastructure in no case represents a significant alteration in the way of life of the communities affected. In the case of substations, these produce a total and irreversible occupation of land, however, in the case of electricity lines, land use is limited to the feet of the towers and the newly created accesses to the infrastructure. The land surface with overhead electricity lines is subject to a right of way easement during the useful life of the infrastructure. Livestock and agricultural activities are compatible with the lines, allowing all kinds of agricultural crops to be grown under them and the free movement of the machinery necessary for its management.

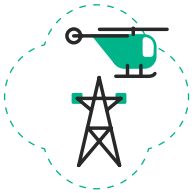
Social aspects are integrated into the environmental impact assessment carried out in the design phase of facilities. The main conditioning factors considered in this phase are: the use of land not compatible with the facilities; areas of high agricultural yields and agroforestry plantations, and landscape, touristic and cultural resources.

In addition to carefully defining the siting of facilities, preventive and corrective measures are defined that ensure the impacts both on the land and the activities carried out on the land, are kept to a minimum. These measures are similar to those used for the protection of habitats and flora. Noteworthy amongst these are the definition of adequate work techniques to minimise impacts on crops, and the restoration of the land and the elements affected by the works (paths, walls etc.). Sometimes improvement measures requested by the affected parties are added, which often involve the opening of forest tracks and paths and the making good of access routes.

### Noteworthy actions during 2016

Among the preventive measures undertaken during 2016, of particular note is the **use of a helicopter** for the construction of 14 towers during the improvement works on the 132kV Ciutadella-Mercadal line and for the hanging of the new 400 KV Bohimente-Pesoz line. Among the accompanying measures, **noteworthy are the restoration tasks being carried out on the *Pino de los Sasos***, in the municipality of Alcorisa (Teruel), which have consisted mainly of pruning dry branches and the elimination of mistletoe, which improve the conservation of this tree, which has been catalogued as a unique element of the landscape.

**PREVENTIVE** MEASURES



HOISTING OF **14** TOWERS WITH A HELICOPTER

**In 2016**

**CONDITIONING FACTORS AFFECTING FACILITIES**

The following four are considered: the use of land not compatible with facilities; areas of high agricultural yields and agroforestry plantations, and landscape, touristic and cultural resources.

## Noise

**In regard to** substations, worth noting was the work carried out by Red Eléctrica to reduce noise levels produced by different elements that may cause inconvenience to neighbouring properties. In this line of work and to improve understanding of the nature of the noise generated, the ACURED R&D+i project was launched. Increased knowledge will allow the assessment of different technical solutions to reduce noise and promote its application in existing and future facilities. During 2016, the phases of the preliminary study, evaluation, classification and prioritisation of sources of noise, and the proposal and simulation of corrective measures have been carried out. In 2017, the execution and validation of some of these corrective measures (screens for transformers) will be carried out.

During 2016, noise reduction screens were installed at the Santa Ponsa substation (Majorca).

## Blending facilities into the landscape

**One of the main** challenges regarding the integration of electricity transmission infrastructure into the environment is the ability to blend them into the landscape. In order to progress in this integration, it is essential to improve the tools for evaluating the visual impact of the facilities. For this reason, in recent years, Red Eléctrica has been promoting different projects in the field.

- **Analysis methodology and landscape integration in the environmental impact studies for electricity lines.** This methodology, which was put into effect in 2016, permits an evaluation of the landscape impact of future facilities and systematically integrates the landscape variable in decisions about the route to be taken of future lines or other matters such as the distribution and the height of the towers. During 2017, it is expected that this matter will be examined in greater depth and work will proceed on the criteria for defining the height and the type of towers for new projects.

- **Landscape assessment system for Red Eléctrica's facilities (existing facilities).** (Between 2015 and 2016, work was carried out on the definition of the system to be applied and its implementation as a pilot project in the province of León. Based on the results obtained, in 2017 an adjustment will be made in the methodology, allowing it to be applied nationwide and to incorporate other social aspects of interest into the analysis. The

## Main measures regarding landscape integration in 2016

- **Restoration of the areas affected by the works:** adding topsoil, adaptation of embankments and temporary worksites, sowing and planting. Apart from the many measures that are habitually associated with the construction and modification of facilities, gardening work has been done in a recreational area affected by the maintenance of the safety corridor in the municipality of Valdaliga, Cantabria.
- **Creation of vegetation screens and gardened areas:** this year, work has been done at five substations: In addition, a vegetation screen has been erected near a section of the Camino Norte de Santiago (in the municipality of Lourenza) to obscure the electricity line from view.
- **Landscape integration of substation buildings** by developing designs adjusted to the environment in which the substations are located. In 2016, the El Sabinal (Gran Canaria) substation was commissioned. Its design incorporates camouflage and harmonisation techniques, and it was built with materials compatible with the textures and colours of the area.

**LANDSCAPE EVALUATION SYSTEM**

MAP OF
**SENSITIVE LINE SECTIONS**
FOR THE ENTIRE TRANSMISSION GRID

**Will be 100% completed in 2020**

**ACURED PROJECT**

Knowledge regarding the noise generated in substations and an assessment of technical solutions to reduce noise.

objective is to draw up a map of sensitive sections in the entire transmission grid (100% in 2020). Knowledge and study of each situation will make it possible to suggest possible measures related to the maintenance of the facilities or other improvement aspects.

- **Visual impact analysis methodology for electricity lines.** This permits the drafting of intervisibility maps and visual basins, and a view of existing or planned lines, through 3D simulations, using the corporate geographical information system (GeoRed). This is a very useful tool for visual impact analysis applied to specific cases, which allows for comparisons between alternatives or for presentations to different stakeholder groups. The system applied is innovative as it takes into account aspects that up to now had not been considered when drawing up visibility maps: screening of flora, the height of the observer, the part of the tower that is seen and the distances at which it is seen.

Apart from developing assessment tools, the Company continues to work on the application of different integration measures that facilitate the reduction of the impact of the facilities on the landscape.

**ARCHAEOLOGICAL SUPERVISION**

IN
**19**
LINE WORKS
—
**5**
NEW SUBSTATIONS

**GEORED**

Corporate geographical information system for preparing visibility maps for the analysis of impacts in specific cases through 3D simulations.

## Protection of archaeological and ethnological heritage

**The protection of** archaeological and ethnological heritage is an important factor in the design and construction of facilities. In 2014, work began on the ***'Arqueored'* project,** which aims to provide a digital mapping of catalogued heritage for its consultation prior to the planning of works. In this way, potential impacts can be avoided and the necessary measures, where appropriate, can be provided in advance. Thanks to close collaboration with the relevant authorities, the project has progressed in a highly satisfactory manner and information is already available on all the Autonomous

ARQUEORED
PROJECT
***Digital Mapping of archaeological heritage***

***Currently with data from all***
AUTONOMUS COMMUNITIES

## Main actions in 2016

- **Archaeological assessment of the Iberian archaeological site 'Cañada de la Lengua' (Almansa, Albacete).** Action taken within the framework of the archaeological supervision of works for the 400 kV Campanario-Ayora line. An excavation was made of an agricultural installation with a surface area of 150 $m^2$ approximately 2,200 years old, dating from the second or third century B.C. The complex contained a granary, storage rooms, a drying area and grain processing mills. Following the excavation and documentation process, the archaeological remains were protected by shoring them up and covering them.
- **Protective measures for Spanish Civil War trenches in Cabezo del Cerro, Cuevas de Almudén (Teruel).** The existence of these trenches was discovered thanks to archaeological supervision. The area was cordoned off and a geotextile covering was placed on it, along with protection to avoid any effect from the machinery. After the work was completed, the entire surface was restored to its original condition.

**During 2016, there was no incident resulting from non-compliance with the European regulation regarding the levels of electric and magnetic fields.**

## Electric and magnetic fields / G4-DMA / G4-PR1

**Thanks to the criteria** applied in the design of facilities, the levels of electric and magnetic fields (EMFs) stay below those recommended by Communities. In 2017, the second phase of this project will begin, which will consist of the in-situ revision and verification of all the information obtained.

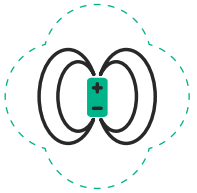
On the other hand, before carrying out any earthworks, an archaeological survey is conducted whose intensity and scope are based on the likelihood of material of interest being present in the area. According to the results, the need for the continued presence of an archaeologist during the works is determined. During 2016, archaeological supervision took place during the construction of five new substations and 19 works carried out on new and existing lines, with the permanent presence of an archaeologist at 95% of the lines and 80% of the substations. Similarly, Red Eléctrica collaborates actively with the public administrations in the conservation of cultural heritage.

the Council of the European Union (The Official Journal of the European Communities 1999/519/EC: exposure limit values for the general public in sites where they may remain for a period of time at 5kV/m for electric fields and 100μT for magnetic fields). The most important measures are the following:

- Construction of double circuits and transposition of phases in lines.
- Increasing the height of towers, thus increasing the safety distances.
- Establishing the minimum distance of electricity lines from population nuclei and isolated houses.

In order to verify compliance with the recommendation, Red Eléctrica has a tool that uses specific line parameters to accurately calculate the maximum EMF levels that said facilities can generate. This action is carried out when requested by stakeholders. In 2016, this was performed on 6 occasions and none of the cases exceeded the recommended limits.

**EMF LEVELS**
2016



CALCULATED FOR
**6**
CASES
NONE EXCEEDED THE RECOMMENDED LEVELS

**By the European Union**

**CALCULATION TOOL**

Allows the maximum EMF levels that can be produced by a facility to be calculated, based on certain parameters.

# Red Eléctrica actively participates in **various working groups and supports research projects** regarding electric and magnetic fields.

In the event of not having the necessary parameters for the calculation, in situ measurements are necessary. This is the case with some facilities acquired by the Company in 2010 in the island systems, for which during 2015 and 2016 a measurement plan was carried out.

The main parameters influencing the field values that an electricity line can generate are intensity (in the case of magnetic fields), voltage (in the case electric fields) and the distance at which the measurement device is from the line when the measurement is taken. Additionally, there are other factors that have an influence, although to a lesser extent, such as the geometry of the line, or the amount of circuits. For this reason, in the definition of the plan, measurements were deemed appropriate for each type of line configuration (defined by the following characteristics: voltage, geometry and amount of circuits) in locations with nearby buildings. As a result, a total of 21 measuring points in the Balearic Islands and 27 in the Canary Islands have been checked, with all having values that are consistent with the recommendation.

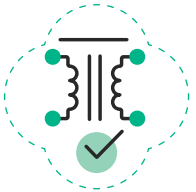
Therefore, at this time it can be considered that Red Eléctrica has evaluated and validated compliance with the regulation for 100 % of its facilities. / G4-PR1

Red Eléctrica, on an exceptional basis, performs some measurements at the request of interested parties. In 2016, measurements were taken in two lines and one substation, with results being below those values recommended by the European Union in all cases. During 2016, there was no incident resulting from non-compliance with the regulation in this area. / G4-PR2

Moreover, Red Eléctrica considers it of utmost importance to remain abreast of all news generated on the topic, as well as to participate in various working groups and actively support research projects in this matter. Therefore, the Company has signed up to an international information service (ELF Gateway, which reports almost daily via email to its customers all the news appearing in the world) and maintains contact with different organisations and associations.

In order to reflect the advances in the scientific community and the recent declarations of international organisations, Red Eléctrica has worked with UNESA in updating the publication 'Electric and magnetic fields of 50 HZ. Analysis of the current state of knowledge' that will be published on the corporate website in the upcoming future.

REGULATORY **COMPLIANCE**



**100** %

OF THE FACILITIES VALIDATED

**Regarding EMF levels**

In the 'Environmental' subsection of the 'Sustainability' section of the corporate website.

# BIODIVERSITY / G4-DMA

**The commitment** of Red Eléctrica to biodiversity has always been a key principle of its environmental policy and specifically, it becomes evident in its biodiversity strategy and in a specific action plan that covers all the Company's activities.

Red Eléctrica is part of the Spanish Business and Biodiversity Initiative (IEBB) promoted by the Ministry of Agriculture, Food and Environment.

## CORNERSONES OF THE BIODIVERSITY STRATEGY

***Integrate conservation***
and the sustainable use of biodiversity in the development of the transmission grid.

***Establish mechanisms***
to ensure the protection and conservation of environmental values in the activities carried out by the Company, especially in sensitive natural environments.

***Contribute and promote the development***
of applied research projects aimed at blending the transmission grid into the environment.

***Promote a communication and collaboration framework***
with stakeholders, increasing the visibility of the Company's commitment to biodiversity conservation.

**MAXIMUM SCORE**
OF RED ELÉCTRICA

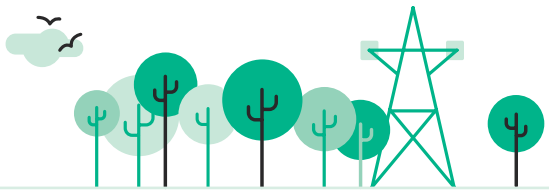
**100**
OUT OF
**100**
IN THE BIODIVERSITY CRITERIA

**In the Dow Jones Sustainability Index 2016 assessment**

In the 'Environmental' subsection of the 'Sustainability' section of the corporate website.

## Biodiversity challenges

| CHALLENGES | ACTIONS | PROGRESS | OBJECTIVES |
|---|---|---|---|
| ***Design new approaches for biodiversity management*** | • Value and work on **incorporating the concepts** of net impact and mitigation hierarchy. | • **New Project 2017.** | ***Objective:*** incorporation of the new management approaches regarding biodiversity into the biodiversity management of the Company. |
| ***Make facilities compatible with birdlife*** | • **Project for the mapping of bird flight paths:** identify sensitivity areas, obtain risk maps, design a plan for the marking of electricity lines with bird-saving devices.<br>• **Monitoring the interaction between lines and birds.** Analysis of accident rates and assessing the effectiveness of different models of bird-saving devices. | • Risk map finalised and the marking plan for all the Autonomous Communities defined.<br>• Fulfilment of the objective of the 2016 line-marking plan. Marking of planned lines in the Balearic Islands and the Canary Islands. | ***2017-2023 objective:*** fulfilment of the line-marking plan for all Autonomous Communities. |
| ***Make facilities compatible with forested areas*** | • Signing of agreements for the **prevention of forest fires.** | • Eleven agreements currently in force. | ***2020 objective:*** agreements signed with all the Autonomous Communities nationwide. |
| ***Make facilities compatible with habitats of high ecological value*** | • ***Hábitat* Project,** phase 1 (2015-2017) | • Obtaining mapping for 10 Autonomous Communities. Validation and qualification of conservation status in 5 of them. | ***2017 objective:*** mapping, validation and qualification of conservation status for all Autonomous Communities.<br>***2020 objective:*** phases 2 and 3 of the project. |
| ***Collaborate with Autonomous Communities and other stakeholders on biodiversity matters*** | • **Innovation** (R&D+i Projects).<br>• Framework agreements regarding protection and other agreements on **biodiversity protection.**<br>• Agreements for the reforestation of degraded areas. **The REE Forest.** | • Project completed: experimental technique for the recovery of Posidonia oceanica seagrass meadows.<br>• 10 agreements with Autonomous Communities.<br>• ***Progress 2009-2016:*** Thirteen agreements signed. | ***New project: Biotransporte:*** transmission lines as stepping stones for biodiversity.<br>***2015-2020 objective:*** agreements with all the Autonomous Communities.<br>***2020 objective:*** one forest per year. |
| ***Promote Red Eléctrica's stance on biodiversity matters*** | • Participation in **forums, development of informative material** and the involvement of suppliers. | • Participation in various forums related to biodiversity.<br>• Publication of two videos about birdlife.<br>• Tests with suppliers to know the impacts on biodiversity of the contracted services identified in 2014. | ***2017-2020 objective:*** participation in two events per year. Produce an annual publication.<br>***2020 objective:*** Incorporate the criteria of protection and conservation of biodiversity in the selection of suppliers. |



## Electricity infrastructure and biodiversity

**Red Eléctrica's** facilities are distributed nationwide, as the aim of the electricity transmission grid is to connect the points of energy generation with those of consumption. Avoiding areas rich in biodiversity is a priority criterion taken into account in the grid planning phase as well as in the definition of each project. However, considering that 25% of the area of Spain has some form of environmental protection, it is inevitable that in some cases infrastructure cross, or are located in protected areas or areas with species of interest.

On these occasions, Red Eléctrica implements all preventive and corrective measures required to minimise the possible impacts on habitats and species (impacts associated with construction work and the modification of facilities, impacts on birdlife as a result of collisions and fire hazards). In addition, these measures are complemented with environmental improvement actions to enhance biodiversity in those areas where facilities are located.

Red Eléctrica´s current facilities occupy only 0.08% of the Red Natura Española (Natura 2000 Network). Of the total infrastructure, existing in 2016, only 15% of the lines and 6% of the substations are located in protected areas (Red Natura).

## Protection of habitats and species during works

**In works** for the construction of lines or the modification of facilities, the main effects to be avoided are the alteration of the habitat of certain species of fauna and flora, and also the impact on vegetation due to the opening up of safety corridors, necessary to prevent fires in the operation of the line. / G4-EN12

Among the preventive and corrective measures applied, noteworthy are the following:

- Detailed field studies on specific issues, such as impact reports for Red Natura and surveys to identify the presence of protected flora and fauna.
- Introduction of modifications in the design of facilities to mitigate their effect on flora: compacting or increasing the height of towers, relocation of towers, modification of access roads etc.

RED ELÉCTRICA'S **CURRENT FACILITIES**

OCCUPY ONLY

**0.08 %**

OF *RED NATURA ESPAÑOLA*

**IN 2016**

Just 6% of the substations and 15% of lines were located in protected areas (*Red Natura* - Natura 2000 Network).

## *Hábitat* Project (2015-2020)

This project seeks to determine in detail the natural values present in the area of influence of the facilities of Red Eléctrica and their conservation status. The ultimate goal is to monitor the interaction of electricity transmission lines and natural habitats of Community interest, information that will be able to be used for the decision-making process regarding the operation and maintenance of facilities.

The first phase, which is expected to end in 2017, consists of the creation of a digital information system with all the data, obtained by working in collaboration with the different Autonomous Communities and experts in the field.

In later phases, work will be carried out on the design of plans or measures to promote the conservation of these habitats (2018-2020).

- Construction of decanting pools and filters to prevent contamination of waterways.
- Signage and protection of habitats and species of ecological value to avoid them being damaged during the course of the work.
- Use of construction techniques that minimise earthworks and the occupation of land (reducing the opening up of access roads, the size of work sites and storage areas for materials): hoisting structures with a boom crane, hanging of line by hand, or carrying out works using a helicopter or a drone.
- Transfer of species affected by the work to other areas.
- Biological stoppages in 100% of the works during breeding or nesting periods to reduce impacts on the fauna that may be impacted.
- Recovery of affected areas: restoration of slopes, sowing of seed and the planting of flora.
- Accompanying measures and the development of specific projects to improve biodiversity in affected areas.

**LINE MARKING** 2016

FOR THE PROTECTION OF BIRDS

**RISK MAPS**

AND A LINE MARKING PLAN FOR ALL AUTONOMOUS COMMUNITIES

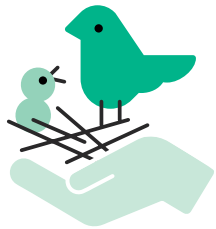
**BIOLOGICAL STOPPAGES**

Are carried out for 4 to 6 months in all works during the breeding and nesting season so as to avoid impacts on various species.

# Red Eléctrica applies construction techniques that **minimise the impact on habitats and also restores areas** that may have been affected.

## Specific measures for the protection of habitats and species 2016

- **Use of a helicopter** to hoist 14 towers in the works to improve the 123 kV Ciutadella-Mercadal line
- **Hanging of line by hand** (10 spans), in areas located in priority habitat, for the 220kV Torremendo-San Miguel de Salinas line and 15 spans of the incoming and outgoing feeder lines of the Torremendo substation.
- **Biological stoppages of different duration** (between 4 and 6 months) for 6 lines, to avoid impacts on different species, notably the Egyptian vulture, Golden eagle, Bonelli´s eagle, Booted eagle, Black kite, Honey buzzard, Marsh harrier, Grey eaglet, Royal owl, Dupont´s lark, Lesser kestrel, Little bustard, Pin-tailed sandgrouse, Black-bellied sandgrouse, Great bustard, Common crane and Sand martin.
- **Removal of Sweet tabaiba** *(Euphorbia balsamifera)* with its root ball intact, for subsequent use in the restoration works of the area of the incoming and outgoing feeder lines of the El Sabinal substation.
- **Transplanting of 25 Olive trees affected** by a tower of the incoming and outgoing feeder lines of the Godelleta substation, for their subsequent use in the restoration of the area near this substation.
- **Planting of different species to offset tree felling works:** 200 Poplars in the municipality of Valtierra (Navarra), restoration of 25.9 hectares in Grandas de Salime and 16.9 hectares in Pesoz (Asturias), by planting 36,000 Pine trees, 3,032 Chestnut trees, 3,563 Birch trees and 1,469 Wild cherry trees.



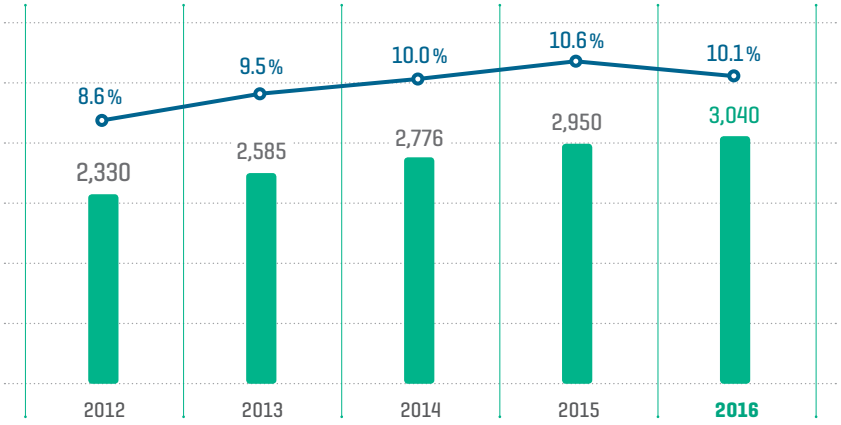
## Minimising the risk of bird collisions

**The main effect** on fauna by Red Eléctrica's facilities is the risk of birds colliding with grounding cables that protect the lines from electrical discharges during storms. The main measure to reduce that risk is marking the grounding cables with devices that increase their visibility. / G4-EN12

In 2016, the project 'Identification, characterisation and mapping of flight paths of birds that interact with high voltage transmission lines' was completed; a project for which the Company has received various recognitions since it was rolled out in 2016.

Thanks to this project, 47 focal species (considered prone to collisions) have been identified and selected according to diverse criteria. The most complete and updated data on the presence and flight routes of these species has been reflected in a geographic information system.

### MARKING OF LINES WITH BIRD FLIGHT DIVERTERS (1)




(1) Data for the Peninsula accumulated at the end of each year.

MULTI-YEAR **LINE MARKING PLAN**

**217.7** km OF CRITICAL PRIORITY LINE MARKED UP TO 2016

**15%** **reduction in the potential risk of collision**

With this information, sensitivity maps (areas where these species can be found and which should be kept in mind when defining new line routes) and risk maps (sensitive areas in which there are also factors that influence the probability of accidents occurring) have been prepared.

Based on the analysis of the risk maps, work is being carried out on a **Multi-Year Line Marking Plan**, in which priority is given to actions in the sections of the line with the greatest potential impact on birdlife. Work under this plan began in 2016, with lines being marked in the island systems; foreseen to be completed in 2023.

## Multi-year line marking plan (2016-2023)

**Objective of the Plan:** line marking on all the sections that have been designated as a priority for critical intervention (sensitive areas), a total of 738.5 km of lines. Line marking of the sensitive sections represents, for the transmission grid, a 25% reduction in the potential risk of collision.

**Up to the end of 2016:** 217.7 km of sensitive line had been marked (marking of these lines represent a 15.2% reduction in the potential risk of collision).

**Total length of sensitive lines pending line marking:** 528.8 km (marking of these lines will represent the remaining 10.2% reduction).

## The prevention of fires associated with transmission lines is achieved with the adequate **design of the security corridors and by conducting predictive** and preventive maintenance activities on facilities.

Other relevant projects regarding the protection of birds in relation to collisions are:

- A specific methodology and protocol for the collection and analysis of data from bird collision accident rates with electricity transmission lines.
- Analysis of the effectiveness of blade-type bird flight diverters in different bird communities. Project carried out in collaboration with the Doñana Biological Station (CSIC) (2013-2018).
- Collaboration with SEO Birdlife on the drafting of the 3rd Atlas of birds in the breeding season in Spain (2014-2018). The information obtained will allow the data relevant to the identification, characterisation and mapping of routes and flight paths to be updated.

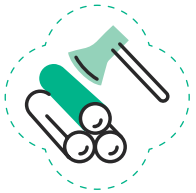
### Fire prevention

**In order** to minimise the risk of fire associated with the presence of transmission lines strict compliance with the safety distances between flora and facilities is critical. Red Eléctrica ensures this compliance through the proper design of the safety corridors and the actions of predictive and preventive maintenance, such as the annual inspection of all facilities and conducting periodic forestry work.

The Company applies best practices in the design and maintenance of safety corridors, respecting shrubs and small size/slow growing tree species, minimising the actions on protected species and not using chemical treatment methods.

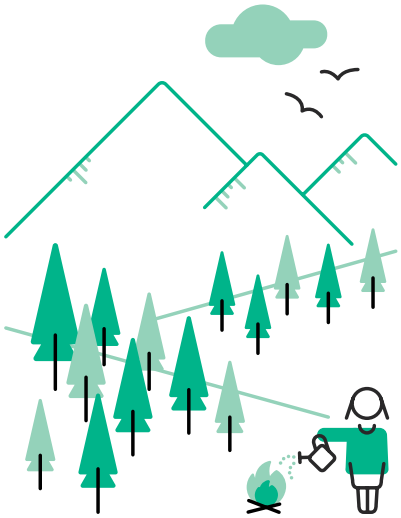
In order to optimise the vegetation treatment tasks, the R&D+i **Vegeta Project** (2016-2017) was launched. During 2016, work was done on defining an algorithm that, based on the analysis of different variables (state of the vegetation, growth index, distance from the electricity line, legal requirements and other established criteria) allows felling works to be coordinated with greater efficiency. The project also includes making detailed inventories of the vegetation in the safety corridor below the overhead lines, making it possible to identify more precisely the compatible and incompatible species, thus

VEGETA **PROJECT**



ESTABLISHES THE **FELLING SCHEDULE** WITH GREATER EFFICIENCY. IDENTIFIES COMPATIBLE AND NON-COMPATIBLE SPECIES

**Facilitates the application of environmental criteria in maintenance tasks**



facilitating the application of environmental criteria to the maintenance work. So far, a pilot project has been carried out in one Autonomous Community and in 2017, a second pilot project will be undertaken in another community which has different characteristics in order to validate the methodology.

Also, noteworthy is the active and ongoing collaboration of Red Eléctrica with public administrations involved in forestry management.

## Collaboration agreements for the prevention and fighting of forest fires

Red Eléctrica aims to sign agreements with the different competent administrations in forestry management. In these, issues are reflected related to the management of safety corridors where electricity lines run through and additionally it sets out other commitments related to firefighting. Currently, there are **11 agreements in force,** with a **budget of 1,100,000 euros associated every five years.**

Within the framework of these agreements, various actions were carried out in 2016:

- Supply of 39 individual sets **of protective equipment for hired personnel** (Navarra).
- **Selective clearing** of land for the prevention of fires (Navarra).
- **Training and awareness actions:** awareness campaign for school children, farmers and infrastructure maintenance contractors (Aragón), Head of Forest Fire Fighting course for staff of the Regional Government of Extremadura and Vizcaya, Forest fire prevention campaign to raise awareness among the tourism sector in the Balearic Islands, collaboration on the general informative campaign called 'El bosc vital' in Valencia and the 3rd Working Days on forest fire prevention in Castilla La Mancha. It is interesting to note that within the framework of the latter, people took part in the first edition of the 'International Forest Fire Awards 2016', whose objective is to promote research in this field.

**CONSERVATION PROJECTS**

IN **10** AUTONOMOUS COMMUNITIES IN 2016

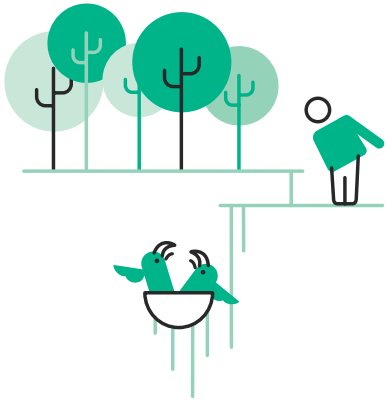
**Projects related to birdlife and other species of flora and fauna**

**FIRE PREVENTION AGREEMENTS**

11 agreements are currently in force between Red Eléctrica and the competent administrations, with a budget of 1.1 million euros every 5 years.

## Contribution to biodiversity conservation / G4-EN13

**Red Eléctrica** actively contributes to the conservation of biodiversity in Spain spearheading or participating in various projects and conducting dissemination activities and environmental training. The Company aims to carry out conservation projects in all autonomous communities. In 2016, it collaborated on projects related to biodiversity in ten autonomous communities. Most of these projects are linked to birdlife conservation, although work is also being carried out on other types of flora and fauna. Also relevant are the actions aimed at restoring degraded habitats, among which noteworthy is the **'REE Forest'.**



## Conservation projects in connection with endangered species / G4-EN14

- **Platforms** for the Osprey *(Pandion haliaetus)* in Andalusia. [1]
- **Reintroduction** of the Bonelli's eagle *(Hieraaetus fasciatus)* in Majorca. [1]
- **The actual impact** of supplementary feeding on the spatial and reproductive ecology of the Bonelli's eagle *(Hieraaetus fasciatus) in the Community of Valencia*. [1]
- **Monitoring,** conservation and recovery of the population of the Spanish Imperial eagle *(Aquila adalberti)* in Doñana. [2] [3]
- **Adaptation** of the facilities of the Bearded Vulture *(Gypaetus barbatus)* in La Alfranca. [2]
- **Foraging areas** and movements of the Canarian Hubara *(Chlamydotis undulata fuertaventurae)*. [2] [3]

[1] Vulnerable species according to the national catalogue of endangered species.
[2] Vulnerable species in danger of extinction according to the national catalogue of endangered species.
[3] Vulnerable species according to the IUCN Red List.

## Experimental technique for the recovery of *Posidonia oceanica* seagrass meadows (2012-2016) R&D+i project / G4-EN13

***Posidonia oceanica*** is a marine plant endemic to the Mediterranean. It forms a habitat of priority interest, an essential ecosystem for many organisms to complete their lifecycle. Posidonia contributes to the control of water quality and the protection of the coastline, and also constitutes one of the main $CO_2$ sinks in the sea.

The Posidonia seagrass meadows can be affected due to various reasons, among them, the construction works for submarine electricity cables. For this reason, Red Eléctrica decided to promote this project, in collaboration with the Mediterranean Institute of Advanced Studies (CESIC-IMEDEA), whose objective has been to define and develop the necessary actions to restore the Posidonia meadows.

**Main phases of the project:**

- Review of previous studies, definition of the project and training of the team.
- Non-invasive collection of Posidonia fragments and seeds.
- Cultivation of fragments and seeds in an aquarium (laboratory).
- Sowing of seeds and planting of fragments on different substrates of the bays of Santa Ponsa (Majorca) and Talamanca (Ibiza).
- Monitoring of plantations (growth rates and degree of survival).

As a conclusion of the work, it has been possible to determine that the plantations are viable (survival rates around 50 % have been obtained), so from this experience it is planned to establish an open methodology for its use.

As a follow-up to this project, Red Eléctrica has decided to launch the project **'Red Eléctrica Marine Forest',** which will be developed in collaboration with the CSIC and the Balearic Islands Government and whose purpose is the actual restoration of 2 hectares of Posidonia in a degraded area of the Bay of Pollensa (Balearic Islands), following the methodology resulting from the research carried out. This plantation will be a living laboratory in which to continue advancing in the knowledge of the species and its ecology.

**REE**
FOREST

**1.79**
MILLION
EUROS
INVESTED

**750**
ha
OF SURFACE
AREA RECOVERED

## Red Eléctrica Forest
### / G4-EN13

**Started in 2009** and of an ongoing nature, this project is twofold: to offset emissions from Red Eléctrica by planting trees and the recovery of degraded natural areas of public 'common' land, thus contributing to the conservation of biodiversity. This initiative also seeks to contribute to the development of local economies by contracting work to companies or groups in the area, and also raise awareness and involve the local population and Company employees.

## Relevant milestones in 2016

**La Carballeda Forest (Zamora).** Restoration of 55.68 hectares of land affected by forest fires in the municipality of Espadañedo by planting 104,830 trees of different species: Pine *(Pinus sylvestris)*, Birch *(Betula alba)*, Wild cherry *(Prunus avium)*, Mountain ash *(Sorbus aucuparia)*, Oak *(Quercus robur and Quercus petraea)*. Training workshops have been held for 153 schoolchildren from five schools in the area in addition to a forest tour, within the same programme created to work in the framework of the Puebla de Sanabria forest project *'I plant my land'*.

**Tremuzo Forest (Galicia).** Restoration of 40.87 hectares in the Tremuzo highland area (Concello de Outes) that had been affected by a devastating fire. A total of 59,693 native trees have been planted: Pines *(Pinus pinaster)*, oaks *(Quercus suber* and *Quercus robur)*, Birch *(Betula celtibérica)*, Chestnut *(Castanea x hybrida)*, Alders *(Alnus glutinosa)* and Holly *(Ilex aquifolium)*, which complement the species that survived the fire (Wild willows and Pear trees). The rocky areas, in the highest parts, have been preserved in their natural state in order to favour open areas for the feeding of the fauna and thus contribute to the conservation of biodiversity.

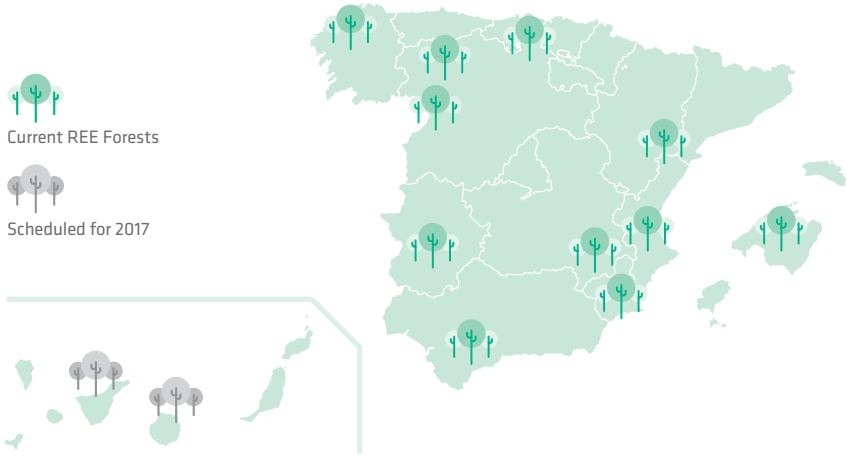
The project has been completed with the putting up of different informative signs, including descriptive milestones for each of the species planted and signage for a burial structure, dating back about 4,000 years, found in the area where the works were carried out.

Within the framework of the project, different workshops have been organised with a total of 120 students from the two schools in the area, who have also carried out the planting of 156 trees. In addition, an awareness training day was conducted in which 61 Red Eléctrica employees participated.

**Firgas Forest (Gran Canaria).** An agreement has been signed with the Island Council of Gran Canaria for the restoration of 16.96 hectares in Parque Rural de Doramas in the municipality of Firgas.

**Chajaña Forest (Tenerife).** An agreement has been signed with the Island Council of Tenerife for the restoration of 26.97 hectares in Parque Natural Corona Forestal in the municipality of Arico.

THE RED ELÉCTRICA FOREST
IN FIGURES (2009-2016)




**761** ha
Surface area recovered

**638,145** units
Trees and shrubs planted

Investment
**€1,795,914**

Emissions offset
**183,483** t of $CO_2$ eq.

In the 'Map of projects' subsection of the 'Sustainability' section of the corporate website.

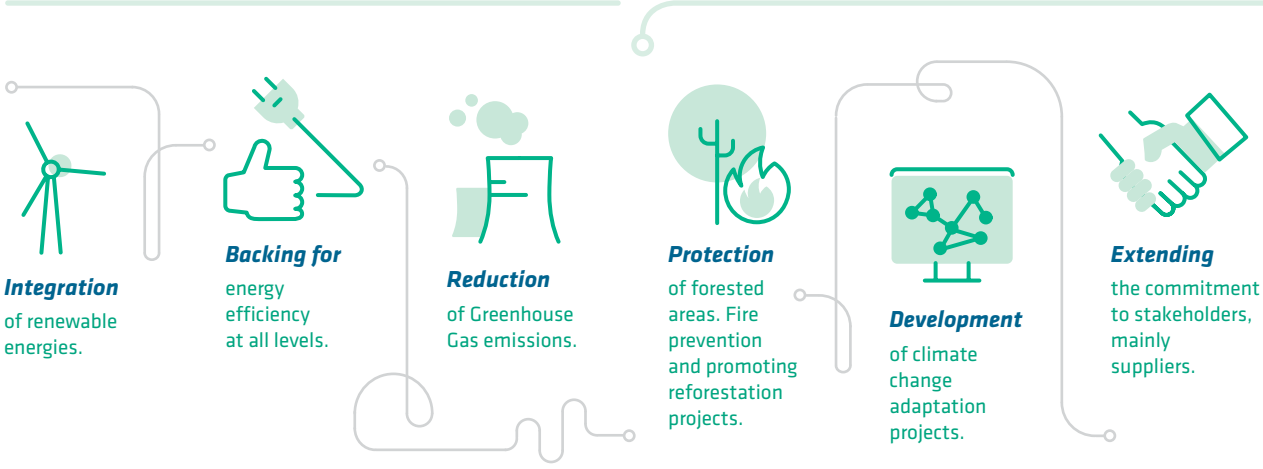
# CLIMATE CHANGE / G4-DMA

**In order** to combat climate change, it is indispensable to adopt an energy model based on the electrification of the economy, the decarbonisation of the electricity sector and increased energy efficiency.

Red Eléctrica as transmission agent and operator of the Spanish electricity system is a key player in the progress towards a more sustainable energy model: the development of transmission infrastructure and the implementation of solutions for system operation aimed at integrating renewable energy represent major opportunities in sustainability and, at the same time, are essential to the achievement of the transition towards clean energy, whilst maintaining security of supply.

Therefore, although Red Eléctrica is not subject to regulations requiring reporting and the reduction (or possibly offsetting) of emissions associated with their activities, the Company decided to formalise its voluntary commitment to the fight against climate change by publishing in 2011 a specific strategy that was reviewed and approved by the Chairman in May 2014.

## CORNERSTONES OF THE CLIMATE CHANGE STRATEGY



***Integration*** of renewable energies.

***Backing for*** energy efficiency at all levels.

***Reduction*** of Greenhouse Gas emissions.

***Protection*** of forested areas. Fire prevention and promoting reforestation projects.

***Development*** of climate change adaptation projects.

***Extending*** the commitment to stakeholders, mainly suppliers.

## RECOGNITIONS 2016

**Inclusion** in the CDP Leadership Index (A list). The Company has been recognised as part of the group of leaders, for its efforts and actions to combat climate change.

**DJSI** Maximum score in the Dow Jones Sustainability Index, in the criteria of Climate Strategy.

**RED ELÉCTRICA**

Red Eléctrica is a member of the Spanish Green Growth Group, an association whose goal is to promote public-private collaboration, in order to progress together in the decarbonisation of the economy, by working on aspects related to mitigating actions and the adaptation to climate change and to the circular economy.

# Red Eléctrica works on the review and update of the targets included in the Climate Change Action Plan.

## Climate change action plan

**In May 2015,** Red Eléctrica launched an Action Plan on climate change which included the targets to achieve in this area and the measures to be undertaken to reach these targets are established. The plan is divided into four main lines of work:

### Contribution to a sustainable energy model

**Includes** actions related to the activity of Red Eléctrica as operator and transmission agent of the electricity grid, and is necessary for the achievement of the European 20-20-20 targets for the year 2020. In this regard, the construction of facilities is expected to help reducing emissions from the electricity system as a whole, such as electricity interconnections and the transmission facilities necessary for the evacuation of renewable energy and the rail transport network.

Also included are all the projects to promote the maximum integration of renewable energy, such as optimising CECRE, improved tools for predicting renewable generation, the development of mechanisms for its participation in system ancillary services and the integration of energy storage systems. In addition, in this regard, all activities to contribute to the efficiency of the electricity system are contemplated, such as the different demand-side management measures and the development of research projects relating to smart grids and electric mobility.

**CARBON FOOTPRINT**

REDUCTION OR OFFSETTING OF

**21**

%

**Of the Company's emissions in 2020 compared to 2010**

Found under the heading 'Energy and climate change' within the 'Sustainable energy' subsection of the 'Sustainability' section of the corporate website.

Detailed information on these actions is described in the Sustainable Energy chapter of this report.

### Reducing the carbon footprint

**The Action Plan sets the reduction or compensation of 21% of the company emissions compared to 2010 as a general target for 2020,** in addition to other partial objectives. The activities are grouped into four broad areas: improved calculation of the carbon footprint, reduction of $SF_6$ gas, greater efficiency in electricity consumption and reducing fuel consumption of fleet vehicles and the reduction of business trips. In this chapter, we describe these aspects in more detail.

Red Eléctrica is working on revising the objectives included in said plan, in order to adapt them to the new international situation (the Paris Agreement and the new European targets) and to internal changes (that affect the methodology for calculating emissions and different aspects of management). During 2017, it is expected that an updated action plan will be approved and presented.

## Involvement of stakeholders

**This covers a** series of initiatives whose goal is to involve the stakeholders in Red Eléctrica´s commitment to combat climate change. To this end, different channels of collaboration with the administration have been established and actions are also being defined to extend the commitment to the Company´s suppliers. Different activities are also being carried out to make the public aware of and sensitive to this issue. It is worth noting that Red Eléctrica participates as a global partner in the **'Community for the Climate'** initiative, which is driven by several local social entities, the Ministry of Agriculture and Fisheries, Food and Environment, the Spanish Green Growth Group and several NGOs, and whose goal is to promote climate-related actions in Spanish society.

**COMMUNITY**
FOR CLIMATE

**DRIVES**
CLIMATE ACTIONS IN THE SPANISH SOCIETY

**Red Eléctrica jointly participates with the Ministry of Agriculture, the Spanish Green Growth Group and Various NGO's**

## Adapting to climate change

**Besides working** on mitigation actions, Red Eléctrica is aware of the need to work in the field of adaptation to climate change. For this reason, it has identified and evaluated both the risks and opportunities arising from climate change and has begun to develop some actions derived from this analysis.

### *Climate change risks and opportunities* / G4-EC2

The climate change risks inherent to Red Eléctrica are integrated into the corporate risk map. The Corporate Governance chapter of this report, which details the risks inherent to the Company, provides information on the climate change risks and the main actions carried out by Red Eléctrica to manage them. Regarding opportunities, the fight to stop climate change implies a change in the energy model and the transmission model. Policies set at European level are clearly aimed at these purposes. The need to increase the share of renewable energy in the electricity system (connection of new facilities and the optimisation of their management), the improvements to be undertaken in order to increase the efficiency of the system, changes in mobility policies (boost to rail transport and development of electric vehicles) represent a clear need for new investment in the transmission grid (new lines, interconnections) and therefore, a clear business opportunity for the Company.

**Besides working on mitigation actions, Red Eléctrica is aware of the need to work in the field of adaptation to climate change.**

## Emissions inventory / G4-DMA

**Red Eléctrica** drafts its **emissions inventory** based on the methodology of the GHG Protocol. Since 2011, the Company has been working on expanding the inventory and improving the calculation processes. Since 2013, the inventory has been submitted to independent review in accordance with ISAE 3410. The Independent Assurance Report is included in the annex to the present report.

**In 2016,** Red Eléctrica registered its **emissions inventory** in the Carbon Footprint Registry, offsetting and absorption projects of the Spanish Climate Change Office (MAPAMA).

# During 2016, the action guidelines when faced with $SF_6$ leaks have been revised in order to minimise breakdown and incident resolution times.

## Control of $SF_6$ emissions

**The main** direct emissions derived from Red Eléctrica's activities are those of sulphur hexafluoride ($SF_6$). This gas, despite its high potential for global warming, provides huge technical advantages. It is a nontoxic gas that allows a huge reduction in the distances to be maintained between the various elements of facilities which makes it possible to reduce the size of the installation and therefore better blend it into the landscape.

The emissions of this gas are associated with small leaks from equipment, leakages due to handling the gas and those one-off accidents that may occur, which makes it very difficult to establish measures and reduction targets. However, for Red Eléctrica this is a priority issue and it has various courses of action underway aimed at improving knowledge about and control of the gas and the reduction of leaks. The most important courses of action are the following:

- Improvement of the procedures for the control and identification of leaks, inventory and management of $SF_6$ gas. In this regard, during 2016, Red Eléctrica has continued to improve the procedure for monitoring the gas and the calculation of annual emissions having incorporated this process into the Company's IT tools (this new procedure will be implemented during 2017).

  In addition, work has been done on defining new requirements for the handling of $SF_6$ gas by suppliers and contractors and for the management of equipment at the end of its useful

MANAGEMENT OF $SF_6$

**IMPROVEMENT**
OBJECTIVE IN 2016

CONTEMPLATES THE FOLLOWING CRITERIA:

- **Improvement in the monitoring calculation**
- **Requirements from suppliers**
- **Reduction in response times**

life. Criteria related to action guidelines regarding leakage have also been revised in order to minimise breakdown and incident resolution times to minimise emissions. The execution of all these works has been considered a priority managerial objective for the Company, reaching a compliance of 100% in 2016.

- Provision of the most efficient equipment for the detection of leaks, the handling and measurement of $SF_6$
- Training of people involved in the handling of the gas. Red Eléctrica has two legally recognised training centres with a classroom for lectures and a workshop for experiments in which 426 employees have been trained since 2013.
- Replacement of old equipment with equipment with lower leakage rates.
- R&D+i projects related to the improvement in the management of gas. Collaboration with EPRI (2015-2020) and the development of a leak repair methodology for $SF_6$ in GIS facilities (2016-2018).

**TRAINING CENTRES**

**426**

**EMPLOYEES**

HAVE RECEIVED TRAINING IN THE HANDLING OF $SF_6$

**Since 2013**

Additionally, Red Eléctrica works in collaboration with the government and other entities in the search for solutions aimed at controlling and reducing these emissions. During 2016, different meetings were held under the framework of the voluntary agreement signed in May 2015 between the Ministry of Agriculture, Food and Environment, manufacturers and suppliers of electrical equipment using $SF_6$, transportation companies and electricity distribution companies and waste managers for this gas and the equipment containing it, for a comprehensive management of the use of $SF_6$ in the electricity industry which is more respectful to the environment.

## Replacement of old equipment with equipment with a lower leakage rate

**Objective 2020:**
Avoid 1,500 t $CO_2$ eq. per year.

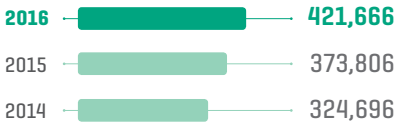
**Actions 2016:**
1,076 t of $CO_2$ eq. avoided annually.

**Actions 2015-2016:**
1,353 t $CO_2$ eq. avoided annually.

**Note:** The calculation of avoided emissions is carried out taking into account the theoretical leakage rates of the equipment, depending on their age.

## EVOLUTION OF $SF_6$ GAS INSTALLED IN RED ELÉCTRICA

kg

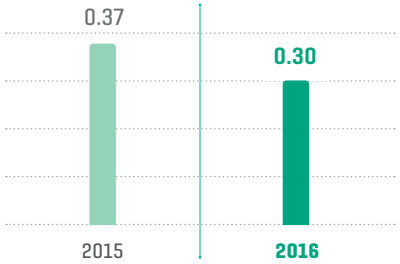



The growth in installed gas is due to the commissioning of new facilities and the replacement of old equipment for equipment insulated with $SF_6$. However, the large increase in 2016 is also associated with the updating of the inventory of $SF_6$ gas insulated substations, which has made it possible to determine the amount of gas contained in them (which in previous years was estimated).

## $SF_6$ EMISSION RATE

**% OF EMISSIONS OF INSTALLED GAS**

%




The reference rate is 0.5 %, which is the maximum leakage rate for equipment in service established in the Voluntary Agreement for $SF_6$ management signed in 2015. This rate is set for the equipment commissioned from the date the agreement was signed, allowing greater leakage rates in previous equipment.

# EFFICIENCY IN ELECTRICITY CONSUMPTION

***Buildings***

**Energy management system certified under ISO standard 50001** in the buildings of the Head office.

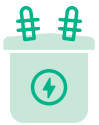
- Efficiency measures in the **construction of new buildings.** In 2016, a new service and logistic depot building was built in the Torrente substation (Ibiza) that obtained a B energy rating.
- Efficiency measures in the **refurbishment of existing buildings.** In the last year, improvement measures have been implemented in the climate control, lighting and insulation systems in six work centres, which are estimated to represent a saving of 96,981 kWh per year.

***IT Systems***

**Efficiency measures associated with the use of computer equipment:**

- **Renewal** of equipment and systems.
- **Implementation** of policies for efficient use, with a target of reducing electricity consumption associated with this equipment by 60 % in the period 2012-2020.
- In 2016, **a renewal of equipment** (laptops, desktops and monitors) was carried out that represents an estimated reduction in electricity consumption of 2,548 kWh per year.

***Substations***



**Reduction of electricity consumption in substations:** selection of more efficient equipment and components and establishing efficient guidelines for use, with a special focus on auxiliary services: climate control in buildings housing control elements, substations and cabins and improvement of lighting systems.

Advances in the standardisation of new technologies and the rationalisation of the use of lighting in substations. Launching of the innovation project: 'Study on the use of geo-cooling for gas-insulated facilities and cable galleries' (R&D+i).

***Awareness***

**Awareness campaigns** for employees and collaborators working in Company facilities.

During 2016, a series of energy audits were carried out in compliance with RD 56/2016 on energy efficiency. As a result of these works, different efficiency measures have been identified related to climate control systems and lighting that will be implemented between 2017 and 2018 and are estimated to bring savings of 183,800 kWh per year.

## *Red Eléctrica eficiente*

One of the axes of the Company's climate change strategy is the commitment to energy efficiency at all levels. In order to make it visible, and to encourage employees to identify and drive projects that promote the efficient use of natural resources, the internal efficiency brand ***Red Eléctrica Eficiente*** has been created, which identifies all these projects.

Each year some of them are awarded for their contribution to the achievement of the different efficiency objectives. In the Fourth Edition of the ***Red Eléctrica Eficiente*** Awards, three awards were presented:

**Sustainable Stock Project:** reverse logistics project that allows the recovery of part of the value of equipment or materials not useful for the Company, through an auction system for reuse or valuation by third parties.

Automatic Real-Time Management of the El Hierro Hydro-wind Power Station. The tool proposed in this project automates the real-time monitoring of wind power generation and the state of the power station, supporting the system operator and allowing the maximum integration of renewables under secure conditions. Thanks to this, new records of renewable energy integration were reached throughout the year, with periods of more than 70 hours of continuous demand coverage with 100 % renewable energy being registered. The total integrated renewable energy has gone from 19 % in 2015 to 42 % in the period January-November 2016.

**REDCOM Project.** Extension of the use of Microsoft's Lync communication tool in terms of the number of users and the use of features, with the benefits that this entails in improving communication and reducing trips.

RED ELÉCTRICA eficiente

# The Company is committed to the rationalisation of the use of private vehicles in the commute to workplaces.

## Sustainable mobility

**Red Eléctrica** has for several years been working on optimising the trips made for executing its work and reducing the emissions associated with them. In 2014, it decided to give a greater impulse to this initiative, by approving a Sustainable Mobility Plan, with the goal of incorporating a new culture of mobility in the Company. Among the most important measures taken, the following are noteworthy:

- **Efficient vehicle management:** a progressive improvement in the energy rating of the vehicles used and the optimisation of their use, through the CARs IT application (Agile, Responsible and Safe Driving System), which facilitates responsible driving and the use of efficient routes. Proof of this is the 'Green Fleet Accreditation' in its 'Master' mode (the most demanding) received from AEGFA (Association of Fleet Managers) and IDAE (Institute for Energy Diversification and Saving) obtained by Red Eléctrica in 2015.

- **Reduction of emissions associated with business trips:** launch of a corporate fleet of 12 electric vehicles for trips during the working day; prioritisation of the use of efficient taxis (75% of the kilometres have been travelled in ECO taxis) and improvements in communication tools, in order to reduce the number of trips (video conferences and remote accessibility platforms).

**ENERGY RATING** OF VEHICLES

**77.65 % of fleet vehicles** (including saloon cars, shared leasing vehicles, management vehicles, pool of electric vehicles, off-road, vans and car-derived vans) have an energy rating of A or B, or are electric.

**If we exclude special** purpose vehicles (off-road, vans and car-derived vans) this percentage reaches 98.5 %.

- **Rationalisation of the use of private vehicles in the commute to workplaces:** Improvements in the company bus service and shuttle services connecting the offices with different locations; redesigning routes and lengthening hours so as to provide a better service; inclusion of the transport pass in the employee options for payment in kind (16% of the employees have adopted this measure) and promoting the use of shared vehicles (53% of the employees are doing so regularly).

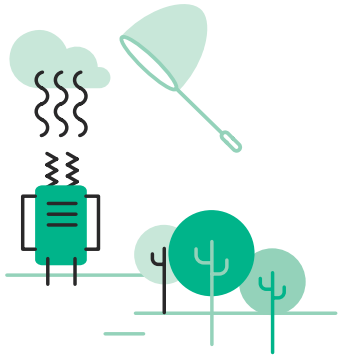
- **Efficient vehicles for executives:** implementation of a fleet of electric and hybrid vehicles for the executive team, with recharging points at work centres.

## Mobility targets 2020

- **30 % reduction** in emissions associated with the use of fleet vehicles (2010-2020).
- **300 t of $CO_2$** equivalent avoided each year on business trips as of 2020.
- **200 t of $CO_2$** equivalent avoided annually in the employee commute to work centres as of 2020.

## Offsetting emissions

**Red Eléctrica** has put into effect different alternatives for emissions reduction. However, given the nature of the emissions (the main direct emissions are diffuse) and the characteristics of the Company´s activities, in order to achieve greater progress in reducing the Company's carbon footprint, it is important to work on offsetting measures. The main method of offsetting emissions is the execution of the Red Eléctrica Forest programme, described in the chapter on biodiversity.



**OFFSETTING** EMISSIONS

+20 %

OF TOTAL DIRECT EMISSIONS

**Meeting the annual target of the Climate Change Action Plan**

**TREMUZO FOREST**

The planting of 59,693 trees in this forest in Galicia has represented the offsetting of 57% of direct emissions in 2016.

# Red Eléctrica offsets part of its emissions by supporting a deforestation project in the Amazonia rainforest of Peru.

During 2016, work was completed on the planting of the La Carballeda Forest (Zamora), which is estimated will offset 31,449 tonnes of $CO_2$ and which, when added to the work already executed at Ejulve in 2015, will offset all of the direct emissions from 2015.

Additionally, the planting of 59,693 trees in the Tremuzo Forest (Galicia) will offset 17,908 tonnes of $CO_2$, representing 57% of the direct emissions during 2016, thereby meeting the goal of offsetting 20% of the direct emissions, as reflected in the climate change action plan.

Moreover, for the fourth consecutive year the Company has offset a part of the emissions corresponding to employee commutes to their respective work centres, having purchased a total of **2,050 VCUs *(Verified Carbon Unit)*** under the standard VCS (Verified Carbon Standard), which correspond to the emissions generated by all those workers who answered the mobility survey 2016 (57.15% of the workforce). This purchase has been offset by supporting a project against a deforestation project in the Amazon rainforest - Peru: *'Madre de Dios Amazon REDD Project'*, which contributes to the conservation of biodiversity in the area and the development of indigenous communities.

# WASTE AND EFFLUENTS / G4-DMA

**The waste** that Red Eléctrica generates is produced as a result of the following activities:

- Preventive or corrective maintenance tasks: inspections, changing of parts, oil renewal, etc.
- Actions against accidents: containment measures used in the case of leaks or spillages and cleaning work may lead to a large amount of associated waste.
- Improvement of facilities: renewal of obsolete switchgear, improvement in accident prevention systems, among others.

Red Eléctrica has established processes that help minimise the quantity and the hazardous risk level of waste generated, such as the in-situ regeneration of power transformer oil for its reuse and the avoidance of the need to deal with large quantities of oil as waste. In this line, the opportunity to reduce 'water-oil mixture' waste has been identified and an R&D+i project has been launched, and some results have already been obtained.

However, and given the nature of the waste generating activities, it is very difficult to predict the evolution of the quantities generated and set quantitative reduction targets. Therefore, most of the efforts are aimed at finding better solutions for final management, promoting good practice through training and awareness and seeking the best options among our suppliers.

The waste generated in construction activities is managed by contractors. For all works there, is a waste management plan which sets out the management to be carried out in each case, with the being minimisation and reuse the prevailing criteria

## Minimisation of waste resulting from the cleaning of transformer containment pits. R&D+i project

The goal of the project is to develop a catalyst that allows, through the utilisation of a mobile plant, for the cleaning of the water from oil containment pits, so that it would only be necessary to manage, through an authorised waste management expert, part of their content (the oil) and not the entire amount (the water-oil mixture). The treated water could then be reused in the same pits, in order to maintain the level of water needed for them to function correctly. In this way, the waste to be managed and dealt with would be significantly reduced.

The project has been undertaken in two phases. In the first, experimental phase, the contents of different pits were analysed and characterised in a laboratory; in a second phase, practical treatment was carried out in situ at different substations. In both phases, very positive results were obtained, with very high performance (higher results with the more contaminated waste). In all cases, hazardous waste has been reduced by at least 90 %.

During 2017, work will continue on applying the conclusions of this work to the real management of Red Eléctrica's facilities.

**WASTE** MANAGEMENT

APPLICATION OF **BEST PRACTICES**

**MANAGEMENT OF WASTE FROM WORKS**

Red Eléctrica includes specific requirements in the contractual documentation for works, and reviews its compliance through on-site inspection of works.

criteria of minimisation and reuse established as a priority (which is especially important for surplus excavation material). In addition, Red Eléctrica includes specific waste management requirements in the contractual documentation of works and reviews compliance through monitoring visits to works and via documentation control.

## 'Sustainable Stock' Project

This is a reverse logistics project that faithfully follows the 3R principle: reduce, re-utilise and recycle.

It consists of the sale of materials considered useless for their reuse, or their valuation as waste, through an auction system. The project permits the extension of the useful life of some materials and the total or partial recovery of their components or materials.

In December 2015, the pilot project ended and it became a standard company practice due to it being considered very effective, given that successful solutions were found for 100 % of the materials auctioned (which so far has represented 4 % of the total stock of Red Eléctrica).

ENVIRONMENTAL **RISK ASSESSMENT**

ELECTRICITY SUBSTATIONS

**OBJECTIVE:**

MINIMISE THE RISKS OF LEAKS AND SPILLAGES OF HAZARDOUS SUBSTANCES

**2015-2016**

**IN 2017**

Assessment of the environmental risk of cables containing oil will be conducted.

## Protection against leaks and spillages

**Red Eléctrica** includes among its environmental risks the risk of contamination of soil or groundwater from leaks or spillages of oils, fuels and hazardous substances. For this reason, it has established numerous preventive and corrective measures to minimise these risks.

On the one hand, proper maintenance of equipment is carried out and strict working procedures that reduce the number of incidents are established. On the other hand, it has adequate containment systems (especially relevant in the case of power transformers containing large amounts of oil) and response protocols when faced with possible events that result in a reduction of the severity of the consequences should accidents occur.

Apart from all these measures, the Company has decided to promote work intended to minimise, as much as possible, the risks from leaks and spillage of hazardous substances. To this end, during 2015 and 2016, the 'Evaluation of environmental risk and the identification of environmental liabilities at electricity substations' project was carried out. The goal was to define the level of environmental risk associated with these substations and to classify the facilities in accordance with the same. The evaluation has centred mainly on those substations where there is equipment present with significant oil content. Besides evaluating the potential risk of impacting on the soil and water associated with the different elements of the substations, consideration has also been given to risks associated with activities habitually carried out, as well as those activities carried out adjacent to the sites, in addition to the environmental value of the surroundings and their vulnerability.

Once the facilities were classified, a proposal was made for actions, prioritised according to urgency, to reduce, control or completely eliminate the risks identified.

Red Eléctrica expects to continue working on improving the comprehensive management of this type of risk. In order to do so, in 2017 work will be carried out to evaluate the environmental risks related to cables with oil.

# INDICATORS

## FUEL CONSUMPTION
/ G4-EN3

L

| | 2014 | 2015 | **2016** |
|---|---|---|---|
| Diesel | 408,277 | 400,096 | 712,853 |
| Petrol | - | 44 | 49,768 |
| Biodiesel | - | 121 | 0 |
| LPG Autogas | | 33 | 0 |
| Diesel generator sets (1) | 4,100 | 5,061 | 3,452 |

(1) Corresponds to diesel refilled in the fuel tanks in 2016.

**Note:** Data from 2014 and 2015 only includes fleet vehicles owned by Red Eléctrica.
Data for 2016 includes owned vehicles and shared leasing vehicles (including management vehicles).

## ELECTRICITY CONSUMPTION
/ G4-EN3

kWh

| | 2014 | 2015 | **2016** |
|---|---|---|---|
| **Total** | **16,180,971** | **15,900,041** | **15,516,259** |

**Note:** Includes the consumption of the Head Office, the electricity control centres (centres that operate 24/7 and have a special energy consumption) and work centres (regional offices and maintenance centres).

## SUMMARY OF ENERGY CONSUMPTION (1)
/ G4-EN3

J

| | 2014 | 2015 | **2016** |
|---|---|---|---|
| Fuel consumption | $1.52 \cdot 10^{13}$ | $1.48 \cdot 10^{13}$ | $2.82 \cdot 10^{13}$ |
| Electricity consumption | $5.82 \cdot 10^{13}$ | $5.72 \cdot 10^{13}$ | $5.58 \cdot 10^{13}$ |

(1) Total consumption data in joules, according to the criteria defined by GRI.

1 kWh= $36 \cdot 10^{5}$ joules; 1 litre of diesel fuel= $37 \cdot 10^{6}$ joules; 1 litre of gasoline= $34 \cdot 10^{6}$ joules,
1 litre of gas oil= $37 \cdot 10^{6}$ joules; 1 litre of biodiesel= $32.79 \cdot 10^{6}$ joules; 1 litre of LPG= $25.7 \cdot 10^{6}$ joules.

## INDIRECT ENERGY CONSUMPTION. ELECTRICITY
/ G4-EN3

/

| | 2014 | 2015 | **2016** |
|---|---|---|---|
| Transmission grid losses (MWh) (1) | 3,187,000 | 3,023,000 | 3,441,000 |
| Transmission grid losses (joules) | $1.15 \cdot 10^{16}$ | $1.08 \cdot 10^{16}$ | $1.23 \cdot 10^{16}$ |

(1) Losses in the electricity transmission grid are related to the location of generation points in relation to the consumption points (the greater the distance, the greater the losses), the amount of energy demanded during the year, the generation mix of the year (percentage of each generation technology in the total energy generated), international exchanges and the shape of the demand curve. Practically none of these factors are manageable by Red Eléctrica, making it very difficult to reduce losses. However, Red Eléctrica works to identify and improve those factors it can have an influence on. During 2016, the value of losses in the transmission grid increased compared to the previous year mainly due to the different distribution of generation in the Spanish peninsular system.

## EXTERNAL ENERGY CONSUMPTION. LOGISTICS
/ G4-EN4

| | 2014 | 2015 | **2016** |
|---|---|---|---|
| Fuel consumption (litres) | 239,120 | 238,240 | 196,973 |
| Fuel consumption (joules) | $8.85 \cdot 10^{12}$ | $8.82 \cdot 10^{12}$ | $7.29 \cdot 10^{12}$ |

**Note:** In 2016, the calculation method has been adjusted (this is the reason for the decrease in emissions shown by the data).

1 litre of gas oil = $37 \cdot 10^{6}$ joules

## REDUCTIONS IN ELECTRICITY CONSUMPTION
/ G4-EN6

| | kWh/annually | joules/annually |
|---|---|---|
| Efficiency measures in work centres: improvements to insulation, climatization and lighting (1) | 113,454 | $4.08 \cdot 10^{11}$ |
| IT efficiency measures: Renewal of desktop equipment, laptops and monitors (1) | 2,548 | $9.17 \cdot 10^{9}$ |

(1) Estimated annual reductions resulting from the measures carried out in 2016 (estimations obtained from equipment specifications and information based on energy audits regarding the implementation of measures).

## ENERGY INTENSITY
/ G4-EN5

| | 2014 | 2015 | **2016** |
|---|---|---|---|
| Electricity consumption per employee in Head Office (kWh/employee) (1) | 6,725 | 7,126 | 6,763 |
| Transmission grid losses (MWh/MWh transported) (%) (2) | 1.320 | 1.219 | 1.376 |
| Average consumption of vehicles for logistical use (external) (litres/100 km) | 25.7 | 26.6 | 26.4 |

(1) The calculation takes into account all staff working at the Moraleja and Albatros work centres (employees of the Group, interns, employees from temporary staffing agencies and collaborators).
(2) Losses in the electricity transmission grid are related to the location of generation points in relation to the consumption points (the greater the distance, the greater the losses), the amount of energy demanded during the year, the generation mix of the year (percentage of each generation technology in the total energy generated), international exchanges and the shape of the demand curve. Practically none of these factors are manageable by Red Eléctrica, making it very difficult to reduce losses. However, Red Eléctrica works to identify and improve those factors it can have an influence on.

## TOTAL WATER WITHDRAWAL BY SOURCE
/ G4-EN8

| | 2014 | 2015 | **2016** |
|---|---|---|---|
| Head Office ($m^3$) (1) | 9,177 | 9,018 | 9,166 |
| Other work centres ($m^3$) | 18,892 | 18,232 | 17,276 |
| Total of all work centres ($m^3$) (2) | 28,069 | 27,250 | 26,442 |

(1) Only the Head Office building in 'La Moraleja' is taken into account.
(2) The data provided has a coverage of 99 %, in terms of personnel (taking into account all personnel that work in the different work centres in Spain: employees of the Group, interns, employees from temporary staffing agencies and collaborators).

**Note:** The water consumed comes from: the municipal mains (62.18%), wells (34.6%), cisterns (3.23%). In the Northern regional office and in some work centres cisterns are available for the collection of rainwater for sanitary use, fire prevention and irrigation. In general, the cisterns do not have mechanisms to measure the water stored, so the actual % of utilisation of rainwater cannot be calculated. / G4-EN10

## PRESENCE OF FACILITIES IN RED NATURA SPACES

/ G4-EN11

| | 2014 | 2015 | 2016 |
|---|---|---|---|
| Km of line in Red Natura/total km of line (%) | 15.1 | 15.0 | 15.0 |
| Number of substations in Red Natura/number of substations (%) | 6.16 | 5.96 | 5.92 |
| Surface area of facilities in Red Natura/total surface in Red Natura (%) [1] | 0.09 | 0.08 | 0.08 |

Red Natura (Natura 2000 Network) includes: SCI (Site of Community Importance) and SPA (Specially Protected Areas for birds).

[1] Surface area occupied by lines and substations. The surface area of lines has been calculated assuming an occupation of 20 m on each side of the line. It is necessary to keep in mind that the occupation is overhead, there is only actual land occupation in the case of the towers.

**Note 1.** For the calculation of the 2014 ratios, the base data published in July 2014 was used. In the case of the 2015 ratios, the base data published by MAGRAMA in February 2016 was used. For 2016, the base data published by MAGRAMA in January 2017 was used.

**Note 2.** The mapping of in-service facilities is improved and updated annually, whereby some variations in calculations not related to the increase or decrease in the number of facilities may result.

## COLLISIONS OF ENDANGERED SPECIES DETECTED IN 2016

/ G4-EN12

| Species affected | Nº of birds affected |
|---|---|
| Great Bustard *(Otis tarda)* [1] | 1 |
| *Little Bustard (Tetrax tetrax)* [2] [3] | 1 |
| *Red Kite (Milvus milvus)* [4] | 2 |
| *Black-bellied Sandgrouse (Pterocles orientalis)* [3] | 8 |
| *Black stork (Ciconia nigra)* [3] | 1 |
| *Canarian Egyptian Vulture (Neophron percnopterus majorensis)* [4] | 4 [5] |
| *Houbara Bustard (Chlamydotis undulata)* [1] [4] | 7 |

[1] Vulnerable species according to IUCN Red List. / G4-EN14
[2] Near-threatened species according to IUCN Red List. / G4-EN14
[3] Vulnerable species according to the National Catalogue of Endangered Species. / G4-EN14
[4] Near extinct species according to the National Catalogue of Endangered Species. / G4-EN14
[5] One of the Canarian Egyptian Vultures involved was only injured.

Collisions are mainly detected during monitoring plans or specific studies. In 2016, a specific study was carried out in the Canary Islands (Study for the quantification of the impact of the electricity cables of the eastern islands of the Canary Islands on bird mortality), in collaboration with the Museum of Natural Sciences (CSIC) and GREFA.

## DESCRIPTION OF THE MOST SIGNIFICANT IMPACTS ON BIODIVERSITY

/ G4-EN12

### Most relevant impacts on protected spaces [1]

Effects on marine SCI of 'Canal de Menorca': Contamination of three coves and subsurface waters due to accidental oil leakage in the Majorca-Menorca interconnection cable. Leakage due to accidental damage to cable caused by the anchor of a yacht and also through two accidental leaks. Affected area: between 1,200-1,600 $m^2$ of seabed and a seawater surface area of between 2,200 and 2,600 $m^2$. Measurements were taken for the containment of the spillage as well as for the cleaning up of the affected beaches and of the oil present on the surface of the water. In addition, various actions were carried out regarding water characterisation and the monitoring of potentially affected areas.

Effects on the beach of 'Cala Mesquida' in the SCI and SPA of 'Muntanyes d'Arta' due to the leakage of a land section of the Majorca-Menorca interconnection cable. Affected area: 1,100 $m^2$ of soil and 1,700 $m^2$ of groundwater. Different characterisations of soils and water have been made to determine the extent and depth of the impact (pending final results). Emergency measures have been established to extract the contaminating product present in groundwater.

### Most relevant impacts on vegetation

Felling of Sweet Tabaibas *(Euphorbia balsamifera)* linked to the construction of the new electricity line.

Felling of indigenous flora – 157 Aleppo pines *(Pinus halepensis)* and 2 date palm trees *(Phoenix dactylifera)* in protected spaces, due to the opening up of a forest safety corridor in the construction of two new electricity lines.

[1] For more information on these incidents, please consult the / G4-EN24 indicator.

## SPECIES INCLUDED IN THE IUCN RED LIST

**and the national conservation list whose habitats are located in areas affected by operations, broken down by the extinction risk level of the species**

/ G4-EN14

| | Scientific name | Common name | Classification according to MAGRAMA (2016) (National Catalogue) | Classification according to the IUCN red list |
|---|---|---|---|---|
| 1. | *Aquila adalberti* | Imperial Eagle | In danger of extinction | Vulnerable (VU) |
| 2. | *Hieraaetus fasciatus* | Bonelli's Eagle | Vulnerable | Least concern (LC) |
| 3. | *Pandion haliaetus* | Osprey | Vulnerable | Least concern (LC) |
| 4. | *Burhinus oedicnemus subspp.* | Stone-curlew | Vulnerable | Least concern (LC) |
| 5. | *Neophron percnopterus* | Griffon Vulture | Vulnerable | Endangered (E) |
| 6. | *Neophron percnopterus majorensis* | Canarian Egyptian Vulture | In danger of extinction | Not evaluated (NE) |
| 7. | *Chersophilus duponti* | Dupont's Lark | Vulnerable | Near threatened (NT) |
| 8. | *Botaurus stellaris* | Eurasian Bittern | In danger of extinction | Least concern (LC) |
| 9. | *Otis tarda* | Great Bustard | - | Vulnerable (VU) |
| 10. | *Chlamydotis undulata* | Houbara Bustard | In danger of extinction | Vulnerable (VU) |
| 11. | *Aegypius monachus* | Black Vulture | Vulnerable | Near threatened (NT) |
| 12. | *Marmaronetta angustirostris* | Marbled Duck | In danger of extinction | Vulnerable (VU) |
| 13. | *Ciconia nigra* | Black Stork | Vulnerable | Least concern (LC) |
| 14. | *Corvus corax canariensis* | Common Raven | - | Not Evaluated (NE) |
| 15. | *Fulica cristata* | Crested Coot | In danger of extinction | Least concern (LC) |
| 16. | *Pterocles alchata* | Pin-tailed Sandgrouse | Vulnerable | Least concern (LC) |
| 17. | *Pterocles orientalis* | Black-bellied Sandgrouse | Vulnerable | Least concern (LC) |
| 18. | *Ardeola ralloides* | Squacco Heron | Vulnerable | Least concern (LC) |
| 19. | *Falco pelegrinoides* | Barbary Falcon | In danger of extinction | Least concern (LC) |
| 20. | *Geronticus eremita* | Northern Bald Ibis | - | Critically endangered (CR) |
| 21. | *Oxyura leucocephala* | White-headed Duck | In danger of extinction | Endangered (E) |
| 22. | *Milvus milvus* | Red Kite | In danger of extinction | Least concern (LC) |
| 23. | *Columba junoniae* | White-tailed Laurel Pigeon | Vulnerable | Near threatened (NT) |
| 24. | *Lagopus muta* | Rock Ptarmigan | Vulnerable | Least concern (LC) |
| 25. | *Dendrocopos leucotos* | White-backed Woodpecker | In danger of extinction | Least concern (LC) |
| 26. | *Fringilla teydea subspp.* | Blue Chaffinch | In danger of extinction (Tenerife) Vulnerable (Gran Canaria) | Near threatened (NT) |
| 27. | *Aythya nyroca* | Ferruginous Duck | In danger of extinction | Near threatened (NT) |
| 28. | *Gypaetus barbatus* | The Bearded-Vulture | In danger of extinction | Near threatened (NT) |
| 29. | *Tetrax tetrax* | Little Bustard | Vulnerable | Near threatened (NT) |
| 30. | *Tetrao urogallus cantabricus* | Cantabrian Capercaillie | In danger of extinction | Not Evaluated (NE) |
| 31. | *Tetrao urogallus aquitanicus* | Aquitanian Capercaillie | Vulnerable | Not Evaluated (NE) |

The main risk on protected species due to the operations of Red Eléctrica arises from birds colliding with the electricity lines. Within the framework of the project 'Identification, characterisation and mapping flight paths of birds that interact with high voltage transmission lines' 2010-2014, allowed the species that are prone to colliding with Red Eléctrica's lines to be identified (focal group, a total of 47 species) and whose habitats are located in areas where such lines exist. Of the 47 species identified, 31 have been considered threatened.

## DIRECT GREENHOUSE GAS EMISSIONS (t $CO_2$ equivalent) (1)

tCO2

/ G4-EN15

| Direct Emissions (SCOPE 1) | 2014 | 2015 | 2016 |
|---|---|---|---|
| $SF_6$ (2) | 81,018 | 31,651 | 28,770 |
| Air conditioning | 809 | 840 | 610 |
| Fleet vehicles (3) | 1,094 | 989 | 1,898 |
| Diesel generator sets | 204 | 182 | 222 |
| **Total direct emissions** | **83,125** | **33,662** | **31,500** |

(1) The calculation of emissions is performed from an operational control perspective. The information on the inventory scope and methodology is available on the REE website (http://www.ree.es/en/sustainability/sustainable-energy/energy-and-climate-change/our-carbon-footprint). The inventory was submitted to independent review in accordance with ISAE 3410.
(2) Taking GWP (Global Warming Potential) to 100 years: 22,800 (Source IPCC, Intergovernmental Panel on Climate Change: 4th assessment report). The decrease in $SF_6$ emissions post 2015 is linked to the change in the methodology used for its calculation. In 2014, the data was calculated based on the application of theoretical emission factors of the installed gas. As of 2015, the calculation is based on actual data regarding leakages.
(3) Data for 2014 and 2015 only include emissions from Red Eléctrica-owned fleet vehicles. The data for 2016 includes those from vehicles owned and shared leasing (including management vehicles).

## OTHER INDIRECT EMISSIONS SCOPE 3

**(t $CO_2$ equivalent) (1)**

tCO2

/ G4-EN17

| Indirect (SCOPE 3) | 2014 | 2015 | 2016 |
|---|---|---|---|
| Emissions associated with business travel (1) | 1,485 | 2,517 | 1,433 |
| Emissions associated with the internal transportation of materials (2) | 641 | 589 | 494 |
| Employee commuting | 3,468 | 3,345 | 3,574 |
| Emissions associated with the value chain (3) | 175,389 | 234,807 | 223,275 |

(1) Corresponds to trips made by train, plane, privately owned or rental vehicles and taxi. This scope does not correspond to that of 2015, which also included the emissions derived from the use of shared leasing vehicles and management vehicles, which this year have been included in scope 1.
(2) The calculation method was adjusted in 2016.
(3) 2014: information on suppliers that represent 95% of the volume of purchase orders. Carbon intensity in the value chain: 370 t $CO_2$ / million euros.
2015: data on 100% of purchase orders. Carbon intensity of the value chain: 424 t $CO_2$ / million euros.
2016: data on 100% of purchase orders. Carbon intensity of the value chain: 372 t $CO_2$ / million euros.

**Note:** For the correct interpretation of the data it is necessary to take into account that carbon intensity depends on the type of purchase orders made during the year and there are products / services with different carbon intensity. That is why strict comparisons cannot be made between the different years. Of all the activities, the construction of facilities and equipment manufacturing are the most carbon intensive.

## INDIRECT GREENHOUSE GAS EMISSIONS FROM THE GENERATION OF ENERGY

**(t $CO_2$ equivalent) (1)**

tCO2

/ G4-EN16

| Indirect Emissions (SCOPE 2) | 2014 | 2015 | 2016 |
|---|---|---|---|
| Electricity Consumption (2) | 3,867 | 4,229 | 1,664 |
| Transmission grid losses (3) | 767,907 | 804,118 | 736,374 |
| **Total indirect emissions** | **771,774** | **808,347** | **738,038** |

(1) The calculation of emissions is performed from an operational control perspective. The information on the inventory scope and methodology is available on the REE website (http://www.ree.es/en/sustainability/sustainable-energy/energy-and-climate-change/our-carbon-footprint).
(2) Different emission factors are used depending on the electricity supply of each work centre. Until 2015, the average peninsular factor calculated by Red Eléctrica was used.
(3) Losses in the electricity transmission grid are related to the location of generation points in relation to the consumption points (the greater the distance, the greater the losses), the amount of energy demanded during the year, the generation mix of the year (percentage of each generation technology in the total energy generated), international exchanges and the shape of the demand curve. Practically none of these factors are manageable by Red Eléctrica, making it very difficult to reduce losses. However, Red Eléctrica works to identify and improve those factors it can have an influence on (see sustainable energy section). In this case, similarly as in the case of emissions associated with electricity consumption, $CO_2$ is not emitted during Red Eléctrica activities, as it takes place at the different points of power generation. To calculate the emission factor associated with losses in transmission, the emission factor calculated by Red Eléctrica, which is based on the annual peninsular electricity generation balance, is used. During 2016, emissions have been reduced due to the decline in the emission factor, mainly associated with increased hydroelectric power generation and a lower share of coal in the peninsular energy mix (emission factor in t $CO_2$ / MWh: 0.266 in 2015 and 0.214 in 2016).

## GREENHOUSE GAS EMISSIONS INTENSITY

/ G4-EN18

| | 2014 | 2015 | 2016 |
|---|---|---|---|
| Emissions of $SF_6$/$SF_6$ installed (%) [1] | | 0.37 | 0.30 |
| Emissions from fleet vehicles (kg $CO_2$/ km) [2] | | 0.27 | 0.16 |
| Emissions (1 and 2)/revenues (t $CO_2$/million euros) [3] | 479 | 462 | 427 |
| Emissions/revenues (t $CO_2$/million euros) [4] | 48.8 | 20.8 | 18.0 |
| Emissions/energy transported (t $CO_2$/GWh) [5] | 3.5 | 3.4 | 3.1 |

(1) The emission rate is calculated based on emissions data calculated according to actual data regarding leakage. No data from previous years is included as it is not comparable.
(2) All types of vehicles are included. The indicator litre/100 km is replaced by this new indicator as it is considered more appropriate to reflect all types of fleet vehicles (biodiesel and LPG vehicles are included).
(3) Emissions Scope 1 and 2 (includes transmission grid losses).
(4) Emissions Scope 1 + electricity consumption emissions. REE considers it relevant to monitor this indicator, without including transmission grid losses (since it is not possible to act on them, as explained above). The reduction in the indicator is due to the decrease of Scope 1 emissions associated with the change in methodology in calculating $SF_6$ emissions.
(5) Emissions Scope 1 and 2 (including transmission grid losses). The total energy transported corresponds to the annual demand measured at power station busbars.

## REDUCTION OF GREENHOUSE GAS EMISSIONS

/ G4-EN19

| **Net savings** [1] | **t $CO_2$ eq** |
|---|---|
| Savings in emissions due to efficiency measures related to fleet vehicles | 10 |
| Savings in emissions due to efficiency measures related to management vehicles | 23 |
| Savings in emissions due to the use of efficient taxis | 5 |
| Savings in emissions due to contracting an electricity supply with a guarantee of origin [2] | 1,869 |

| **Annual savings** [3] | **t $CO_2$ eq / year** |
|---|---|
| Efficiency measures in work centres: improved insulation, climatization and lighting | 24 |
| IT efficiency measures: Renewal of desktop equipment, laptops and monitors | 1 |
| Reduction in $SF_6$ emissions due to the replacement of old equipment with new ones with a lower leakage rate | 1,076 |

(1) Net savings compared to 2016 (measured or estimated).
(2) Electricity with guarantees of origin: 0 t $CO_2$/kWh.
(3) Reductions associated with the measures implemented in 2016.

## TOTAL WEIGHT OF WASTE ACCORDING TO TYPE AND TREATMENT METHOD

/ G4-EN23

| Type of waste | 2014 | 2015 | **2016** |
|---|---|---|---|
| Non-hazardous waste (kg) (1) | 2,111,046 | 1,857,536 | 1,522,422 |
| Hazardous waste (kg) (2) | 2,375,019 | 1,183,925 | 2,035,645 |

| Waste management method (%) (3) | Non-hazardous | Hazardous |
|---|---|---|
| Composting/Regeneration/Recycling | 85 | 46 |
| Valuation | 0 | 40 |
| Elimination (by any method) | 15 | 14 |

(1) Metal waste not included as an adjustment is being made in the process of collecting and recording the information. This explains the difference of the data for 2014 and 2015 with those published in previous years. Waste vegetation is not included either because it cannot be quantified, most of it is incorporated into the land or given to landowners, as the most appropriate form of waste management.
(2) There is a slight variation from the 2015 data published last year due to a change in the qualification of a waste product. The increase in the amount of waste produced is related to the increase in the remodelling and refurbishment works of facilities which have led to an increase in oil and water mixture waste (due to the cleaning of tanks), equipment with oil, (due to the renewal of power transformers) and gas in pressurised containers (due to works for the replacement of equipment containing $SF_6$).
(3) The management of the waste corresponds to the information provided by the contractor, or by the default procedure of the contractor responsible for the removal of waste.

**Note 1.** Red Eléctrica concluded its Plan of elimination / decontamination of transformers, equipment and oil with PCBs in 2010, however, there is still some old sealed equipment that can only be analysed at the end of its useful life. For this reason, waste continues to be generated from equipment contaminated with PCBs. In 2016, 10,479 kg were managed.

**Note 2. The treatment of used $SF_6$ gas waste,** which consists of the regeneration of the gas for its subsequent reuse, takes place outside of Spain. This means that **0.52% of the total hazardous waste was transported internationally.** / G4-EN25

## LEAKS AND SPILLAGES 2016 (1) (2)

/ G4-EN24

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Fuel leaks and spillages in substations | 0 | 1 | 1 (3) | 0 | 0 |
| Oil leaks and spillages in substations | 0 | 0 | 4 (4) | 0 | 0 |
| Oil leaks and spillages in lines (cables) | 0 | 0 | 0 | 5 (5) | 0 |

(1) Events classified as being of very little relevance as incidents are not included.
(2) Classification of accidents according to their severity on a scale of 1 to 5 (1 minor - 5 severe). There have been no minor accidents in 2016 and only one accident has been classified as minor. **No spillage has been included in the organisation's financial statements.**

The following are significant and major accidents:

(3) Significant accident: leakage of 1,491 litres of diesel fuel due to failure of the system which manages the transfer between the tank and the diesel generator set (occurred in the room where the equipment is located).
(4) Significant accidents: Three of them due to explosion of equipment with oil spillage of various amounts (50, 175 and 838 kg) that dispersed affecting variable surfaces, within the respective substations. The fourth accident was caused by failure in a power transformer unit, releasing about 1,000 litres of oil around the containment pit.
(5) Major accidents:
- Incident on the land section of the Majorca-Menorca link. The leakage of 9,000 litres of oil affected between 1,200 and 1,600 $m^2$ of soil and a surface area of about 2,200-2,600 $m^2$ of groundwater. Red Eléctrica implemented different emergency measures and a procedure for the cleaning and recovery of the affected areas is being undertaken.
- Damage caused to the cable of the Majorca-Menorca submarine link by the anchor of a yacht. Discharge into the sea of between 18,000-20,000 litres of oil. Impact on several beaches and seawater (area located in Red Natura). The beaches were closed and cleaned and the oil present on the surface of the water was removed and various water characterisation was undertaken, as well as the supervision of the potentially affected areas.
- Leakage due to fault in the submarine cable of the Majorca-Menorca link resulting in the discharge of 300 litres of oil in Red Natura. The area has been cleaned.
- Incident due to leakage in the land section of the Majorca-Menorca link resulting in the leakage of 3,620 litres of oil affecting the beach of 'Cala Mesquida' in Red Natura. (Impact: land 1,100 $m^2$ and groundwater surface area 1,700 $m^2$). Emergency measures have been established to clean up the oil.
- Damage caused by an anchor in the Tarifa-Fardioua submarine cable, resulting in an estimated oil leak of 33,400 litres. The incident occurred in Moroccan waters so the actions have been coordinated by the Moroccan operator.

## SANCTIONS AND FINES

/ G4-EN29

| | 2014 | | 2015 | | **2016** | |
|---|---|---|---|---|---|---|
| | Nº of cases | Amount (euros) | Nº of cases | Amount (euros) | Nº of cases | Amount (euros) |
| Fire risk (lack of maintenance of vegetation or the abandoning of material) | 1 | 100 | 2 | 811 | 1 | 451 |
| Unauthorised felling and pruning | 2 | 2,175 | 1 | 100 | 2 | 7,060 |
| Obstruction of waterway / Unauthorised works in certain areas | 2 | 3,600 | | | | |
| Opening up of a forest trail without authorisation | 1 | 1,001 | 1 | 2,000 | | |
| Use of a helicopter in a critical birdlife area without authorisation | | | 1 | 1,000 | | |
| Crossing of a livestock route with an electricity line without authorisation | | | 1* | 30,051* | | |
| Incorrect waste management | | | 1* | 2,500* | | |
| **Total** | **6** | **6,876** | **7*** | **36,462*** | **3** | **7,511** |

(*) Data updated in 2016 after resolution of two cases opened in 2015.

## ENVIRONMENTAL EXPENDITURE AND INVESTMENT
/ G4-EN31

| | 2014 | 2015 | **2016** |
|---|---|---|---|
| **Investment** | **2,651,609** | **3,856,802** | **2,983,757** |
| Engineering and construction of facilities [1] | 2,651,609 | 3,856,802 | 2,983,757 |
| **Expenditure** | **19,795,259** | **18,848,972** | **19,665,125** |
| Development of methodologies and systems [2] | 50,082 | 47,145 | 116,854 |
| Environmental studies and analyses | 125,502 | 201,743 | 108,435 |
| Environmental actions regarding in-service facilities | 17,502,652 | 16,722,722 | 17,679,436 |
| Contamination prevention [3] | 1,376,552 | 1,268,565 | 1,376,552 |
| Protection of biodiversity. Landscape [4] | 14,914,991 | 14,593,765 | 14,820,439 |
| Climate change [5] | 771,487 | 635,143 | 974,994 |
| Waste reduction and management | 439,622 | 225,250 | 488,409 |
| Research and development | 363,316 | 339,554 | 440,739 |
| Training and communication | 256,722 | 176,595 | 48,862 |
| Environmental training and awareness | 54,310 | 41,067 | 15,125 |
| Communication [6] | 202,412 | 135,528 | 33,737 |
| Environmental taxes and fees | 280,223 | 92,906 | 51,360 |
| Cost of personnel involved in environmental activities | 1,216,762 | 1,268,307 | 1,219,440 |
| **Total expenditure** | **22,446,868** | **22,705,774** | **22,648,882** |

(1) Environmental impact studies carried out on all projects, application of preventive and corrective measures, environmental supervision at electricity facilities under construction and application of environmental improvement measures.
(2) Environmental certifications, audits and consultancy.
(3) Adaptation of facilities, repair of equipment, analysis, etc.
(4) Fire prevention (inspection of facilities, felling, pruning and clearing of vegetation for the maintenance of the safety distances, projects related to the prevention and fight against forest fires), line marking with bird flight diverters, bird-nesting deterrents, management of nests, landscaping adaptation, biodiversity conservation projects, etc.
(5) The section on climate change and energy efficiency has been unified. It includes costs of: meter installation, energy audits, activities to improve energy efficiency, projects to reduce emissions (improvement in $SF_6$ management) and offsetting of emissions (REE Forest, purchase of carbon credits).
(6) Affiliations, congresses, brochures and reports, stands at fairs, publicity in magazines, collaboration and sponsorship agreements.

## NUMBER OF ENVIRONMENTAL GRIEVANCES

/ G4-EN34

| | 2014 | 2015 | **2016** |
|---|---|---|---|
| Electromagnetic fields | 1 | 1 | 0 |
| Impact on the landscape | 1 | 0 | 0 |
| Facilities | 0 | 0 | 7 |
| Waste | 2 | 0 | 0 |
| Noise | 0 | 1 | 1 |
| Flora | 11 | 19 | 17 |
| **Total** | **15** | **21** | **25** |

**Note:** Environmental cases reported are managed through the DÍGAME service. Reported cases are classified and handled according to their nature (including complaints, enquiries, suggestions, requests for information and recognition) or grievances. In 2016, 72 environmental cases were handled, 25 of which have been grievances. (Only those deemed applicable in accordance with the criteria established in REE's internal procedure are accounted for).
All grievances from previous years were closed in 2015. Of the grievances filed in 2016, 19 were closed in the year, leaving 6 pending.