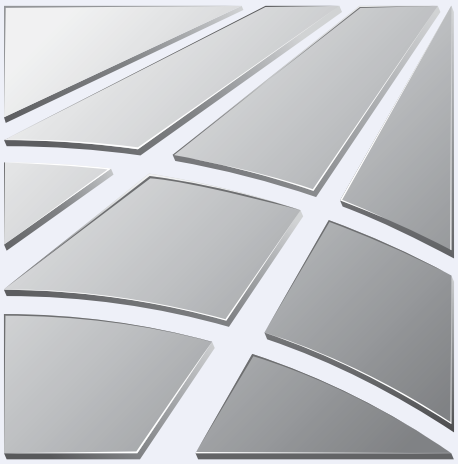
2011



Environmental responsibility

Terna

Our approach

Terna acknowledges the importance of a right balance between energy requirements and the safeguard of the environment and local communities and seeks in its activity appropriate solutions to ensure Italy the electricity it needs in the most reliable, cost-effective, and environmentally-sustainable way.
Terna's business consists in providing the service of transmitting electricity, which is performed through the high voltage electricity grid. Therefore, from the environmental point of view, the most obvious impact of this activity is not so much in the use of natural resources or the emission of polluting substances as in the **physical presence of electricity lines and stations** and in their interaction with the surrounding natural and anthropic environment.
Increasing environmental awareness and widespread local opposition to the construction of new infrastructure – a typical feature of many industrialized countries and certainly of Italy – have led Terna to develop an approach that is very attentive to the environment and the needs of local communities. The way it has chosen for the construction of new lines is **consultation with local institutions** (Regions, Provinces, Municipalities, park boards, etc.) in order to consider environmental needs from the earliest stages of planning and take the related details increasingly into account up to the construction stage.
Respect for the environment and local communities represents the credentials with which Terna intends to establish a relationship based on trust with the national government (e.g., the relevant ministries and regulatory authorities) and local institutions, which are also empowered to authorize new infrastructures. In this way, the consideration of environmental issues matches Terna's interest in investing in the development of the grid and the broader interest of society in the continuity, safety, and efficiency of the electricity service.
As far as the existing lines and their management is concerned, Terna's concern for the environmental impact of its activities is embodied in its Environmental Management System, which is **ISO 14001** certified. The certification regards all of Terna's activities and covers 100% of the transmission grid (stations and lines) and offices.
The following **significant environmental issues** should be noted in particular:
- the visual impact of stations and lines;
- the impact of lines on biodiversity, with particular regard to birdlife;
- special waste and its disposal;
- the emission of electric and magnetic fields;
- emissions of greenhouse gases.

Terna does not produce electricity, therefore the emission of greenhouse gases is not a feature of its activities. Our concern for emissions – which takes the form mainly of **controlling leakage of SF_6**, a gas that is present in station equipment, as well as controlling the emissions of the corporate vehicle fleet – is thus the result of a general sensitivity to the problem of climate change. It should therefore be noted that the investment included in the Grid Development Plan can have positive indirect effects on emission reduction by the national electricity system.
Terna has established an Environmental Policy, which expresses its commitment to practices to limit and reduce its environmental impact even beyond the limits imposed by law whenever this does not compromise the defense of the other general interests that Terna is obliged to ensure: the safety and continuity of the electricity service, keeping the electricity system efficient, adapting the system to the country's production and consumption needs, and equal access to the grid for industry companies.
Among Terna's main commitments for the environment, the following should be noted:
- in the planning of investment to develop the grid, paying attention to the needs expressed by stakeholders (especially local institutions and environmentalist associations) and seeking agreement on solutions;
- in the construction, management, and maintenance of the grid, adopting procedures in compliance with law provisions and, whenever possible, reducing the environmental impact;
- in relations with suppliers, requiring them to gradually adapt to the standards of respect for the environment adopted by Terna;
- with regard to magnetic fields, strict compliance with regulations and attention devoted to the development of scientific studies, while contributing to the correct presentation and understanding of the phenomenon;
- with regard to biodiversity, commitment to limit the impact of the grid, particularly on birdlife, and carry out mitigation actions, including programs agreed on with environmentalist associations;
- with regard to climate change, recognition of the importance of the problem and commitment to actions that foster the reduction of greenhouse gases.

As far as improvement programs are concerned, Terna continues its commitment to reducing emissions through limiting SF_6 leakage and energy efficiency, while the continuation of cooperative projects with leading environmentalist associations will allow guidelines – in addition to mitigation instruments – to be established for the environmental integration of electricity lines as well as in-depth scientific examination of the interactions between electricity lines and biodiversity.

In organizational terms, environmental responsibility is divided among several corporate departments, which participate in an Environment and Sustainability Steering Committee to coordinate activities and establish priorities and objectives to propose to the top management. The participating departments are: Operations Italy, Corporate Security (which is in charge of the integrated Quality-Environment-Safety management system), Institutional Affairs, Organization and Human Resources, and External Relations and Communication. The Corporate Social Responsibility Unit acts as the secretary of the Committee. Monitoring of the environmental indicators is entrusted to a permanent group of experts working within the framework of the Environmental Management system.

Compliance with laws and regulations

EN28
EN30
EN23

In the three-year period 2009-2011 there were no final administrative or judicial penalties, pecuniary or non-pecuniary, for non-compliance with laws or regulations regarding the environment. Further information on environmental litigation is reported in the section dedicated to the indicator tables and the "Disputes and litigation" section.
In 2011, as in 2009, no significant spills of polluting liquids were recorded. In 2010 a fire in a transformer in Calenzano (Florence province) caused oil to spill on the surrounding land. Following this event, 400 cubic meters of earth (from an area of 450 square meters) were promptly removed mechanically to avoid possible environmental damage.
In order to avoid the risk of potential spills, an assessment of the types of oil collection tanks installed at Terna's plants was completed in 2011.
Following monitoring, a work group charged with providing Guidelines for the proper maintenance of the different types of oil collection tanks in use was formed.
In the 2010-2011 two-year period, with the support of accredited external bodies, Terna completed a survey on noise produced by its transforming stations. The criticalities uncovered have been dealt with and are in the process of being resolved (e.g. by replacing old equipment, by erecting anti-noise barriers) so that the level of noise can be brought within the limits allowable by law and by municipal regulations.
Finally, in 2011, Terna, together with ANIE (National Federation of Electricity Companies) started up a technical work group on environmental matters connected specifically to the construction, maintenance and demolition of power lines; the work group was established based on the need to compare and share experiences, problems and the relevant proposals for proper management of environmental safety at work sites. The comparison concerns, in particular, waste management and the analysis of reference regulations in order to allow the standardization of practices and the management of activities at work sites.

Lines and local communities

SO10
SO9
SO1

The construction of new lines meets the technical requirements of the electricity system, such as the elimination of congestion and the risk of overload, as well as the increased production and consumption of electricity that accompanies the economic growth of Italy or of specific areas of the country. Terna includes the necessary new building activity in its Grid Development Plan, which every year follows a complex authorization process (see the "Integrated-planning Process" box, page 115). The development of the grid aims at the general interests of society, however, the environmental impact connected with the construction of new power lines focuses on the territory crossed by the line route. Furthermore, the population density of many parts of Italy and the artistic, cultural, and landscape value of many others increases the complexity of planning and the difficulty in implementing the projects. In response to these problems, Terna adopted an approach based on dialogue and consultation with local institutions to seek solutions that allow the local treasures and potential of the country's environmental and cultural heritage to be preserved.
The necessity of working on the existing lines is usually connected with the fact that many lines were constructed tens of years ago. The gradual urbanization of rural areas and the adoption of new regulations that change the parameters previously in effect with regard to the interaction between electricity lines and the surrounding territory, determine the need to update portions of the existing grid.

Consultation

EN26
EU19
EC8

Since 2002, Terna created a completely new scenario regarding the construction of infrastructures in Italy. In the practice that had been followed until then, discussion with local institutions started only at the beginning of the authorization process, when the planning of the infrastructure was already at the execution stage. Environmental considerations were

introduced at that stage through the Environmental Impact Assessment (EIA) procedure. This approach led to strong opposition by the local institutions involved and the related population, with the result that often changes in the original plan were required and the work suffered delays. In some cases, it was even impossible to find a feasible solution.
Terna decided to carry out **the discussion with local institutions before the strategic planning stage of the work** – the construction of new lines and stations – included in its Development Plan. Participation of local institutions in defining works that concern the territory reduces opposition during the authorization phase for the infrastructures, and facilitates acceptance and sustainability of the planned works. The method used provides for early consultation with local governments and other institutions at different levels (regions, provinces, and municipalities), based on shared criteria for characterizing the territory and aimed at finding the **optimal location for the new plants**. The solutions reached in this way are ratified by the signing of specific agreements between Terna and the above-mentioned governments. Ultimately, Terna's approach has entailed the voluntary development of a method of relating to local stakeholders based on the Strategic Environmental Assessment (SEA) of environment integration in the planning process. At that time the subject of EC Directive 2001/42/EC, the SEA was to be adopted by Italian law only many years later – in 2007, with Legislative Decree 152/2006 – and with considerably less complex implications as far as relations with local institutions are concerned. The choice of following the SEA method to construct a transparent, documented, repeatable, and participatory planning process was agreed on and developed by Terna with a national work group (the "SEA" Negotiating Group) formally established in 2005, in which the Ministry of the Environment, the Ministry of Cultural Heritage and Activities, the Ministry for Economic Development, and the governments of the regions and the autonomous provinces participated. The group's work has been supplemented by the gradual signing of memorandums of understanding and planning agreements with regional and local governments to formally establish the progress of the mutual commitments. Since 2002, Terna has signed agreements on the application of the SEA method with 18 Regions, including the Autonomous Province of Trento.

Over the years, the model based on the SEA has undergone significant changes, according to a complex and fruitful cooperation among the parties, and is currently organized into different levels of discussion, analysis, and assessment:

- **at the strategic level**, the reasons for developing the National Transmission Grid – i.e., the new work to plan in response to the problems identified – are presented (1:250.000 scale);
- **at the structural level**, the process shared with the territory of finding possible locations for the corridors begins. These are strips of land up to several kilometers that are suitable for hosting the planned work (1:50.000 scale);
- **at the execution level**, possible alternative locations for the project infrastructure are identified inside the chosen corridor as feasibility ranges for the route (1:10.000 scale), i.e. segments of land up to several hundreds of meters inside of which the project's route can be developed.

Criteria of territorial characterization

As part of consultation with local institutions, one of the most effective instruments for selecting the alternatives with the least impact consists in agreeing on the **ERPA location criteria (Exclusion, Repulsion, Problems, and Attraction)**.
The area in question, with its soil use classifications and its relative protection restrictions, is characterized according to criteria that express its greater or lesser suitability to host the different kinds of work. Working within the SEA group, Terna and the Regions agreed on a system of criteria based on four classes:

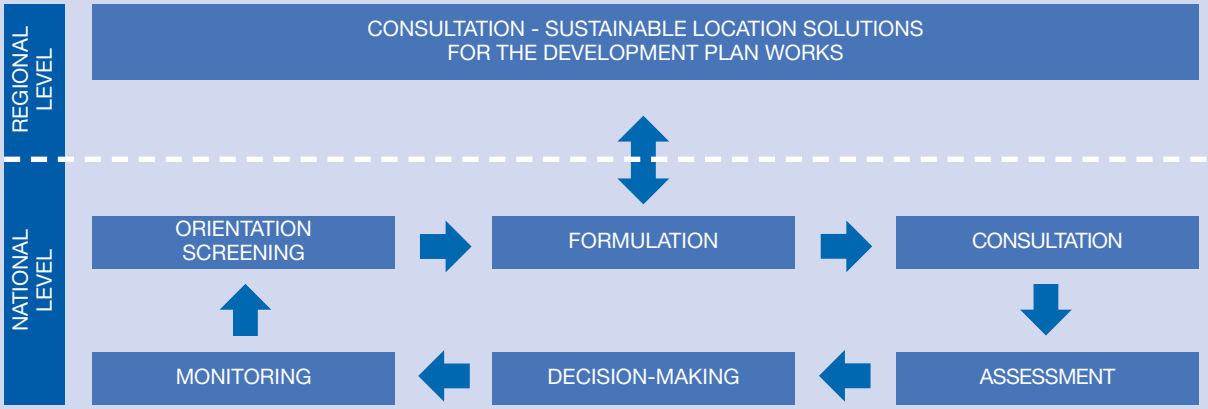
- **Exclusion:** areas in which any kind of construction is excluded.
- **Repulsion:** areas where it is preferable not to construct, unless there is no alternative or there are only ones that are even less environmentally compatible, and in any case in compliance with the prescriptive framework agreed on.
- **Problems:** areas in which the landscape is problematic for an objective reason documented by the bodies involved and that therefore require further territorial analysis.
- **Attraction:** areas to favor whenever possible after checking the area's load capacity.

Every class of the ERPA criteria includes several categories. Currently, the Exclusion criterion includes the areas the law recognizes as to be excluded absolutely, such as airports and military zones, and areas the law does not directly exclude, but which are restricted by specific agreements beforehand between Terna and the bodies involved.
The Repulsion criterion includes areas that may be taken into consideration only in the absence of alternatives; protected natural areas, with regard to which specific agreements are made, and areas that are to be taken into consideration only if there are no alternatives that are more environmentally compatible.
The Attraction criterion includes areas with good landscape compatibility and areas that already host line infrastructure, such as infrastructure and energy corridors, in which the location of a new line – if it is compatible with the area's load capacity – is more sustainable than in new areas that do not have any line infrastructure.
By using GIS (Geographic Information System) technology, all layers of information concerning the above-mentioned different types of soil use and protection restrictions (territorial, naturalistic, cultural, landscape, etc.) can be considered integrally, and can be suitably redistributed within the different ERPA criteria classes in order to identify localized possibilities – in terms of "corridors" – sustainable for development works of the NTG and consistent and compatible with the layout of the territory that they will affect.

The integrated planning process

S01

COEXISTENCE AND INTEGRATION OF DIFFERENT DECISION-MAKING LEVELS



The diagram shows the integrated planning process Terna developed in agreement with the national "SEA Group". This process promotes the consultation approach developed over the years by Terna ("regional level"), which has harmonized it with the procedure required by the regulations in force ("national level").
"Integrated planning" means that the activities of planning the electricity system are engaged in a constant dialogue with the activities of consultation. Terna believes that in this way it can contribute to ensuring the sustainability of NTG development planning, since it concretely incorporates the environmental considerations that arise from its dialogue with local institutions in the planning itself.
The national level is the formal level of the SEA procedure as established by law (Legislative Decree 152/2006 and similar), which applies to the Development Plan and provides for the preparation of an Environmental Report (ER) in which the effects that the implementation of the plan or program could have on the environment are identified, described, and assessed. The different stages into which the national level is organized are those of orientation, formulation, consultation, approval, and monitoring of the Development Plan, the related Environmental Report and the Preliminary Report (PR), which defines the orientation or screening stage.

The regional level represents the concrete level of the "dialogue with local institutions", i.e. of the precautionary consultation that Terna has carried out since 2002 with regional and local governments to seek and agree on the most viable and sustainable solutions for the location of the infrastructure necessary for the development of the NTG. Whenever agreements are reached with regional and local governments they are recorded in the Development Plan (DP) or in the related Environmental Report. An essential aspect of the integrated planning process described above is the coordination between the two levels, leaving appropriate decision-making autonomy to the regional level, which proceeds in any case according to the criteria and methods established by the national level (national "SEA Group").

The SEA portal

To improve quality and transparency with its stakeholders, in 2011 Terna created a new interactive corporate portal dedicated to the SEA procedure of the NTG Development Plan.
Through the SEA Portal (http://portalevas.terna.it) it is possible to consult not only the Environmental Report, with reference to mapping, but also data concerning the SEA monitoring of the implementation of the Plan.
Through the cartographic portal, moreover, one can follow the structure of the Plan on a regional basis, in the sole environmental, social, technical and economic aspect, or in its whole, utilizing evaluation indicators and concise sustainability indexes.
From the SEA portal it is possible to monitor via web, also from a cartographic point of view, the progressive implementation of the Plan, on the basis of specific indicators defined for evaluating variations, if any, that can occur between the coordinated action, the authorized project and the action taken.

EN26 Reducing the environmental impact

To reduce the impact of electricity lines on local communities and the environment, Terna can implement a series of solutions, which are described below.

Measures on the grid

Upgrading is complex work, which involves several grid components at the same time and often includes the dismantling of some grid segments and the construction of new lines.
Upgrading work consists mainly in:

- replacing plants with more advanced ones, such as, for example, introducing new 380kV connections to replace a larger number of lower-voltage lines;
- eliminating parts of the grid that are useless, following the construction of new infrastructures representing an upgrade;
- integrating new grid components, for example stations, to avoid having to upgrade saturated lines.

When upgrading is possible, the construction of a new plant may lead to the reduction of the space occupied by electricity lines, because of the removal of the old lines. Especially in the vicinity of cities, upgrading represents a solution to problems connected with the presence of infrastructures in areas that are being gradually urbanized. Overall, in the upgrading work provided for by the Development Plan, infrastructure demolition greatly exceeds construction, with a net positive effect in terms of freeing the local communities from the presence of electricity lines. The demolition of stretches of line made possible by the construction of new lines represents the most significant contribution in favor of the environment entailed by the development of the grid.
Laying cables underground eliminates or reduces the negative impact on the landscape that is typical of the overhead stretches of lines. For this reason, local institutions often request underground cables as their first option for the construction of new lines. Underground cables actually have a number of technical and economic drawbacks. They are less reliable over time than overhead lines and take much longer to repair in case of malfunction. For this reason they often do not adequately ensure the security of the electricity system and service continuity. Furthermore, underground cables imply a greater impact in the construction site stage, i.e. in terms of road systems, and entail construction costs that are higher than those of overhead lines (normally five to ten times).
Reclassification includes the upgrading of existing electricity lines to a higher voltage through the construction of new lines and towers to replace the existing ones. This work may entail the replacement of the old towers with larger ones that occupy more space, as occurs when, for example, a 130kV line is upgraded to 220kV. However, with respect to the construction of a new line, upgrading has the advantage of generally using already existing infrastructure corridors, thus avoiding the occupation of new portions of land.
Enhancement work aims at reducing the exposure of the local population to magnetic fields (See in this regard the box on "Electric and magnetic fields: the legal limits"), by for example, using higher pylons. Enhancement work may also include changing the corridor, while at the same time dismantling stretches near clusters of population.

Electric and magnetic fields: the legal limits

The main reference values for the emission of electric and magnetic fields currently provided for by the law (Minister's Decree of July 8, 2003) are the following:

- exposure limits: in case of exposure to electric and magnetic fields at a frequency of 50 Hz generated by electricity lines, the limit is 100 microteslas for magnetic induction and 5 kV/m for the electric field, understood as effective values;
- values of concern: as a precautionary measure of protection from possible long-term effects connected with exposure to magnetic fields generated at the grid frequency (50 Hz), in children's play areas, homes, schools, and places where people stay for at least four hours a day, the value of concern for magnetic induction is 10 microteslas, understood as the average over 24 hours in normal operating conditions;
- quality objectives: in planning new electricity lines near children's play areas, homes, schools, and places where people stay at least four hours a day and in planning new settlements and areas such as the aforesaid in the vicinity of electricity lines and installations already present, in order to gradually minimize exposure to electric and magnetic fields generated by electricity lines operating at a frequency of 50 Hz, the quality objective is set at 3 microteslas for the value of magnetic induction, understood as the mean value over 24 hours in normal conditions of operation.

The values of the three parameters, and in particular the value of concern (10 microteslas) and the quality objective (3 microteslas) show that Italian legislation has adopted the precautionary principle expressed by article 15 of the Rio Principles. Compliance with the law in its activities implicitly entails Terna's adoption of the same principle.

The online thematic mini-site on electromagnetic fields (EMF)

The "Sustainability" section of the website www.terna.it has been expanded to include a mini-site dedicated to electromagnetic fields (EMF), which provides accurate and easy to understand information on a subject that often raises unjustified alarmism.
Terna benchmarks the sites of other grid operators in order to evaluate the type and quality of information given. Subsequently, in collaboration with Fondazione Ugo Bordoni (FUB), the institute of high culture and research in Italy that boasts the best experience and expertise on the subject, the company created a work group to create a dedicated site.
The result is a site that combines scientific accuracy with direct and straightforward language on electromagnetic fields.
The site has 5 sections:

- electromagnetic fields, with general information;
- 10 Things to Know, a series of answers to frequently asked questions about EMFs, in particular concerning the effects they may have on health, the legislation in force, and what happens in the proximity of a power line;
- electricity grids and electromagnetism, with definitions, graphics and pictures which clarify the characteristics of the electric and magnetic fields generated by power lines;
- true or false, a quiz to test one's knowledge;
- more in-depth, with links to the sites of the World Health Organization and other institutions of reference, including the Bordoni Foundation.

Measures adopted in the planning stage

Terna can reduce the impact of its electricity lines on the landscape by identifying **routes in areas with good landscape compatibility and choosing towers that blend in well with the environment**. In the last few years, Terna has increased the alternatives at its disposal, among other things by having internationally famous architects design new towers.
Similar considerations hold for the construction of power stations. Stations have a much greater, albeit more limited, impact. In some cases, Terna plans to plant masking trees.

Mitigation

With regard to existing plants, mitigation measures aim at **reducing their visibility and/or improve their integration in the surrounding area**. In particular, Terna devises masking systems for station fences, upgrades the buildings, and uses naturalistic engineering techniques. (For further examples, see the "Management of impacts on biodiversity" section.)
These solutions also represent the basis for developing criteria for the design of new plants.

EU13

Construction-site management

For the management of construction sites, Terna has equipped itself with Operating Instructions – "Management of environmental aspects during plant construction" – to ensure compliance with the environmental policy adopted by the Company. It provides in particular for **the construction site and the new service roads to be located in areas of lesser vegetative value** (agricultural areas) whenever this is compatible with the technical requirements of the plan.
However, if the areas regard natural or semi-natural habitats, after the work has been completed, the area concerned must be environmentally restored to a condition that is as close as possible as the previous one. Scheduling the stages of construction must take into account the vital needs of the species that are potentially affected and avoid the activities with the greatest impact during the periods when the species reproduce.
Furthermore, particular care must be taken in managing the waste produced on the construction site in compliance with the relevant regulations in force, such as avoiding spills and the temporary storage of polluting substances.

Contract work

The Operating Instructions "Management of environmental aspects during plant construction" provide instructions for minimizing environmental impact along the supply chain.
The obligations regarding the environment that apply to contract work entrusted to other companies were established according to the provisions of the applicable environmental laws and prescriptions of the ISO:14001 standard and include aspects such as: preventive measures against contamination of groundwater, the limitation of damage to vegetation, the management of accidents, minimization of air emissions and noise, vehicle use, and the correct management of waste and excavated land (also see the paragraph "Relations with suppliers", page 104 on the subject).

The “Energy Bridge” between Sicily and Calabria: the Sorgente-Rizziconi power line

In June 2011, Luigi Roth, Chairman, and Flavio Cattaneo, CEO, in the presence of Stefania Prestigiacomo, Minister of Environment, presented the project and the works underway for the new 380 kV power line, the “Energy Bridge”, which is being built between the Sorgente (Messina) power station and the Rizziconi (Reggio Calabria) station, and which will be completed by the end of 2013.
The work will join Sicily and Calabria through the world’s longest 380 kV alternating current connection – a 105 kilometer long connection, 38 kilometers of which consist of a submarine cable. The power line will improve the quality and safety of the Sicilian electricity grid, which is obsolete and poorly connected with the rest of Italy. Once finished, the work will yield numerous benefits, also in terms of the environment: while 82 kilometers of new lines will be built in the provinces of Messina and Reggio Calabria, 67 kilometers will be buried and 170 kilometers of existing overhead lines will be demolished.

Safety and economic benefits

The work will allow for an overall savings for companies and families of nearly 800 million euros a year, thanks to the annulment of the price differential of energy in Sicily, which is currently 40% higher than the rest of Italy. The difference is due to an energy generation capability on the island that is less efficient than the rest of Italy, resulting in less competition. The construction of the power line, which will improve the connection between Sicily and Calabria, will allow for a greater use of energy flow produced by more efficient production plants in the south of Italy, thereby increasing competition which will result in a decrease in energy prices.
The work will also reduce the risk of blackouts in Sicily and will increase the safety, efficiency and quality of the electricity service in the entire area.

Environmental benefits

The “Sorgente-Rizziconi” connection will allow the removal of more than 170 kilometers of obsolete overhead lines (87 in Sicily and 85 in Calabria), significantly reducing the impact of electricity infrastructures on the territory involved.
The overhead part of the new connection, characterized by lines with a record single span of 1.3 kilometers in Scilla, uses huge single pole pylons - high tech innovative tubular supports built, for the first time in Europe, with mechanical characteristics that make them particularly suitable for installation in inaccessible areas. For example, a 20-kilometer long overhead connection from the station in Villafranca to the station in Sorgente will be entirely built using a total of 45 new supports. Due to their compactness, which reduces visual impact and has a minimal encumbrance on the ground, which is 25 times lower than that of the traditional truncated pyramid pylons – 5/6 sqm versus 150 sqm – the tubular supports are a valid alternative to traditional pylons.
The submarine part of the work, on the other hand, which runs 38 kilometers under the Strait of Messina, will be constructed by laying cables in a single phase and reaching over 370 meters in depth in the Tyrrhenian Sea.
Moreover, in order to safeguard the territory, care was taken by Terna to avoid crossing the “Dorsale Peloritana” (Peloritana main line), in the province of Messina, and, in particular, the Site of Community Importance, “Antennamare-Curcuraci”, with an overhead line; the existing energy corridor (on the Sicilian side) will be used, so as not to occupy non-infrastructured areas. Furthermore, attentive environmental monitoring will be carried out on the construction sites through periodic inspections on the status of water, vegetation and fauna.

EN26 EN12 Biodiversity

Terna's plants are disseminated throughout Italy in a grid that extends for nearly 57,000 kilometers. The grid's relation with the surrounding natural environment and its impact on biodiversity take on different characteristics during the construction of new lines and the operation of existing ones. **During the construction stage, the impact on biodiversity is connected with the activities on the work site:** the opening of passageways in order to build the towers, excavation of the earth, and the removal of left-over materials. The construction of new lines and stations requires special attention if it takes place in the vicinity of or inside protected areas.
Once the line has been constructed, it has a two-fold relationship with biodiversity. On the one hand, **the route of the line can be a factor of growth for biodiversity** and protection for several species. For example, when lines cross large open areas or extensive areas of grain monoculture, the towers and their bases represent "islands" of concentrated biodiversity. Tower bases – especially the larger ones that support high-voltage lines – are the only zones spared from intensive agriculture, with its land transformation and use. These are places where spontaneous grasses and brambles flourish in which wild rodents find shelter, since their den systems are not periodically destroyed by plowing. They are also places with concentrations of predators of the rodents, i.e. birds of prey. Birds, especially rapacious ones, commonly use electricity lines and their towers as both posts for observing the surrounding area and structures for nesting.
On the other hand, lines have potentially negative effects on biodiversity, that regard birds in particular. The risk of electrocution should not concern Terna's lines, since it is connected with the narrow space between the typical wires of low- and medium-voltage lines, which can electrocute birds – especially large ones – that cross their route. However, high-voltage lines can entail the risk of collision. The actual occurrence of collisions depends on the density of the birdlife and the frequency with which birds fly in the vicinity. The important factors in this regard are the routes of migratory bird – which are especially important in Italy, a bridge between Europe and Africa – the location of wetlands in the area, and the presence of protected areas, reserves and parks.

EN26

A radar for migratory birds

For the construction of the Sorgente-Rizziconi line, whose route includes an overhead part in the proximity of the Strait of Messina, for the first time in Italy, Terna has experimented with using radar to monitor birdlife passing by the future route of the line. This particular attention is justified by the importance of the Strait of Messina for migratory birds who arrive in Sicily from Africa and then travel on to the peninsula through the strait in the area around Scilla. Observations were carried out for two weeks during the migration in spring 2010.
The radar system punctually registered the number of crossings, the altitude and the flight direction of the birds in transit. The experiment scientifically measured the potential impact of the projected line on the migratory area of the trans-Saharan birdlife by clearly identifying their flight pathways and altitudes. This made it possible to avoid that the lines involved significant risks for migratory birds.
The new line will play a principal role in developing the "green" energy sector, and will bring about significant benefits for the electricity system; it will, in fact, allow more wind farms, which are experiencing rapid growth in Sicily and in all of southern Italy, to connect to the Sicilian grid, which will make it possible to export renewable production (wind and solar) of over 700 MW from the island to the mainland.

EN11 Lines in protected areas

Considering the importance of the proximity of protected areas or in any case of natural interest areas for the risk of a negative impact by Terna's plants on birdlife, the interaction between lines and such areas is constantly monitored. Given the extension of the grid all over Italy, the main instrument for identifying the critical stretches of line is a complete territorial database with data from ministries and the Regions. These data were acquired through data-exchange protocols for the purpose of applying the SEA to the NTG Development Plan.

The data collected were harmonized and included in a standard cartographic system at the national level. In addition to the location of electricity lines, the main information included in the data base regards geological, hydro-geological, naturalistic, and landscape aspects, including:

- degree of seismicity;
- climate data;
- polluted sites;
- the official list of protected areas, fluvial parks, natural parks, reserves, terrestrial and marine national parks;
- Sites of Community Importance (SCIs) e Special Protection Zones (SPZ);
- Important Bird Areas (IBA);
- landscape-risk map;
- legislative restrictions and administrative boundaries.

With the support of the database, Terna has made an **inventory of possible interference between its structures (lines) and protected areas or areas with high biodiversity**, by cross-referencing data (through the use of cutting edge GIS - *Geographic Information System* - instruments) relative to electricity grids with data regarding the land. Considering all the kinds of protected areas established by different laws (national and regional parks, national and regional reserves, SCIs – Sites of Community Importance, SPZ – Special Protection Zones) and eliminating overlaps, **9.3% of Terna's grid (5,385 km)** crosses protected areas for stretches that range from a few hundred meters to several tens of kilometers.
In all, net of overlaps, protected areas cover 22.3% of Italy's territory.

Management of impacts on biodiversity

Terna manages its impacts on biodiversity with a series of integrated instruments that consider such impacts right from the planning stage and, whenever necessary, the adoption of appropriate mitigation and compensation measures.
The approach is primarily preventive. Beginning in the planning stage, Terna considers **the need to preserve the environment by seeking solutions agreed on with local governments** regarding the location of its electricity infrastructure. Like other environmental variables, biodiversity – and in particular the presence of protected areas – therefore represents an important input in the sustainability-based planning of grid development. The biodiversity features of the areas that could potentially host new infrastructure are carefully studied. The information collected becomes part of the criteria determining the final route and is available in the parts of the Environmental Report containing regional details that accompany the Grid Development Plan.
This approach was confirmed in the memorandum of understanding signed by Terna and the WWF (see the box below), which provides for, among other things, the incorporation of environmental criteria consistent with the WWF's conservation strategy in the planning of new lines.

EN13

Completion of Terna's works in three WWF Oases

WWF Oasis in Padule-Orti Bottagone (LI).

Started in 2010, the first three environmental restoration and mitigation projects envisaged by the strategic partnership between Terna and WWF Italia and prepared in collaboration with WWF Research and Planning, were implemented and presented to local institutions and media.
In spring 2011, following the occasional suspension of activities at the worksite so as not to interfere with the nesting season, the works in the Tuscan Oases of Stagni di Focognano, on the Florentine plain, and Padule Orti-Bottagone, in the municipality of Piombino (Livorno) were completed.
In **Focognano**, a lake Oasis that spans 35 hectares and is only 10 kilometers from the

historic center of Florence, the presence of two HV electricity lines with two supports placed directly in the pond, and two at the edge of the area, has oriented the works in the direction of mitigation of impact on birdlife. High voltage cables are not easily seen and pose a potential danger to birds in flight who use this Oasis as a stop-over, such as the blackwinged stilt, the red heron, the little egret and the little bittern. In order to minimize such risk, Terna has constructed actual road signs for birds that cover over 1000 meters of electricity line. The installation of 108 "anti-collision spires" was carried out by specialized technicians thanks to a spectacular helicopter maneuver. These are special colored visible spiral-shaped devices wrapped around guard- wires whose purpose is to avoid collisions, while the hissing of the wind also makes them effective at night. In Focognano, Terna has also set up artificial nests on some pylons, complete with webcams, in order to encourage reproduction of Kestrels and allow for monitoring.

With respect to the **Padule Orti-Bottagone** Oasis, the WWF-Terna goals are to significantly increase the naturalistic potential of the area together with the strengthening of infrastructures for the management, fruition and monitoring of the species present. In this area, which includes six different habitats of community interest, and which is divided in two by the provincial road, the first ever "condo" for birds in Italy was built. It is a special watchtower where 154 nests of different shapes and sizes have been placed and which welcomes, apart from visitors and birdwatchers, martins, sparrows, swallows and swifts. Only a few months after the installation of the condominium, 5 couples of Italian sparrows and 4 couples of starlings nested and all the species arriving from Africa that the "houses" are intended for (martins, swallows and swifts) have already gone inside and surveyed the special structure, and may nest there in the upcoming seasons. As a result of this structure, Orti Bottagone was awarded the prize of "Most Beautiful Oasis" at the end of 2011 by EBN Italia, the Italian Bird Watching Organization for the promotion and enjoyment of oases and nature reserves.

Terna also built in Orti-Bottagone a watching post, a watchtower, an underpass that guarantees visiting continuity despite the provincial road that cuts across the Oasis and new paths for exploring the beauties of the area, including a special pathway on piles, shielded by a wall with slits for enjoying walks only a few centimeters from the water without disturbing the flamingos, blackwinged stilts, teals and cormorants stopping in the marsh.

Terna's initiatives in these two Tuscan oases were presented to the citizens, institutions and local media at an event organized by WWF Italia in the Palazzo Appiani in Piombino, which was followed by a guided tour of the Orti Bottagone Oasis. The meeting in Piombino was also an opportunity to present video and hardcopy materials (brochures and maps of the Oasis) which were prepared for visitors to the Stagni di Focognano and Orti-Bottagone Oases.

In the fall, the works on the third WWF Oasis, the Sicilian Torre Salsa (Agrigento), were concluded and it, too, was chosen because it is typically representative of Italian territory.

The main objective of the project was to increase the use of the Oasis in terms of nature tourism and didactic and scientific research activities. The result is an outfitted overlook facing the sea from which one can admire the hundreds of egrets, herons, spoonbills, the European honey buzzard, and cranes who in the spring and fall pass through one of the most important migration routes on the peninsula, as well as the peregrine falcon who nests on the imposing rocky sea cliffs along the coast. An open-air green room was created, protected by a tensioned structure in wood and cotton, fully removable, as well as a pathway with benches, informative lecterns and boards so that everyone can discover and enjoy the incredible variety of life that the Oasis hosts.

Terna wanted to contribute to better management, surveillance and monitoring of the area by strengthening the physical and technological infrastructures (fences, railings and a system of closed circuit cameras) that will help to protect it from fires, poaching, littering or straying off-trail, which are the main threat factors for this delicate ecosystem.

In November, the works undertaken in the Sicilian Oasis of Torre Salsa were presented to the citizens, the institutions and local media at an event hosted by the Province of Agrigento.

Once this first plan has been completed, the agreement between the WWF and Terna envisages restoration and environmental requalification projects in the Gran Sasso National Park and Monti della Laga in Abruzzo, as well as the Pollino National Park in Calabria. In both cases, upgrading of the National Transmission Grid will take place, with the subsequent removal of stretches of lines, which is an interesting opportunity for environmental requalification of the old line routes. The environmental restoration works will begin once the removal activity has taken place.

In spite of the measures adopted in the planning stage, there may be interference between a given infrastructure component and several species or habitats. To reduce such interference to a minimum, measures of environmental mitigation are adopted during both its construction and its operation. In the event such measures are not sufficient to reduce the interference to levels of little significance, environmental compensation measures are adopted, i.e. actions in areas near the electricity lines.

The main **mitigation** and **compensation** measures involve:

- **environmental restoration** consisting in the construction of naturalistic engineering works to regulate the surface outflow of meteoric water and thus control the phenomenon of soil erosion;
- **reforestation**, through the planting of native species of trees and shrubs belonging to the vegetation of the area;
- **turfing** by sowing seeds belonging to native species together with natural fertilizers and adhesives that help them take root. The use of native species prevents the phenomenon of floristic pollution via the introduction of species that are extraneous to the environment;

EU13

- **compensation**, i.e. offsetting the cutting down of trees along the planned lines by planting trees of the same species in equivalent places.

EN13

With regard to the species of flora and fauna potentially involved, see the 2011 Environmental Report, published in the "Electricity System" section of Terna's website.

During the construction of infrastructures, the habitats and species of the flora and fauna concerned are monitored. This is to check the actual appropriateness of the mitigation and compensation measures adopted in order to constantly assess their effectiveness and, if necessary, to make corrections. Specifically, environmental analyses are performed before construction; the data obtained are then compared to those from samples taken subsequently in order to promptly identify the appearance of any signs of deterioration.

As far as existing lines are concerned, Terna has tried out systems of mitigation regarding in particular the interference between lines and birdlife, which are described in the following section.

Terna is also investigating the possibility of using the lines of the NTG to support environmental monitoring. The installation of specific sensors on pylons would enable the implementation of programs for environmental data collection agreed on with local governments and park agencies. In this way, in addition to expanding the range of potential uses of its transmission infrastructure, Terna could make a significant contribution to the monitoring and management of biodiversity and the environment.

EN13

EU13

Masking the power stations in Chignolo Po and Maleo

Following the construction of the power stations in Chignolo Po and Maleo, work was undertaken to mask the infrastructures through the use of natural engineering techniques.

The works concerned the perimeter area of the power station (nearly 30 sq m) and included planting and hydro seeding, with the two-fold objective of consolidating the land and masking the electricity infrastructure. In addition, native trees and shrubs were transplanted, such as, for example, four oak trees at the Chignolo Po station.

Works commenced September 2011, upon the definitive closure of the civil work site, and were terminated in November 2011.

For the next three years the plants will be inspected to ensure they have rooted, and general maintenance will be performed.

EN14

Studies on electricity lines and bats

Interest in bats is on the rise. The UNEP Convention on Migratory Species and the European Agreement for the Protection of Bats (EUROBATS) celebrated 2011 as the European Year of the Bat and 2012 as the International Year of the Bat.
At present, however, there are no studies that discuss the effects electricity lines might have on bats, and what mitigating measures could be taken.
Terna has started research with the goal of:

- describing what aspects of bat ecology could be affected by possible interaction with high voltage (HV) and extra high voltage (EHV) lines;
- analyzing the literature on a national, European and international level concerning the subject and other potential problems connected thereto;
- going into depth on the subject by consulting with international experts in the field;
- providing technical charts concerning the biology of species potentially affected by the construction of new HV and EHV lines.

Through bibliographic research and consultation with international professionals and experts in the sector, the study went into depth on the biology and ethology of the species.
An in-depth examination showed that the subject matter has not been developed yet in Europe and no data exist in this regard. The study concluded that as far as bats are concerned, HV and EHV electricity lines do not pose obstacles for them. In fact, the examination excluded the possibility of collisions, or interference with hunting, flight or migration. With respect to the loss of habitat, a catalogue containing possible mitigating actions that can be undertaken has been proposed. Such actions, after adjustment to tailor-fit exact needs, can be included into future Environmental Impact Studies. For each species of Italian bats, a file has been prepared that summarizes the distribution, the ecology of the species, potential impact and an analysis of flight in relation to the presence of different supports.
Of special interest is how the pylons are used, in particular how the space between the pillars of the pylon and the wall of the nesting house for birds of prey is being used by bats as a daytime shelter, first discovered in 2011 by ornithologists who collaborate with Terna (see box page 125).

EN13
EU13

Recovery and restoration of building site areas in Val D'Ossola Sud

Within the upgrading of the electricity grid in Val d'Ossola Sud, works have been undertaken for the restoration, mitigation and environmental compensation of the areas affected by the works.
The works, which were carried out between March and April 2011, provided for:

- the forestation of the areas through the planting of dense, tall shrubbery that have a fast growth rate;
- inspection and pruning of volunteer plants and exotic invasive plants around the areas affected by the forestation.

The choice of planting shrubs was determined also by the desire to have a type of tree that reaches a maximum adult height of 5/6 meters, so as not to interfere with the line cables.

EN14 Lines and birdlife

Lines have potentially negative effects on birdlife. While the risk of electrocution characterizes low- and medium-voltage lines, Terna's high-voltage lines can be dangerous particularly for the risk of collision. This is why on stretches of line characterized by the frequent presence of birds in transit, the Company has installed special devices called "dissuaders", which, with their encumbrance and the noise made when they are blown by the wind, make the lines easier to perceive by the birds in flight.

DISSUADERS FOR THE BIRDLIFE PRESENT ON THE NTG

	2011	2010	2009
No. of lines concerned	40	37	30
Km of lines concerned	171	159	146
Total No. of dissuaders	**9,116**	**8,917**	**8,845**

EN14

Criteria for location of dissuaders in the planning phase: the Trino-Lacchiarella power line

In 2011, work began on the construction of the 380 kV Trino- Lacchiarella line. 70% of the line will be built with low environmental impact supports. This solution was decided on taking into consideration the context of the landscape being crossed, as the more harmonic shape of a single pole minimizes the visual impact of the future line.
In compliance with the requests of the Technical Commission for the Environmental Impact Assessment EIA-SEA, the Region of Piedmont and the Ministry for Cultural Heritage and Activities, Terna investigated the technical feasibility of placing dissuaders in order to mitigate the potential impact of the power line on birdlife.
With the aid of the scientific contribution of the Animal Biology Department of the University of Pavia, Terna identified the segments of the power line that should be made more visible with the installation of spirals. An analysis also indicated that only the guard wires needed to be made more visible, whereas the conductors, having three circuits, (i.e. there will be three cables for each phase), are easily seen and recognized by birds, and do not pose a threat.
Once the segment was identified, and the need to place dissuaders only on guard wires was assessed, the structure of the planned supports was verified, taking into account the installation of the spirals on the guard wire with a center distance of not less than 25 meters. This distance is based on the most cautious indications for birdlife recommended by the Department of Animal Biology of the University of Pavia.

In 2008, **Terna signed an agreement with the LIPU** (the Italian partner of Birdlife International) **for a scientific study of the interaction between high-voltage lines and birds**.

The project represented an important opportunity to systematically study for the first time, and on a large national scale, the actual interactions of birdlife with the high- and extra-high-voltage lines of the National Transmission Grid (NTG). The only studies available regarded the phenomenon of the electrocution of birds whose wings touch two wires at the same time, which is typical of low- and medium-voltages lines.
LIPU's study highlighted that collision risk for birds with HV and EHV electricity lines is low in 4 out of 7 areas monitored. Near the lake in Montepulciano and in the Mezzano area – which are wet areas subject to migratory flows – increased risks seem to exist for birds, suggesting additional observations also with new experimental approaches, for a correct risk assessment and identification of possible mitigation measures. The study conducted on the Strait of Messina stressed the need of a more detailed monitoring with the aid of appropriate technology, such as the use of radar.
For some time Terna has been involved in experimenting with alternative uses of electricity lines to benefit biodiversity. Worthy of particular mention is the placement of nest boxes for predatory birds atop the pylons. Numerous studies have indicated that electricity lines function as observation points for predatory birds on the hunt, who perch on the supports due to the height and protection they offer from predators.
In 2011, Terna continued its support to the "**nests on pylons**" initiative in collaboration with the ornithological association *Ornis italica*, which, through the years, has resulted in the installation of nearly 500 boxes suitable for bird nesting. The

constant monitoring of the boxes by a group of researchers has allowed for the collection of biological and ethological data, and has shown a positive effect in terms of biodiversity. Among the main species that have occupied the boxes is the kestrel, a species of small falcons that have adapted to living in manmade areas, the horned owl, and the European roller. Also in the 2011 reproductive season, the boxes on the pylons were monitored to collect data on reproduction (see the following box).
In 2011, Terna continued its collaboration with *Ornis italica* with the Birdcam Project, which entailed installing cameras in artificial nests so that the reproductive period of the birds could be followed online at www.birdcam.it, as well as on Terna's website. The webcam connection also allows for the remote scientific observation of animal behavior by researchers.

The 2011 reproductive season in the nests on Terna's pylons

Kestrels, cuckoo falcons, peregrine falcons, horned owls and European rollers are the species of birds that have chosen to spend their reproductive seasons in the artificial nests on Terna's high voltage pylons.
The monitoring of artificial nests was carried out by *Ornis italica*'s ornithologists, who, in 2011, inspected nearly 10% of the over 500 nests placed on the grid's pylons in Lazio, Tuscany, Umbria and Emilia-Romagna.
In the Parma area, 31 kestrel nests were monitored and 99 chicks were ringed. For the first time, a nest with a pair of cuckoo falcons was spotted with three chicks, all of which were ringed two weeks after birth. The nature of colonial falcons to reuse old nests lends hope that in 2012 this first couple and their chicks will return to settle more permanently in the area. The other new nests which were created to foster the reproduction of this medium/small-sized migratory falcon were, instead, occupied by kestrels. In the same area there was no evidence of European rollers or horned owls in the nests.
Also nests in the Mazzano area, in the province of Ferrara, which were installed for the cuckoo falcons, were occupied instead by kestrels. Completely unexpected, on the other hand, was the presence of bats (the Lesser Noctule) in daytime rest in a very tight space between a nest wall and the pylon support (see picture page 125).
Two nests located in the Ferrara area hosted pairs of European rollers, from which 8 chicks flew away: considering the rareness of the species in this area, the occupation of the nests is an important success, perhaps the beginning of a greater future colonization.
In Lazio, nearly 60 nest boxes intended for European rollers and horned owls have been monitored. With respect to 2010, the presence of pairs of European rollers has almost doubled (there were 15 in 2010, and 25 in 2011) and the number of horned owls has also increased. In all, 98 European rollers and 12 horned owls were born, the majority of which were ringed. No monitoring of the reproduction of kestrels took place in 2011.
In some cases, the nest box is outfitted with a webcam that provides the scientific community 24/7 – as well as enthusiasts – with round-the-clock viewing of all phases of reproduction, from the laying of the egg to its hatching and up to the moment the chicks spread their wings to fly away.
The adoption of new technology for the audio and visual transmission in HD has further improved the quality of the streaming. An "eggcam" was tested, which allowed for close-up shots of the egg being laid and, subsequently, cracking open. These novelties broadened the vast audience of enthusiasts: the first posting on YouTube showing an egg being laid was uploaded by an American birdwatcher.

Energy efficiency and climate change

Terna's business is the transmission of electricity and the Company does not carry out any production activities, which are among the most responsible for greenhouse-gas emissions in the electricity industry and businesses in general. For this reason, Terna is not subject to obligations to reduce emissions according to the Kyoto objectives, nor to emission trading schemes of any kind. Terna decided anyhow to being committed to limit its emissions on a voluntary basis.
In addition to monitoring and programs for containing its own direct and indirect emissions, illustrated in the following pages, some of the activities Terna undertakes account for significant reductions of CO_2 emissions from the electricity system as a whole. In particular:

- investments provided for in the Development Plan (page 138);
- management improvement for the safe operation of the grid (page 135) and a reduction in the resources supplied to the dispatching services market, which result in fewer production requests given the same service (page 92);
- the construction of photovoltaic plants completed in 2011 (page 36).

EN3-4 Energy consumption

The transmission of electricity requires the direct consumption of energy only for a few activities that support the service:

- fuel for the Company's vehicles (used for line inspections, repairs, and other activities mainly connected with the maintenance of lines and stations);
- gas oil for emergency generating sets, which are used only in cases where electricity – the normal energy source for equipment – is lacking, in order to ensure the control and restoration of the normal operation of the electricity system;
- gas oil and methane for heating, particularly in offices.

The indirect consumption of energy is represented by the electricity used to run stations and operating systems (more than 86% of the total) and in offices and workshops.
The following tables show Terna's direct and indirect consumption. The database for energy consumption is still being improved. In some cases (gas oil for heating) monitoring regards purchases, with the consequence that the changes from one year to another can reflect procurement cycles rather than reductions or increases in consumption; with respect to the indirect consumption of electricity (offices and stations), in 2011 the changeover from estimated data to data based on measurements begun. The published value is the result of an estimate allowing to cover 100% of plants and offices, and is based on exact measurements from meter readings of 79% of the power stations.
A comparison between the consumption registered and the estimated data obtained by using the same calculating method of past years indicated an overestimation of consumption for previous years, which were, therefore, revised downwards consistent with the new measurements. (Values published for energy consumed and for the corresponding CO_2 emissions differ, therefore, from those published in the previous two years).
In detail, in 2011:

- consumption of fuel (gas and gas oil) has increased by 3% as a consequence of an increase in the grid perimeter and managed assets, resulting in company vehicles having to cover increased distances;
- consumption of methane gas for heating has increased due to more severe climates in some areas. The increase in the consumption of methane in three years should be viewed in relation to the simultaneous reduction of heating gas consumption (representing 87% of the value shown on the table under the entry "Gas oil for generating sets and heating").

An increase in the consumption of electricity was registered, due to an increase (+5%) in the number of stations in 2011.

DIRECT AND INDIRECT ENERGY CONSUMPTION BROKEN DOWN BY PRIMARY SOURCE - GIGAJOULES [1]	2011	2010	2009
Direct consumption			
EN29 Gasoline for vehicles [2]	7,504	7,113	6,981
Gas oil for vehicles [2]	75,731	74,588	72,528
Methane for heating	9,468	7,277	6,144
Gas oil for generating sets and heating	11,289	12,890	13,279
Total direct consumption	**103,993**	**101,869**	**98,933**
Indirect consumption			
Electricity for stations and offices [3]	627.480	591,840	555,120
Total direct and indirect consumption	**731.473**	**693,709**	**654,053**

(1) The data regarding direct consumption in thousands of tons and thousands of m^3 are reported in detail in the indicator tables. The parameters specified in the Global Reporting Initiative's GRI-G3 protocols were used to convert the quantities of resources into gigajoules.
(2) Only the consumption of operating vehicles is considered and not that of managerial vehicles. The 2011 data is a result of exact measurements for the first half and an estimate – based on variations registered between the 2nd half of 2010 and the first half of 2011 – for the second half.
(3) Throughout 2011, surveying and in-depth investigation on electricity to supply stations and offices were carried out. In light of the results of said activity, it was possible to include more exact data into the table not only for 2011, but also with respect to what was previously published for 2010-2009.

In 2011, Terna created an internal work group, coordinated by the energy manager, for the rational use of energy. Through the Initial Energy Analysis, the group's activities will allow for fine-tuning the energy consumption database and will be aimed at:
- identifying different uses for energy, underscoring areas of criticality and the elements that primarily influence consumption;
- forecasting expected consumption and comparing it with actual consumption;
- including the evaluation of energy consumption into corporate processes;
- implementing energy policies.

Direct and indirect emissions of CO_2

EN16

Greenhouse-gas emissions connected with Terna's activities are caused by:
- direct consumption of energy sources (gasoline and gas oil for vehicles, gas oil for generating sets and heating and methane for heating);
- indirect consumption of energy sources (electricity consumption);
- leaks of SF_6 (sulfur hexafluoride), a greenhouse gas used in station equipment for its high insulating power;
- leaks connected to R22 refrigerant gas, used in air conditioners.

Leakage of SF_6 is the main direct source of Terna's greenhouse-gas emissions. From 2009 to 2011, the quantity of SF_6 present in Terna's plants increased by 77 tons (+23%). This trend is common to many transmission companies and is bound to continue in the near future because of technical reasons connected with the higher insulating performance of the gas and the reduced encumbrance of stations constructed with equipment containing SF_6 with respect to more traditional solutions. For this reason, the indicator that Terna considers is the percentage of leakage compared to the total quantity of gas contained in the equipment. Containment programs of incidence of SF_6 leakage are illustrated in the paragraph provided on page 135.

TOTAL DIRECT AND INDIRECT EMISSIONS OF GREENHOUSE GASES TONS OF CO_2 EQUIVALENT [1]	2011	2010	2009
Direct emissions			
SF_6 leakage [2]	57,406	60,313	68,522
R22 leakage [2]	25	240	1,104
Gasoline for vehicles	520	493	483
Gas oil for vehicles	5,605	5,520	5,368
Methane for heating	531	408	344
Gas oil for generating sets and heating	836	954	983
Total direct emissions [2]	**64,922**	**67,928**	**76,805**
Indirect emissions			
Electricity [3]	71,463	70,692	66,306
Total direct and indirect emissions [2]	**136,385**	**138,620**	**143,111**

EN29

(1) The conversion of direct consumption into emissions of CO_2 equivalent is made using the parameters specified by the Greenhouse Gas Protocol (GHG) Initiative. For indirect consumption of electricity, the conversion is made taking into account the weight of thermoelectric production in total Italian electricity in 2011. The reference for the breakdown of the production mix is the "Monthly report on the electricity system" for December 2011, which is available online at www.terna.it.

(2) From this year, with respect to direct emissions it was decided to report the amount of the leakage associated with the consumption of R22 (value previously included in the text). The data was also included in 2010-2009. As of this year, IPCC AR 4 conversion factors have been used, which brought about a variation of tons of SF_6 and R22 equivalent with respect to what had been previously published. The two above-mentioned variations consequently led to a variation in total direct and indirect emissions with respect to those previously published.

(3) Throughout 2011, surveying and in-depth investigation on electricity consumption to supply stations and offices were carried out. In light of the results of said activity, also data from 2009-2010 was reviewed downward, which were found to be over-estimated. Consequently, also the total emissions data has been modified.

CO_2 emissions: comparative data

Comparison between Terna and other companies on the subject of greenhouse gas emissions takes as a reference the total of direct and indirect emissions in thousands of tons of CO_2 equivalent.
Both the data from transmission companies (TSO panel) and the data from large Italian listed companies (FTSE-MIB) as well as from international leaders in sustainability (SAM - Supersector Leaders) were examined.
The data in absolute value are not representative of company performance concerning the efficient use of energy and the containment of climate altering emissions, which should be evaluated over time and with reference to normalization factors that eliminate the differences stemming from the different type of activities and the size of the company.
In the absence of normalization factors that are significant and valid for all sectors, it was decided that it would nevertheless be of interest – despite the limited comparability – to present company data on CO_2 emissions in absolute values. Said data, which according to the case takes on very different orders of magnitude, provides at least an indication on the relevance of greenhouse gas emissions – therefore of the materiality of their reduction in terms of sustainability – in different sectors and in different companies.
For example, within the TSOs, the highest data refers to Eskom, which operates in South Africa and which, among its activities, counts also the generation of electricity, whereas the lowest data refers to TDE, a small-sized TSO that operates in Bolivia and that works only in the field of electricity transmission.
In 2011, greenhouse gas emissions linked to Terna's activities totaled 136.4 thousands of tons of CO_2 equivalent; in 2010, for which comparison data is available, emissions totaled 138.6 thousands of tons of CO_2 equivalent.

TSO Panel: 16 available data; average CO_2 emissions: 25,938.9 thousand tons CO_2; lowest figure: 0.8 (TDE - Bolivia); highest figure: 230,300 (Eskom - South Africa). In this comparison, Terna ranked below the average, which is the highest among the averages of the three panels and is influenced by four transmission operators that also have electricity generation activities. The lowest figure refers to the smallest operator out of all those considered.

FTSE-MIB Panel: 18 available data; average CO_2 emissions: 10,802.5 thousand tons CO_2; lowest figure: 15.1 (Ubi Banca); highest figure: 116,645.0 (Enel). Terna ranked among the major Italian companies with the fewest emissions, well below the average and with total emissions just above those of banks and insurance companies which registered the lowest values.

SAM - Supersector Leaders Panel: 18 available data; average CO_2 emissions: 13,647.8 thousand tons CO_2; lowest figure: 34.2 (Itaúsa - Financial Services); highest figure: 146,274.0 (Stockland - Real Estate). Also in comparison with the global best practices of sustainability, Terna confirmed a quantity of emissions well below the average. The high standard deviation points to great variability among sectors, some of which are characterized by high quantities of CO_2 (for example, companies from the Oil & Gas sector).
The great variability of company data renders a graphic illustration of little importance; the table shows the lowest, average and highest figures of the three panels.

	Greenhouse gas emissions – thousands of tons CO_2 - 2010		
	TSO	FTSE-MIB	SAM - SUPERSECTOR LEADERS
Average	25,938.9	10,802.5	13,647.8
Max	230,300.0	116,645.0	146,274.0
Min	0.8	15.1	34.2
Standard Dev.	63,799.6	30,159.0	35,703.4
Terna		138.6	

For additional information on panel structure and generally on comparisons with other companies, refer to the Methodological Note, page 16.

Other indirect emissions of CO_2

EN17

In addition to the emissions corresponding to the consumption of electricity, other indirect emissions caused by Terna's activities are connected with:
- grid losses;
- employee flying.

Grid losses

EU12

Grid losses are defined as the difference between the energy injected by producers and imports and end consumption. The losses that are significant for Terna are those associated with the transmission grid. Both measurements are the result of an estimate, which breaks down the total losses of the electricity system (including the distribution networks) in proportion to the voltage levels, beginning with calculations performed assuming particular grid configurations and considering the losses on lines because of the corona effect, directly proportional to the voltage and because of the joule effect, directly proportional to the current, as well as losses in the transformers.

GRID LOSSES

	% with respect to energy demand			GWh		
	2011 (1)	2010	2009	2011	2010	2009
EHV grid	1.23	1.23	1.27	4,077	4,055	4,067
HV grid	1.39	1.39	1.44	4,633	4,608	4,612

(1) For 2011, data was calculated on "temporary operational data of the 2011 national electricity system"; the 2010 data refers, instead, to definitive available data and, therefore, differs from what was previously published.

It should be noted that Terna can only contribute to determining the extent of the losses, which are not completely under its control. To explain this, it is useful to distinguish between dispatching activities and activities for developing the grid.
Dispatching is necessary to ensure the constant balance between injections and withdrawals and to avoid problems of grid security and poor service. These activities take place, according to regulated criteria, within the framework of production set-ups determined by the energy market and therefore cannot be conditioned by Terna with the objective of minimizing losses. On the other hand, it should be noted that the energy market implicitly favors the more efficient productions and thus entails a trend of emission reduction that is much greater than that of grid losses.
With equal production set-ups, the activities of grid development would determine greater efficiency and therefore a reduction of losses. However, the development of the grid leads to production set-ups that were not previously possible and also enables consumption to increase. Furthermore, grid development itself is partly dictated by the need to connect new plants, whose location is not determined by Terna. The overall effect of grid development on losses is therefore not predetermined and not even under the control of the grid operator. Other factors can significantly offset the increase in efficiency ensuing from the development of the grid, in terms of both the absolute quantity of the losses and the losses as a percentage of the total energy consumed.
The CO_2 emissions associated with grid losses in 2011 were as follows:
- for the EHV grid, 1,671,570 tons/year;
- for the HV grid, 1,899,530 tons/year.

Terna is developing new specifications for the acquisition and use of medium-voltage/low-voltage transformers with "low losses of electricity". The adoption of the new specifications is in line with Terna's environmental and energy policy and with the Electricity and Gas Authority's resolution ARG/elt 348/07. The objective of the new specifications is the construction and acquisition of Ak class transformers, the highest performing, with an average reduction of load losses of 11% with respect to the current values. As far as no load energy losses are concerned, the adoption of the B0 class will lead to an average loss reduction of 28% with respect to the current values, which is non-negligible, given the fact that 50% of the transformers installed are in this working condition to guarantee a reserve that is ready in the event of a breakdown. The reduction will also have an impact on grid losses.

Employee flying

The emissions corresponding to employee flying recorded a slight increase with respect to 2010 (+3%), mostly miles and emissions related to international travels have risen (+36%), because of the increase in the Company's activities in the Balkans and the Mediterranean area (see Profile page 36).

INDIRECT EMISSIONS OF CO_2 FOR EMPLOYEE FLYING

	Miles			CO_2 emissions (tons)		
Kind of flight	2011	2010	2009	2011	2010	2009
Domestic	3,174,881	3,065,573	3,511,970	1,048	1,010	1,013
International	1,523,415	1,128,909	1,223,462	367	271	260
Intercontinental	521,433	945,914	1,618,459	109	195	306
Total	**5,219,729**	**5,140,397**	**6,353,891**	**1,523**	**1,477**	**1,578**

Other atmospheric emissions

Several refrigerating gases affect the environment since they damage the ozone layer, due to their greenhouse effect, or because they entail both of these effects. In the 2009-2011 period, Terna gradually extended its monitoring of the refrigerating gases contained in its equipment. The extension of the recording boundary included equipment that operates non-stop for the security of the electricity service and requires a larger number of cooling systems to maintain the temperature constant. In 2010, the monitoring of the refrigerating gases contained in Terna's equipment was extended to all corporate headquarters and local operating areas.

REFRIGERATING GASES – QUANTITIES KG	2011	2010	2009
R22	2,972	4,716	4,380
R407C	2,470	1,647	817
R410A	2,973	494	334
Other refrigerating gases (1)	686	210	6

(1) The quantity of "Other refrigerating gases" for 2011 regards by 80% the Rr134a gas, which is present in the headoffice in Rome.

Among the gases contained in Terna's equipment, only R22 has harmful effects on both the ozone layer and the greenhouse effect. The other types of gases present do not have any effect on ozone, but only a potential greenhouse effect.
For the R22 gas, the reading also includes consumption and implies an overestimate of the gas actually released into the atmosphere.
Actually, consumption includes the quantity of new gas injected in equipment during maintenance work, which consists initially in the controlled emptying of the above-mentioned equipment. These consumption quantities, which can represent 40% of the total, do not reflect actual atmospheric emissions with effects on the environment.

EN19

REFRIGERATING GASES – CONSUMPTION KG	2011	2010	2009
R22	23	221	1,017

The 2011 figure shows a substantial decrease in R22 consumption with respect to 2010-2009, reflecting the program for eliminating the gas in line with the restrictions introduced by the European regulations on the use of substances that reduce the ozone layer (EC Regulation n. 1005/2009 of the European Parliament and the Council).

EN18

Initiatives to reduce own emissions

With regard to the reduction of greenhouse-gas emissions, Terna concentrates on several voluntary programs concerning its main sources of such emissions:

- **a program for containing the incidence of SF_6 leakage:** Terna has implemented a number of initiatives, such as the early detection of leakage through on-line monitoring systems and the search for technological solutions to increase the air-tightness of the equipment and of components;
- **feasibility studies for initiatives on energy conservation** in power stations;
- **a program for reducing the consumption per km of the corporate vehicle fleet**, which entails a reduction of CO_2 emissions per km (g/km);

• **a program dedicated to the energy efficiency** of the buildings (corporate offices).

The first two cases are initiatives that can have a significant quantitative effect, but only in the medium-to-long term. The results of the third program are already tangible, but regard a source of emissions that is less significant from the quantitative point of view.

Reduction of SF_6 leakage

Thanks to its physical and chemical properties, which make it an excellent insulator, SF_6 (sulfur hexachloride) is used as an insulator in some kinds of electrical equipment, such as switches, current transformers and armored systems. The latter allow building power stations in smaller areas and with less maintenance needs. Because of these properties, it is foreseen that equipment with SF_6 will be increasingly used, as it is by other transmission companies abroad.

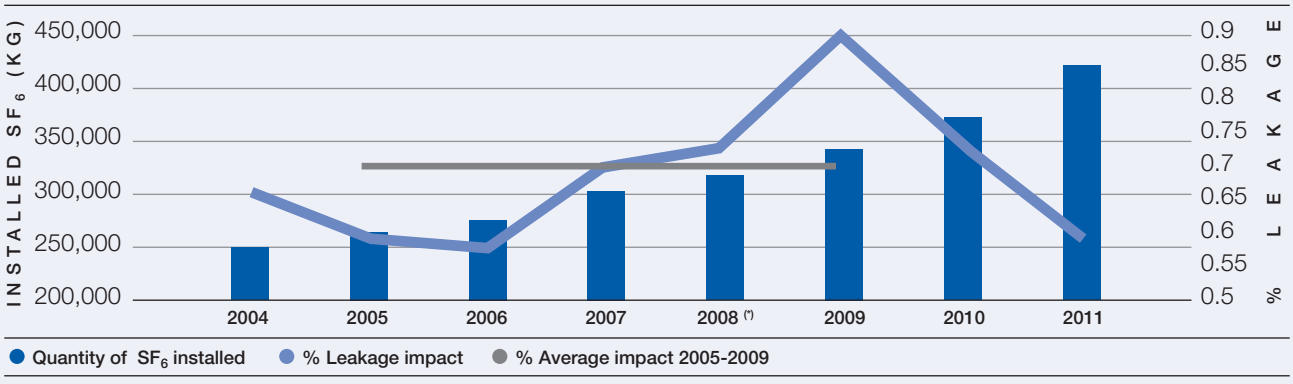
Part of the gas present in infrastructure is dispersed in the air because of the defective tightness of gaskets, during failures and sometimes also during pressure restoration. SF_6 is classified as a greenhouse gas. Terna therefore intends to keep SF_6 leakage under control to contain and, if possible, reduce its incidence with respect to the total quantity of the gas used. If the quantity of dispersed gas could be larger, because of the increased use of equipment insulated with SF_6, a reduction in the incidence of leakage would have a significant impact in terms of emissions avoided.

Although the way in which SF_6 leakage was handled as an indicator of its own performance with reference to climate change, identifying a target is still being examined carefully. In fact, there are several elements of uncertainty:

- a rise in awareness and attention to the subject is reflected in improved measurements of leakage, resulting in – for the years in which the containment activities were started (2009-2010) – what apparently seems to be deteriorating performance;
- the occurrence of breakdowns resulting in the significant leakage of gas – the probability of which increases given the growing use of SF_6 gas in the equipment of large stations – can considerably alter the trend;
- if, on the one hand, the installation of equipment with better withstanding performance tends to reduce the incidence of leakage, on the other, the obsolescence of equipment already installed could cause an increase in leakage;
- Terna already registers low values of SF_6 leakage in comparison to other TSOs (see the dedicated box in this paragraph), therefore, further reductions, which have growing marginal costs, can only be contained, with a high probability of being counterbalanced by adverse factors, already mentioned, of potentially greater impact.

Net of exceptional breakdowns, and possible effects of obsolescence of equipment in operation, it is estimated that the installation of new devices with greater withstanding (such as increased reliability transformers), begun in 2009 and continued in 2010 and 2011, may bring about an estimated reduction of 0.1% in the incidence of leakage over the five year period starting from the start of the installation campaign, without prejudice to the effective availability of the new equipment. Based on this estimate, and always net of the factors mentioned, it is expected that by 2014 the incidence of leakage may converge on values varying around 0.6%, considering that the average incidence for the period 2005-2009 was 0.7%.

SF_6 LEAKAGE



(*) Losses net of an exceptional event (1.07% event included).

In 2011, the incidence of leakage was 0.60%, down from the previous two years (2010: 0.73%; 2009: 0.89%). As illustrated up to this point, from the information available it is not possible to interpret the results as a convergence towards the objective. In 2011, the application of the registration procedure of SF_6 gas top ups has successfully continued aiming at identifying equipment with anomalous leakage and assess the feasibility of a program of targeted maintenance. The study results will enable the Company to establish a more precise target value for the incidence of SF_6 leakage.

Programs and initiatives for SF_6 gas management existing since 2008 are reported below:

- **procedure for monitoring leakage and reduction of dispersion** of the gas during pressure restoration: the procedure for reading requires the registration of the gas used and dispersed for every single station (up to 2007, measurement of the leakage was provided by the overall quantities of SF_6 acquired, net of new plants);

- **multi-function compact modules** (set of different kinds of equipment) with a reduction of at least 30% of the SF_6 necessary for insulation with respect to other equipment. After the positive trial results, the equipment is considered an applicative standard and will be installed as necessary;
- **detection systems with remote transmission of leakage of the gas in equipment:** after having completed the installation of the Lacchiarella power station, assessment of results for a possible widespread application is under way. The early detection by the remote-maintenance center of the equipment where the pressure of the gas is falling anomalously allows the Company to do targeted work on the equipment, thus also avoiding plant downtime because of insulator leakage;
- **new highly reliable (TA) measurement transformers sealed**, with maximum leakage of 0.1% a year: since 2010, the plan for replacing old equipment with new transformers is under way.

Energy saving in stations

Electricity is used in power stations to enable the equipment and its remote control to function.
The main sources of consumption are:
- cooling power transformers;
- external lighting;
- air-conditioning and heating systems in technical locations;
- auxiliary command, control, and protection circuits of all equipment and machinery.

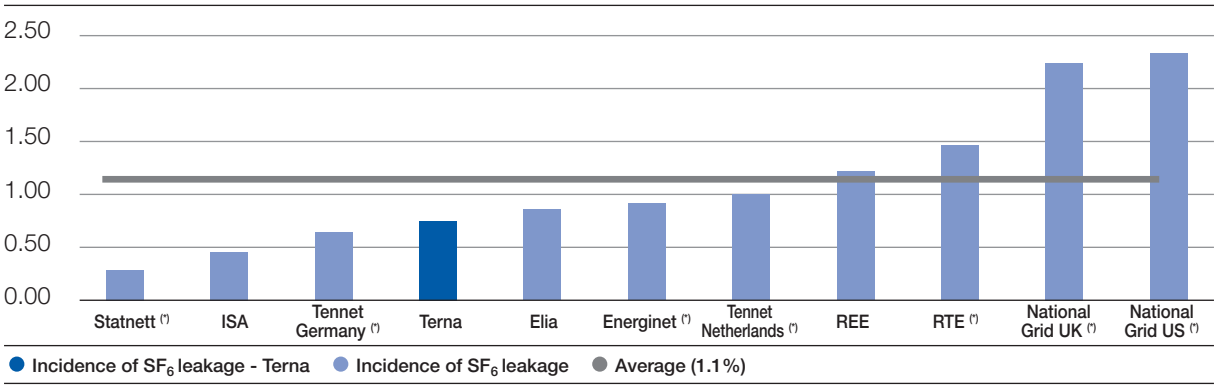
Although the energy consumed is only the quantity that is strictly necessary to ensure the operation, research of opportunities to save is sought for through:
- natural or automatic circulation systems that optimize the functioning of cooling pumps and fans in transformers;
- the installation on station buildings of photovoltaic panels that at least cover the consumption of the computers that manage the plants.

The measurement of the effects of the initiatives described will be possible only in the medium term, when the projects have reached a more advanced stage.

SF_6 leakage: comparative data

The comparison between Terna and other operators concerning SF_6 leakage is made by taking as the reference point the incidence, i.e. the percentage of leakage with respect to the total gas used.
Since the use of SF_6 gas is unique to grid operators, only the data of the companies belonging to the TSO panel were taken into consideration.
In 2011, the average incidence of SF_6 leakage for Terna was 0.6%; in 2010, the year for which comparison data is available, the incidence percentage was 0.7%.
When compared to other grid operators, Terna indicates an incidence of SF_6 leakage lower than average, confirming the results reported in last year's Sustainability Report.
TSO Panel: 11 items of data available; average incidence of SF_6 leakage: 1.1%; lowest figure: 0.3%; highest figure: 2.3%; standard deviation: 0.7%. Terna ranks well below the average for the incidence of leakage.
By comparing data with those belonging to 2009, which were published last year, for 7 out of 8 available data, no significant changes in incidence were recorded, which increases or decreases by 1-2 decimals.

INCIDENCE OF SF_6 LEAKAGE



(*) The incidence of leakage was calculated as a percentage of loss on the total gas installed in the equipment.
For additional information on panel structure and generally on comparisons with other companies, refer to the Methodological Note, page 16.

Reduction of emissions connected with energy consumption in offices

Since 2011, "Criteria for Energy Efficiency in Terna's Buildings" guidelines have been operational. These guidelines establish a common standard for constructing buildings with the lowest energy impact, and provide integrated criteria for the planning/upgrading of buildings. The aim of the document is to save energy over time, thereby reducing direct greenhouse gas emissions. For 2012, an information campaign and relative dissemination is scheduled, also for activities linked to the energy management system (see page 134 in this chapter on this subject).

EN5

In offices the main sources of energy consumption are connected with lighting, heating and air-conditioning, and the use of computers and printers.

In 2011, the Company measured the reduction of consumption obtained by the replacement of 156 personal computers models (only desktop). The new desktop models allow for an average saving of energy consumption equal to 80%.

Reduction of emissions connected with mobility

EN29

The Company's vehicle fleet – which is used mainly for inspecting and repairing lines – is not concentrated in only a few locations, but is used over a widespread area. Therefore, there is no problem of impact on specific areas, but a general pollution effect. The most important measure for reducing the impact of transportation on the environment consists in renewing the fleet every 48 months, carefully indicating technical specifications during the purchasing of the vehicles (devoting attention to the environmental impact) and carrying out scrupulous maintenance.

TERNA VEHICLE FLEET (1)	2011	2010	2009
Hybrid	9	9	9
Euro 5	138	97	79
Euro 4	985	1,009	1,033
Euro 3 (or lower)	219	273	346
Total vehicles	**1,351**	**1,388**	**1,467**

(1) The table shows the vehicles in Terna's fleet by December 31, that during the period in question refueled at least once as recorded in the fuel documents. Only operating vehicles are considered excluding managerial vehicles.

During 2011, Terna has confirmed the actions undertaken to reduce the impact of employee mobility on the environment consisting of:

- optimization of its offices localization in large towns (already carried out for Rome and Milan and planned for Florence);
- monitoring of employee travel;
- introduction of the use of equipment for videoconferences which can be connected with the equipment of suppliers, partners, and other Terna's offices;
- incentives for the use of public transportation through:
  1. easy terms for employees in purchasing annual passes (agreements have been signed with the public transportation companies of Rome and Milan, with 167 employees in Rome and 63 in Milan having purchased passes in this way);
  2. creation of services connecting two offices in Rome and one in Milan with the closest public transportation junctions at no charge to employees;
- courses on off-road vehicles regarding safety and emission reduction.

Terna uses operating vehicles daily to inspect lines and reach operating plants located throughout Italy. Such inspections often require the use of 4WD vehicles, since pylons can only be reached through unpaved trails.

Since July 2008, the Company has participated in Quattroruote's "10X10" project. So far, 35 companies participating in the project are committed to reducing the CO_2 emissions of their vehicle fleets. In joining the project, Terna confirmed its concern for reducing the impact caused by emissions deriving from its corporate mobility, and ultimately the fuel consumption and efficiency of its corporate fleet.

In November 2011, a campaign was launched to replace the remaining Euro class 3 and Euro class 4 vehicles, which should be completed in 2012 (see box "Sustainability in awarding tenders", page 106 of this Report).

The change in the vehicle classes – compared to what is provided for in the table – and the renewal of the vehicles will lead to improving the fleet's efficiency, with a reduction in consumption and emissions.

The replacement campaign, which involves nearly 80% of the fleet's vehicles, envisages, with respect to CO_2 emissions of vehicles used for business transportation, a compensation plan through the creation and protection of new green areas in Rome, Parco della Madonnetta, Madagascar and Costa Rica.

Reaching this objective is ensured through the collaboration between Terna, the vehicle suppliers and LifeGate's Zero Impact project.

Thanks to the creation and preservation of these wooded areas, in the next four years the carbon-dioxide emissions – quantified as more than 10,222,763 kg – generated by Terna's 840 operating fleet vehicles, will be offset.

Emissions were estimated on the average carbon dioxide per vehicle (from data supplied by the manufacturer) per kilometer driven and on the estimated number of kilometers covered each year by Terna's fleet.
The areas involved cover 14,000 sq m in Rome, 510,756 sq m in Madagascar and 2,019,848 sq m in Costa Rica.
Reforestation will compensate over 42% of the Terna fleet's annual CO_2 emissions.

The Development Plan and reduction of the electricity system's CO_2 emissions

The construction of the new lines and stations provided for by the 2012 Development Plan will produce positive effects not only in terms of service security and the end cost of electricity, but also of reduced emissions by the electricity system. Achievable upon completion of the Plan, the effects will be of three kinds:
- reduction of grid losses;
- improvement of the production mix and interconnection with other countries;
- connection of plants using renewable energy sources.

Overall, the reduction of emissions within the time frame of the 2012-2021 Plan could reach the value of nearly 11 million tons a year.

Reduction of grid losses

Grid losses depend mainly, but not only, on the length the electricity travels on the transmission grid. To simplify: with equal consumption the farther the point of withdrawal (i.e., consumption) of electricity from the NTG is from the point of injection into the NTG of the electricity produced, the greater the losses. Furthermore, holding length constant, losses are greater on lower-voltage lines.
Therefore, losses can be reduced by work that improves the mesh of the grid, i.e. brings the points of injection and those of consumption closer to one another. They can also be reduced by upgrading a grid segment, for example by replacing a 150kV line with a 380kV one on the same route.
When all the work included in the 2012 Development Plan has been completed, the decrease in peak losses could reach 200 MW of power, which corresponds to a reduction of energy losses in the grid quantifiable as nearly 1,200 GWh a year. Assuming that the reduction of such losses is equivalent to a reduction in production from fossil fuels, it is estimated that the above-mentioned work will lead to a reduction in CO_2 emissions ranging from 500,000 to 600,000 tons a year [(1)].

Improvement of the production mix and interconnection with other countries

One of the main objectives of the transmission grid development is to overcome the limits of electricity transfer among "electricity zones". These limits impose several restrictions on the possibility of production by generation units that are more efficient – i.e. less polluting in terms of CO_2 emissions – and at the same time render production from obsolete and inefficient power plants necessary for the security of the grid.
Together with the upgrading of interconnection with other countries, the work provided for by the 2012 Development Plan will render a production mix possible that is more efficient than the current one, with a larger share of production from plants with higher yields. The same quantity of end consumption will be possible with a smaller quantity of fuel, and the benefits can be quantified as a reduction of CO_2 emissions of up to 4,800,000 tons a year.

Connection of plants using renewable energy sources

The main contribution to the reduction of CO_2 emissions is due to the connection of plants producing from non programmable renewable sources (NPRS) which are considered in the 2012 Development Plan works. The production of energy from renewable sources has grown rapidly in the last few years. In particular, NPRS generating plants have considerably increased, especially in southern Italy and in the islands.
During 2011, new wind and photovoltaic plants have gone into service, with nearly 8,990 MW and 815 MW respectively of new installed capacity. One of Terna's main tasks is to plan the upgrading of the NTG in order to encourage production of electricity from renewable energy sources by trying to overcome any grid and operating limitations that could condition the injection into the grid of such energy, which is entitled to dispatching priority.
In this regard, the works included by Terna in the 2012 Development Plan will release nearly 4,700 MW of power from renewable energy sources, to whom the beneficial effects should be added related to the installation of widespread storage systems of total capacity amounting to nearly 240 MW, thus obtaining a reduction of emissions amounting to nearly 6,000,000 tons of CO_2.

(1) The estimate was made assuming equal conditions. A change in consumption or the location of production plants could lead to different results.

MAIN WORKS OF THE DEVELOPMENT PLAN WITH EFFECT ON ENERGY EMISSIONS FROM RENEWABLE SOURCES

Category	Works	Power from renewable sources (MW)
Grid upgrading indirectly functional for the reduction of operating limitations in dispatching generation, which favors production from non programmable renewable sources	380-kV "Sorgente-Scilla-Rizziconi" line and upgrading of the EHV grid in Sicily	1,000
	Upgrading of interconnection capacity between Sardinia and Corsica/continental Italy	500
	New 380-kV "Aliano-Montecorvino" line	900
	380-kV "Foggia-Villanova" line	700
	Upgrading of 380-kV "Foggia-Benevento" line	500
Work to upgrade and decongest EHV and HV grid sections into which production is injected from non programmable renewable sources	Upgrading the transmission grid in southern Italy	1,100

EU8

Priority to energy from renewable sources

In 2011, the injection into the grid of energy from plants powered from renewable sources has increased sharply with respect to previous years, by 18.8 TWh (6.5% of electricity demand in Italy) [4].
This increase is due to the growth of installed wind power (+13% year-on-year, for an installed capacity at the end of 2011 of nearly 6,200 MW) and to an increase of installed solar power (+260% year-on-year, for an installed capacity at the end of 2011 of nearly 12,500 MW).
The increase in the production from renewable sources satisfies environmental sustainability requirements, entailing a reduction of greenhouse gases, however, it has repercussions on the complexity of managing the electricity system, which is a consequence of the intermittence of the primary source and its unpredictability.
In order to adjust management of the electricity system to increased production from non programmable renewable sources, Terna has invested in technology and work methods for:

- improving real-time forecasts;
- optimizing the allocation of maintenance and the adjustment of operating procedures;
- adjusting defense systems;
- technical regulation.

Improving real-time forecasts

An accurate forecast of the injection of energy from renewable sources enables better dimensioning of operating reserve margins to be made available in substitution of renewable energy (if not available), with advantages in terms of both cost-effectiveness and security.
The investment made by Terna to improve wind forecasts through the use of self-learning expert systems has enabled the Company to reduce errors in forecasts of the injection from wind plants in 2011 to 11% – against 18% recorded in the previous year – reaching for the third year the improvement objectives as defined by AEEG (see the "Revenue structure and regulatory framework" section page 90).
The process of wind forecasts was also modified calculating, in addition to the forecasts up to the prior day, a re-forecast during the day of reference, with evident advantages in terms of reducing uncertainty concerning meteorological forecasts and consequent advantages in terms of the accuracy of the wind forecasts.
As a result of the growth of photovoltaic facilities, in 2011, instruments for forecasting solar production were introduced, with additional difficulties with respect to what was already developed for wind resources, due to a greater widespread presence of such systems, which are outside of Terna's control, given their connection to the distribution grid.

(4) Provisional 2011 data as of February 2012.

Optimizing the allocation of maintenance and the adjustment of operating procedures

The unavailability of grid elements because of maintenance work can result in a limitation of the grid's transfer capacity and, thus, of the production of the renewable sources plants concerned, in particular wind power plants connected to Terna's sub transmission grid.
Therefore, in order to maximize production from renewable sources, Terna equipped itself with instruments and methods for optimally allocating maintenance, which include the following criteria:

- long periods of unavailability, including those regarding grid developments in preparation of the upgrading of main lines with a high level of installed wind power, are allocated in periods with low windiness, which are identified through appropriate medium-term systems for forecasting;
- brief periods of unavailability are allocated according to short-term forecasts of wind production (for example, allocation 24-48-hours in advance on the basis of the forecast of wind in specific areas of Italy).

Operational procedures for real-time dispatching by renewable source plants underwent further revision, also coordinated with operators that were owners of the plants, in order to be able to define on short notice possible limitations to wind production based on more certain information.
Thanks to such instruments and work methods, Terna has managed to limit considerably the limitations of wind production regarding the maintenance of grid elements (63% reduction of limitation hours).

Adjusting defense systems

The defense systems of the islands have been revised to include corrective automatic controls in the event of accidents connected to a higher amount of renewable generation, also through inclusion of renewable sources plants in defense systems.

Technical regulation

In 2011, greater growth in solar installations has made it urgent to develop applicable technical regulations.
In this connection, Terna has updated the Grid Code to include technical descriptions of solar plants and a definition of management methods so that they can be fully integrated into the electrical system.
With reference to distributed solar generation connected to distribution grids, technical regulation has been started in concert with distribution companies, due to the need for greater coordination in managing the transmission and distribution grids to safeguard the service continuity of reciprocal users.

Terna-Legambiente agreement for a sustainable energy culture

Legambiente's President Vittorio Cogliati Dezza (left) and Terna's CEO Flavio Cattaneo (right).

The comparison with the environmentalist associations on themes of common interest was further enriched with a new and significant collaboration agreement.
On December 12, 2011 Terna signed a Memorandum of Understanding with Legambiente to promote all the initiatives necessary for disseminating an energy sustainable culture joining the development of the electricity system with that of renewable sources. Terna and Legambiente are both committed to promoting and disseminating knowledge on the energy world and to initiate joint activities for an environmentally sustainable energy transportation, starting from reducing CO_2 in the atmosphere.
The Memorandum, that is valid until the end of 2013, includes sharing an operational plan for exchanging information and opinions on themes of common interest, particularly regarding the need

for developing the National Transmission Grid (NTG) and the renewable energy sources.
To promote a proper approach on the first theme, Terna will arrange for technical analyses for measuring territorial and environmental integration of the works included in the 2012 and 2013 Development Plan and will analyze together with Legambiente the hypotheses of locating new electricity lines that will cross through sensitive areas of the national territory. The location choices for the electricity works will also involve Terna and Legambiente sharing any type of mitigation and compensation action for reducing to a minimum the visual and environmental impact. With respect to "green" energy, the Memorandum includes specific analyses and studies on the state of the art and the development scenarios of the renewable sources sector also in relation to the connection to Terna's grid of the renewable energy plants. This action is necessary for supporting the growth of the installations for which the company will provide on a quarterly basis, updated and additional information regarding development projects planned for promoting production.

Resource use and waste management

The production of a service does not normally require significant materials and similarly does not entail treatment of significant quantities of waste. The electricity transmission service is no exception. As far as the materials that enter and leave the production cycle of the service are concerned, the most significant consumption concerns energy and has already been discussed in the "Energy consumption" section.
However, the provision of the transmission service requires the construction and maintenance of a large endowment of capital goods: power lines (towers, wires, insulators), transforming stations (transformers, switches, other station equipment), and control systems are the main components.
Terna's use of materials regards preponderantly the construction of electric and IT infrastructure. Terna's waste management mostly relates to electrical infrastructures maintenance.

Resources

EN1

As far as materials are concerned, **Terna does not use raw materials, but electrical equipment**, wires, and other elements, which are combined to be utilized in providing the transmission service. The following table shows the main non-renewable raw materials used by Terna. The weight is calculated on the basis of the quantity used, the average or typical weight of the single elements, and the share of raw materials contained. In some cases the elements consist of a single raw material (for example, insulators are 100% glass or ceramic, terminals 100% aluminum), while in others an estimate was made of the main raw material (for example, copper accounts for 60% of the weight of an ATR transformer). Information is not currently available on the use of recycled materials by the supplier of the materials and equipment used (with regard to environmental criteria used in procurement, see the box in the chapter on Economic Responsibility).
The increase in the use of raw materials, in particular aluminum and steel, is due to the progress made on the construction of the new 380kV connecting lines included in the Development Plan.

PREDOMINANT RAW MATERIALS IN SUPPLIES – TONS	2011	2010	2009
Porcelain	967	663	494
Polymeric	322	350	244
Copper	2,569	3,853	2,628
Aluminum	9,588	4,927	2,224
Steel	23,875	17,114	6,496
Glass	2,078	1,523	1,191
Dielectric oil	974	1,413	781
SF_6	54	23	21

As of this year, quantities of dielectric oil and SF_6 gas found in supplies were included in the table. Both used as insulators in transformers in Terna's 454 stations.
In office work, the main consumable is paper.

PAPER CONSUMPTION - TONS	2011	2010	2009 (1)
FSC paper	70	83	53

(1) Coverage of paper consumption was not complete in 2009, the data in the table (53 tons) refers to 81% of employees classified as managers and workers.

Paper consumption refers to the quantities purchased, therefore the variation between 2011 and the previous year primarily refers to management of 2010 stocks during 2011. The 2010-2009 difference is connected, instead, to the data gathering perimeter, which was increased in 2010 with the inclusion of the headoffice in Rome where the company's day-to-day office and staff activities are concentrated.

EN2 **All the paper purchased since the end of 2009 has been made with FSC pulp** – that is, without any chlorine whatsoever – certified by the FSC (Forest Stewardship Council – www.fsc.org), which guarantees that the forests providing the cellulose are managed in accordance with sustainability criteria from the point of view of both the environment and human rights.

EN8 **Water is not part of the production cycle of the transmission and dispatching** of electricity. Normally the water used – for personal hygiene, cleaning offices, and air-conditioning systems – comes from aqueducts for civil uses. Consumption increased in the three-year period under consideration, being affected by the effects of the increase in the number of Terna's stations (+ 19%). The 2010 data, higher compared to the one registered this year, was due mainly to the leakage of two pipes in two local offices, which in one case was connected with ice on the plumbing and in the other with work carried out in the vicinity of the pipe.

WATER CONSUMPTION CUBIC METERS	2011	2010	2009 (1)
Water withdrawal (1)	176,525	184,979	158,942

(1) The data are recorded from the meters and bills of suppliers for the entire recording boundary.

It should be emphasized that the water supply regards not only the main headoffices, but also the over 400 stations belonging to Terna that are scattered across Italy. With the objective of being able to timely report any anomalies (high consumption, losses, etc.) the inclusion of water meter readings into the MBI information system used in managing lines and stations – once the monthly registration of consumption for all stations becomes routine – will allow for quick action to solve any problems which may arise.

Water consumption: comparative data

The comparison between Terna and other companies on the subject of water usage is made by taking as reference both total consumption and per capita consumption in cubic meters.
Both the data of individual transmission companies (the TSO panel) and that of large Italian listed companies (FTSE-MIB) and international leaders of sustainability (SAM – Supersector Leaders) have been examined.
In all the panels, the data indicate substantial non-comparability among companies, in that consumption reflects the different importance of the use of water in production processes, as well as the size of the company, not necessarily reflected by the number of employees. The highest per capita data among the three panels concerns Xstrata, a company in the United Kingdom that works in the field of resource extraction, whereas the lowest was Air France. Companies dealing with electricity generation that use water in the production cycle rank in the top of the per capita consumption ranking; companies that provide intangible services (such as banks) rank lowest.
Despite the intrinsic limitations present in the comparison, and lacking more efficient normalization factors for the number of employees, it was decided that it would nevertheless be of interest to present the main data on water consumption. Said data, in fact, though it could not be interpreted as significant of company performance in the efficient use of the resource, provide at least an indication of the relevance of water usage – therefore of the materiality of the subject in terms of sustainability – in the different sectors and in the different companies.
For 2011, the total and per capita amount of Terna's water consumption was 176,525.0 and 50.5 cubic meters, respectively; in 2010, the year for which comparison data is available, water consumption was 184,978.7 cubic meters in all, and 53.3 cubic meters per capita.

TSO panel: 12 available data (10 companies, one of which had different data per country);
- total water consumption – thousands of cubic meters: average 1,808,338.8, lowest figure: 1.5 (Resedur - Peru); highest figure 16,443,032.7 (AEP - USA);
- per capita water consumption – cubic meters: average 106,362.7, lowest figure: 10.3 (ISA - Latin America); highest figure: 878,742.7 (AEP - USA).

In this comparison, Terna ranks well below the average both for total and per capita consumption. The average is strongly influenced by the data of operators that handle not only electricity transmission and dispatching of electricity, but also electricity generation (4 companies) or the transportation of natural gas (3 companies).

FTSE-MIB panel: 24 available data (23 companies, one of which, Ansaldo, has different data per sector);
- total consumption of water – thousands of cubic meters: average 24,878.6 (Stmicroelectronics); lowest figure: 17.4; highest figure 328,700.0 (Enel);
- per capita consumption of water – cubic meters: average 478.8; lowest figure 12.9 (Banca Mediolanum); highest figure 4,729.7 (Enel).

Also in this case, Terna's consumption (total and per capita) ranked below the average. In particular, Terna's per capita consumption ranked slightly above the average of the 10 companies in the panel that handle services (39.5 average).

SAM - Supersector Leaders panel: 5 available data;
- total water consumption – thousands of cubic meters: average 18,800,828.8; lowest figure: 65.0 (Enagas - Utilities); highest figure: 280,236,000.0 (Xstrata - Basic Resources);
- per capita water consumption – cubic meters: average 559,410.3; lowest figure: 9.0 (air France - Travel & Leisure); highest figure: 7,267,342.7 (Xstrata - Basic Resources).

In comparison to global best practices of sustainability, Terna ranks well below the consumption average. The high standard deviation indicates a great variety of sectors considered, some of which consumed large quantities of water, such as companies which handle resource extraction.
The great variability of company data renders a graphic illustration of little importance; the table indicates the lowest, average and highest figures and the standard deviation in the three panels concerned.

Water consumption - 2010

	TSO		FTSE-MIB		SAM - SUPERSECTOR LEADERS	
	Thousands cubic meters	Cubic meter/ employee	Thousands cubic meters	Cubic meter/ employee	Thousands cubic meters	Cubic meter/ employee
Average	1,808,338.8	106,362.7	24,878.6	478.8	18,800,828.8	559,410.3
Max	16,443,032.7	878,742.7	328,700.0	4,729.7	280,236,000.0	7,267,342.7
Min	1.5	10.3	17.4	12.9	65.0	9.0
Standard Dev.	4,721,590.1	255,706.3	74,882.6	1,046.1	72,324,715.5	1,877,642.9
Terna	185.0	53.3	185.0	53.3	185.0	53.3

Per capita consumption, if not directly available, was obtained by dividing the total consumption of water by the number of employees.
For additional information on panel structure and generally on comparisons with other companies, refer to the Methodological Note, page 16.

Waste

Much of Terna's waste is recycled for production. Only a small part is delivered to dumps and therefore entails an environmental impact. **The waste recycled amounts to 83%** of the total (89% in 2010, 83% in 2009).
Similar to the resources being utilized, also waste results mostly from modernization and maintenance of infrastructures. Such activities depend on technical considerations on matters of system safety and efficiency, therefore the quantity of waste may also change consistently from year to year.
With respect to the percentage of recycled waste, according to Terna's Environmental Policy, recovery of materials is the first option to evaluate and possibly choose. Actual recycling, however, depends on the materials that compose the waste. Some materials can be easily separated and sorted and then recycled (i.e., iron parts of pylons, for example). In some

cases, on the other hand, it is not possible, or it is too expensive, to separate the parts, in particular for equipment purchased years before. **For these reasons, it is difficult to see a clear trend of the annual variations of recycled waste.**

WASTE BY CATEGORY [1] - TONS	2011	2010	2009
Waste produced	**7,198,1**	**5,515.9**	**7,053.3**
hazardous	3,887.3	3,013.3	3,995.7
non hazardous	3,310.8	2,502.6	3,057.5
Recycled waste	**5,997.3**	**4,912.8**	**5,856.3**
hazardous	3,380.1	2,849.5	3,322.0
non hazardous	2,617.2	2,063.3	2,534.4
Waste delivered to dumps [2]	**1,153.3**	**626.4**	**1,043.1**
hazardous	450.8	191.5	630.9
non hazardous	702.5	435.0	412.3

(1) Only waste stemming from the production process is included. Waste produced by service activities (urban waste) is excluded. Until 2012, also excluded was waste belonging to the "excavated earth and rocks" and "sewage" categories, because – especially in the case of significant quantities – it has an exceptional aspect connected with the construction of particular work in stations and would make the data series non-homogeneous. The figures for the excavated earth and rocks and for the sewage amounted to 1,541 tons in 2010 (16,053 tons in 2009). For the year 2011 only produced sewage have been excluded, because the "excavated earth and rocks" category is not relevant anymore; the figures for sewage amounted to 675 tons in 2011.

(2) The values regarding waste delivered to dumps may differ from the simple difference between waste produced and waste recycled because of the temporary storage of waste straddling two years.

The main **non-hazardous special waste** produced by Terna's operating activities consists of:

- **metal** (nearly 50% of the total non hazardous waste produced) from discarded **transformers, electrical equipment, and out of order machinery** (for example, generating sets), more than 93% of which is recycled;
- **glass and ceramic** from discarded insulators (materials used to insulate conductor cables from support towers), more than 95% of which is recycled;
- **wood**, mainly from the packaging of the materials purchased, more than 90% of which is recycled.

The main hazardous special waste produced by Terna's operating activities consists of:

- **metal** (nearly 70% of total hazardous waste) from discarded **transformers, electrical equipment, and machinery** contaminated by hazardous substances, of which – after treatment by other companies – more than 95% is recycled;
- **batteries** (lead and nickel), which, in the event of blackouts, enable emergency generating units to be turned on to keep the service of electricity transformation and transfer operating during emergencies, 100% of which is recycled;
- **dielectric oils** for insulating transformers replaced after the periodical checks performed for transformer maintenance, which represent hazardous waste and of which nearly 95% is recycled. This decreases to 77% including the non-recyclable oils present in the collection tanks mixed with rainwater, substances which are very difficult to recycle.

Waste delivered to dumps consists mainly of materials used in the maintenance and cleaning of plants (mud, oily emulsions, and rags containing oils and solvents) and insulating materials containing asbestos for which no kind of recycling is provided. All these items together weigh nearly 70% of the total delivered to dumps (for further details regarding the quantities and kinds, see the Indicator Tables).

Waste Production: comparative data

The comparison between Terna and other companies on the subject of waste is made by referring to both total production in tons and production in kilograms per employee.
Both the data from transmission companies (TSO panel) and the data from large Italian listed companies (FTSE-MIB) as well as from international leaders in sustainability (SAM - Supersector Leaders) were examined.
The data in value – both absolute and per employee – indicate substantial non-comparability in that they reflect differences in the type of activity carried out, in the generation of waste as a result of the production process, as well as in the size of the company, not necessarily reflected by the number of employees. The highest per capita data among the three panels concerns Xstrata (SAM - Supersector Leaders panel), a company in the United Kingdom that works in the field of resource extraction, whereas the lowest concerned the bank Intesa Sanpaolo (FTSE-MIB panel).
Despite the intrinsic limitations present in the comparison, and lacking more efficient normalization factors for employees, it was decided that it would nevertheless be of interest to present the main data on waste production. Said data, in fact, though it cannot be interpreted as significant of company performance in limiting environmental impact, provide at least an indication of the relevance of waste – therefore of the materiality of the subject in terms of sustainability – in the different sectors and in the different companies.
In 2011, Terna produced a total of 7,198.1 tons of waste. Production per employee was 2,060.7 kg; in 2010, for which comparative data is available, production was 5,515.9 tons in all and 1,590.5 kg per capita.

TSO panel: 14 available data (12 companies, one of which has different data for each country);
- total waste production – tons: average 266,747.3; lowest figure 0.9 (Resedur-Perù); highest figure 1,700,000.0 (National Grid-UK);
- waste production per capita – kg: average 12,346.1; lowest figure 48.1 (Resedur-Perù); highest figure 62,756.1 (National Grid-UK).

In this comparison, Terna ranks below an average strongly influenced by four transmission operators that also carry out in the field of electricity generation activities.

FTSE-MIB panel: 22 available data;
- total waste production – tons: average 763,684.9; lowest figure 1,040.9 (Ansaldo); highest figure 11,482,000.0 (Enel);
- per capita waste production – kg: average 18,099.4; lowest figure 42.8 (Banca Intesa Sanpaolo); highest figure 146,616.8 (Enel).

With respect to companies listed in the FTSE-MIB, Terna ranks below average, with figures comparable to those of companies that work in the service fields, such as banks and insurance companies.

SAM - Supersector Leaders panel: 16 available data;
- total waste production – tons: average 70,860,928.1; lowest figure 1,814 (Westpack Banking-Banks); highest figure 1,130,000,000.0 (Xstrata-Basic Resources);
- per capita waste production – kg: average 1,839,267.1; lowest figure 46.6 (Westpack Banking-Banks); highest figure 29,304,219.3 (Xstrata-Basic Resources).

In comparison to global best practices in sustainability, Terna ranked well below the average, which was strongly influenced by the high variety of the sectors considered, some of which produce large quantities of waste, such as companies that deal with resource extraction.
The great variability of company data renders a graphic illustration of little importance; the table indicates the lowest, average and highest figures and the standard deviation in the three panels concerned.

Waste production - 2010

	TSO		FTSE-MIB		SAM - SUPERSECTOR LEADERS	
	t	kg/employee	t	kg/employee	t	kg/employee
Average	266,747.3	12,346.1	763,684.9	18,099.4	70,860,928.1	1,839,267.1
Max	1,700,000.0	62,756.1	11,482,000.0	146,616.8	1,130,000,000.0	29,304,219.3
Min	0.9	48.1	1,040.9	42.8	1,814.0	46.6
Standard Dev.	503,450.5	21,330.1	2,444,709.3	37,251.8	282,437,299.5	7,324,008.4
Terna	5,515.9	1,590.5	5,515.9	1,590.5	5,515.9	1,590.0

Per capita production, if not be directly available, was obtained by dividing the total of waste produced by the number of employees.
For additional information on panel structure and generally on comparisons with other companies, refer to the Methodological Note, page 16

EN1

Disposal of equipment containing PCB oil

Polychlorinated biphenyls (PCBs) were used all over the world as insulators in transformers and other electronic equipment, because they constituted a good alternative to inflammable mineral oils. However, subsequent studies showed that PCB is extraordinarily bio-resistant and can thus have dangerous effects on living organisms.
Legislative Decree 209/99, CEI regulation 10-38, the Ministry of the Environment's guidelines, and EC law 62/05 introduced the obligation to declare the quantity of oil contaminated by PCB possessed and established procedures and deadlines for its disposal.
In compliance with this provision, Terna implemented a disposal program, setting objectives for completing the work before the deadlines prescribed by law. Since 2009, there has been no equipment containing oil with more than 500 ppm of PCB. For oil contaminated by PCB with concentrations of 500 ppm or less and more than 50 ppm, the plan provided for a reduction of the quantity to less than 20,000 kg by the end of 2010. The result obtained (11,766 kg) went beyond the target and in effect ends the disposal program. In 2011, a further decrease of quantities found in Terna equipment was registered. Residual oil is present in small quantities in much of the equipment, which will be used up to the end of its life cycle, as allowed by law, due to the excessive burden of early replacement.

DISPOSAL OF EQUIPMENT CONTAINING PCB OIL

	Kg of oil		
	2011	2010 (1)	2009
PCB concentration			
PCB > 500 ppm	0	0	0
50 ppm < PCB < 500 ppm	7,616	11,766	131,852

(1) The data (8,266 kg) published in the 2010 Sustainability Report was corrected to reflect the data listed in the table (11,766) following evidence which emerged following publication.

EN30 Costs for the environment

Terna's commitment to the environment is shown in the costs it incurs for environmental reasons, as both investment and current expenses. The separate representation of its environmental costs has been developed according to the definitions referred to below, by aggregating information provided by the Company's general and industrial accounting.

Recording methods

The identification of environmental costs is based in the first place on the available definitions, in particular those of Istat (National Statistical Institute), Eurostat, and the GRI, as well as on the recommendation of the European Commission regarding the recording and disclosure of environmental information in annual accounts and reports (Recommendation 2001/453/EC). According to this recommendation, "the term 'environmental expense' includes the cost of measures taken by a company, directly or indirectly through third parties, to prevent, reduce, or recover damage to the environment caused by its operating activities. The costs in question include, among other things, the disposal of waste and measures aimed at preventing its formation, the protection of the soil and surface and groundwater, the protection of the air and climate from pollution, the reduction of acoustic pollution, and the defense of biodiversity and the landscape".
In the second place, the above-mentioned definitions were applied to the environmental aspects considered significant (for example, the noise of stations, electromagnetic fields) in the Company's ISO-14001-certified Environmental Management System to identify in the main corporate processes, Terna's operating and investment activities with environmental significance.

Many of Terna's activities described in this Report entail environmental expenses. However, several limitations were introduced in determining the recording boundary:

- exclusion of integrated costs, i.e. regarding activities whose purpose is not exclusively environmental (for example, the use of towers with features that are innovative also from the point of view of their environmental integration) because of the subjectivity of recording only the environmental components;

- exclusion of the additional costs connected with the consideration of restrictions or requests for the safeguard of the environment during the stage of planning and designing new lines (detours, burials).

Other conditions were that the costs were a) significant, b) consistent with the annual reporting of accounts (operating costs and investments clearly distinguished), and c) directly recordable by the existing corporate accounting system. The last condition regards the need to minimize recourse to estimates based on off-the-books analysis.

Costs for the environment

In the light of the foregoing, the following table constitutes the best representation of the costs incurred by Terna for the environment.

These costs exclude expenses regarding internal resources and consider only expenses for external purchases. The "Environmental activities – existing plants" item, which includes the costs of internal personnel, is an exception.

In compliance with the method adopted and the footnotes to the table, it should be noted that the environmental costs shown constitute a subset of the total environmental costs, as defined above, actually incurred.

The costs shown in the table regard Terna S.p.A..

COSTS FOR THE ENVIRONMENT – INVESTMENTS AND OPERATING COSTS - MILLION EUROS

	2011	2010	2009
Investments			
Environmental offset (1)	15.6	24.1	28.9
Environmental impact studies (2)	1.4	1.5	0.4
Environmental activities – new plants (3)	4.2	4.0	2.8
Environmental activities – existing plants (4)	14.2	15.7	7.8
Demolitions (5)	2.8	5.8	2.7
Total Investment	**38.3**	**51.2**	**42.6**
Costs			
Costs for environmental activities (6)	10.3	9.7	9.0
Total operating costs	**10.3**	**9.7**	**9.0**

(1) These are the sums for offsetting the works provided for by the Grid Development Plan, as determined by special agreements entered into with local institutions. They are recorded as investment at the time the commitment is made, i.e. when the agreement is signed, while the cash flow depends on how long it takes to obtain the authorization and construct the works. The reduction in the figure compared to previous years highlights the actual activity phase, i.e. many projects having passed the coordination and the authorization phases.

(2) Studies of environmental impact regarding plants included in the Grid Development Plan that are at the construction stage or in the process of being authorized by the relevant governments.

(3) The amount shown is the result of an estimate. On the basis of an analysis of several large investment projects, it turned out that at least 1% of the total expenses of the project regard environmental items, usually determined by obligations (for example, masking with trees, barriers against noise, installation of dissuaders for birdlife, environmental monitoring, analysis of excavated earth and rocks). Therefore, a value of 1% of 2009-2011 investment costs for projects with similar features was considered.

(4) Expenses for upgrading existing plants in accordance with prescriptions and new regulations in the environmental field (for example, noise, visual landscape aspects).

(5) Costs for the definitive dismantling of lines as part of Upgrading projects. For 2011 only the amount regarding the most significant demolition (Santa Barbara-Tavarnuzze and Chignolo Po-Maleo) is reported, because the determination of the sums corresponding only to demolition activities requires an off-the-books analysis.

(6) Cutting plants, cutting grass, and waste management and removal activities of limited amounts that are not included in investments. These cost items – the only ones so far determined directly by the industrial accounting – do not exhaust the year's total environmental costs, but they constitute the preponderant part of them.