

Environmental Report 2005



PUBLIC POWER CORPORATION S.A.
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ENVIRONMENTAL REPORT

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In today's era of globalization and serious ecological problems, environmental issues are of great concern for the international community, whereas they play a vital role not only in a State's political and financial decision-making but also in corporate development strategies, especially in the case of Corporations whose activity is closely related to the environment.

In this context, PPC S.A. could do no less than set the Environment as the cornerstone of its development policy and take the appropriate measures so as to ensure the least possible environmental impact, especially in the sites of intensive production activity (mines, thermal plants).

PPC policy with respect to the global issue of climate change is developed in close cooperation with the Hellenic Ministry of Development, as well as with the Hellenic Ministry for the Environment, Physical Planning and Public Works, in a way that it contributes to the achievement of national targets and choices.

PPC has adopted a series of measures aiming at minimizing CO₂ emissions. These measures mainly focus on the five following fields:

- ▶ Exploitation of renewable energy sources.
- ▶ Use of natural gas as a new fuel for electricity generation.
- ▶ Development of the country's hydro-potential.
- ▶ Energy saving and rational energy use.
- ▶ Implementation of the most effective lignite-combustion technologies.

The results of the above measures were indeed spectacular: in the period 1990-2005, electricity generation rose by 69%, whereas the respective CO₂ emissions increased only by 29%. The average coefficient of system emissions decreased from 1.30 kg/kWh in 1990 to 0.99 kg/kWh in 2005, that is to say **by 23.6%**.

This great investment effort, which aims at reducing the average coefficient of system emissions, needs to be recognized by means of the National Allocation Plan (NAP), so that PPC shall be liable to receive greater allowances for its existing facilities. In accordance with the NAP, each member-state of the European Union (EU) is obliged to draw up and submit for approval a report analyzing the allocation of total allowances among all liable facilities.

What also needs to be recognized is the fact that our country is geographically situated on the south-eastern border of the EU, as well as that it is an energy peninsula with a limited capacity for electric power exchange. Therefore, security of supply demands the constant exploitation of Greek lignite, whose price is far less dependent on energy crises than the price of oil and natural gas.

Renewable Energy Sources (RES)

One of the strategic goals of the Company is to strengthen its presence in the RES field, since in the near future RES contribution to total national electricity generation shall significantly increase. It is estimated that until 2014, RES shall account for about 10% of total national electricity generation. In accordance with its new business plan for the years 2006-2010, PPC shall implement a 1.5 billion Euros long-term investment program, with a view to ensuring 50% of total renewable energy generation (that is to say 1540 MW in cooperation with external partners or no less than 770 MW by PPC's independent activities in the RES field).

Relevant investments shall mainly focus on wind parks, small-scale hydroelectric power plants and geothermal systems. In parallel, PPC shall focus on other energy fields that benefit from the new energy bill, such as photovoltaic and biomass systems.

Natural Gas

The participation of natural gas (already integrated into the country's energy system) in the energy potential of the Company is expected to rise. In 2010, natural gas shall probably account for 15.5% of the total energy generation. Its low carbon content, together with the increased power output of the combined-cycle technology (gas turbine – steam turbine) result in high production figures with lower CO₂ emissions.

Exploitation of Hydroelectric Potential

PPC has never given up its intensive effort to make the most of the country's hydro-potential. Other than their environmentally friendly contribution to electricity generation, hydroelectric power plants ensure multiple benefits. In most regions where they have been built, hydroelectric plants have embellished the surrounding space by creating landscapes of outstanding natural beauty. Thus, in addition to supplying water for irrigation and domestic use, hydroelectric power plants offer to local societies the opportunities for tourism development.

Environmental Care

In both the regions of Kozani and Megalopolis, the activity of the Company is by far intensive, since the country's biggest mines, and, consequently, the main Power Plants are situated there. PPC environmental strategy in these regions is focused on the following targets:

- ▶ Source-pollution prevention.
- ▶ Rational natural resources management.
- ▶ Aesthetic and harmonious integration of new land in the wider region where the projects are built.
- ▶ Restoration of the mining areas.
- ▶ Improvement of the Power Plants' environmental behavior.
- ▶ Implementation of the most modern lignite-combustion technologies in the new power plants.

One of PPC's most important contributions to the cities of Kozani, Ptolemais and Amyndeon is district teleheating, which is supplied from the steam produced in PPC Power Plants. Recently, the city of Megalopolis also gained access to the teleheating network.

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Another important project, which has not yet received due merit, is PPC's strong effort to restore the land in the sections where lignite mining has been completed. Thanks to this great effort, dating back to the very beginning of mine exploitation, about 6.000 ha have already been restored and 7.3000.000 trees have been planted, thus creating ecological parks highly visited by local school children and associations.

The fact that PPC Internal Environmental Management Systems have achieved Certification according to ISO 14001 clearly proves PPC's environmental concern.

Yet the environmental action plan of the Company is not limited to its internal systems. It also extends to the transmission and the distribution of electric power, always seeking to provide excellent customer service.

On Wednesday 1st June 2006, during a cultural event organized by the non-profit organization ECOCITY at the Gaia Center of the Goulandris Natural History Museum, PPC S.A. was given the "Environmental Sensitivity OICOPOLIS 2006" award for its environmental investments in Power Plants.

PPC's reward came to recognize the great work accomplished by the Company with respect to environmental protection. It should be noted that this reward only referred to a part of PPC's total environmental investments.

This reward also came to encourage PPC Administration, executives and personnel to keep on their work in a more decisive manner, so as to fulfill their vision of transforming PPC into an ultramodern, powerful company that shows great respect not only for humanity but for the environment as well.

All of us who work for PPC, we believe in a human-oriented development strategy. Therefore, our efforts mainly focus on creating a favorable environment for man and his everyday life. We owe that, above all, to all the generations to come.

Dimitris Maniatakis





The Environmental Strategy of PPC S.A.

Environmental protection, competitiveness and security of supply are the three main pillars of the EU energy policy. The environmental strategy applied by electricity companies is determined by the continuous pursuit to minimize the environmental impact arising from electric power generation, transmission and distribution.

Environmental protection is one of the main principles that govern the strategy and daily operational activity of the Company, as it is integrated into its decision-making process for achieving its strategic goals.

In this context, PPC Business Units implement their environmental policy through a series of preventive measures, programmes and actions, aiming at protecting the environment while promoting social responsibility and dialogue.

Lignite Exploitation

Lignite is the most important indigenous energy source of Greece, as well as the core element of the development and energy programmes of the Company. Lignite exploitation has made a decisive contribution to the development of the Greek energy sector and, according to estimations, it shall continue contributing to the Greek energy balance at least for another 40 years, boosting thus the Greek economy in the most reliable way.

PPC acknowledges that restoration of the mining areas is an issue of outmost ecological, social and financial importance. Therefore, acting in accordance with EU Directives, PPC proceeds at an accelerating pace to the systematic restoration of the land released from the mines, as well as to the protection and upgrade of the environment. Environmental protection is the cornerstone of PPC's lignite exploitation strategy.

Environmental Management Policy during Lignite Exploitation

In order to remain true to the fundamental principles of environmental respect and protection, the Mines Division develops its policy

on environmental management focusing on the following:

- ▶ Compliance with the national and European statutory or other regulatory requirements.
- ▶ Compliance with the Environmental Terms - "Operation phase" of Lignite Centers and their associated facilities.
- ▶ Continuous improvement of environmental performance in every activity.
- ▶ Development and maintenance of an efficient and effective environmental management system.

The main principles set forth for the success of the environmental management policy are the following:

- ▶ Knowledge of the area's environmental conditions.
- ▶ Selection of the appropriate methods and techniques of land rehabilitation.
- ▶ General land planning of the areas to be restored (land use maps).
- ▶ Regular implementation of environmental protection and restoration programmes, in

accordance with the approved Environmental Terms (Joint Ministerial Decrees), aiming at returning all rehabilitated areas to farming, forestry and other land uses.

- ▶ Monitoring and evaluation of the results of environmental restoration by means of modern Geographical Information Systems (GIS).

The adverse effects of the production activity were timely identified thanks to Environmental Impact Assessment studies (EIA) on the construction and operation of Lignite Centers. Thus, upon cessation of extraction activities, the Mines Division's will to cope with such effects in the best possible way, while remaining consistent with the principles and objectives initially set, led to a series of actions aiming at maintaining the mining area in harmony with its surroundings.

Rehabilitation of new land

The Lignite Centers of West Macedonia and Megalopolis systematically implement projects for the rehabilitation of the land gradually

released from the mines, in order to return such land, inter alia, to agriculture and forestry. To this end, an interdisciplinary team of the National Technical University of Athens has carried out special strategic studies on the rehabilitation of the mine's new land. These studies have been taken into account in the formulation of the finalized proposals of the EIA studies.

Electricity Generation

The Generation Division, as well as the Distribution Division which is responsible for the Power Plants built on the islands, implement their environmental strategy through a series of preventive projects, measures and actions designed to ensure environmental protection and to promote social responsibility and dialogue.

PPC finances these projects by making serious investing efforts in order to improve the environmental behavior of Power Plants.





Environmental management policy during power generation process

The main objectives of the environmental management policy during power generation focus on the following principles:

- ▶ Strict application of the European and national environmental legislation as an inviolable condition for every activity of the Generation Division.
- ▶ Integrated environmental assessment aiming at the overall protection of the environment, right from the phase of project design. Systematic assessment of the operation of existing facilities, aiming at their continuous upgrade.
- ▶ Contribution to facing the climate change challenge.
- ▶ Application of the Best Available Techniques (BAT) both to new and existing power plants, in compliance with the Directive on Integrated Pollution Prevention and Control (IPPC).
- ▶ Exploitation of domestic energy resources, mainly of the indigenous lignite and the country's hydro-potential, with respect for the environment. Design and operation of Hydro-electric Projects in compliance with an integrated water resources management and with a view to maximizing the social – environ-mental benefits arising from the projects' combined use.
- ▶ Dialogue with the parties concerned on the preparation of development programmes and projects, as well as on the existing operations of the Generation Division.
- ▶ Development of scientific knowledge and expertise via participation in EU environmental research programmes.
- ▶ Coordination with other related policies, such as the policy for occupational health and safety.
- ▶ Continuous information exchange and cooperation with other European bodies of the same industrial sector aiming at the development of pollution abatement techniques.
- ▶ Development of realistic programmes for informing the personnel on environmental issues.
- ▶ Evaluation of environment-related performance compared to the results achieved by similar European bodies, as well as to the methods applied by the latter.
- ▶ Reinforcement of environmental issues management.
- ▶ Integration of all the above principles into PPC Environmental Management System (EMS). Certification of the EMS.

Implementation of Environmental Projects in order to achieve compliance and to improve the environmental behavior of existing Thermal Plants

With a view to enhance energy efficiency and energy saving, as well as to reduce pollutant and CO₂ emissions, PPC implements a project for upgrading its facilities and improving the operation of existing Power Plants, while ensuring direct environmental benefits. The

project provides for the application of the Best Available Techniques, in accordance with the Best Available Techniques Reference Documents (BREFs) on Large Combustion Plants, as well as for the upgrade of steam turbines, cooling towers, boilers and auxiliary systems.

Environmental management policy during electricity transmission

The minimization of the environmental impact is always taken into account during the design and operation of the Transmission System. Therefore, the Transmission Division always examines issues related to the System's impact on landscape, groundwater aquifer, flora and fauna as well as factors such as noise disturbance, risks caused by abnormal situations, electric and magnetic fields, man-made environment, land uses and protected areas.

It should be noted that the Transmission System has little impact on the landscape. Nevertheless, this is always taken into account during the design phase. Efforts have been made to minimize such impact by means of new Transmission Lines (TL), Substations (SS) and Extra-High Voltage Substations (EHVSS), always bearing in mind the general town planning of developing areas. During the design and construction stage of Transmission projects, the Transmission Division makes sure, where appropriate, that transmission line towers are painted and trees are planted along the fence of Substations and Extra-High Voltage Substations. In addition, the Division avoids installing Transmission Lines on crests or areas with unobstructed view of the horizon.

PPC creates around Extra-High Voltage Substations green spaces with fast-growing trees so as to ensure that the facilities are not perceptible to the human eye, offering thus to the surrounding area a "green lung" that contributes to its development and upgrade. As



far as new Substations and Extra-High Voltage Substations are concerned, PPC is already using green and grey colors for the primary equipment in order to minimize their visual impact.

In the course of the Transmission System's upgrade, all national and EU Directives and laws are taken into consideration so as to minimize the environmental impact.

Environmental management policy during electricity distribution

State-of-the art technologies already applied in European countries are used during the design, construction and maintenance of the Transmission System. Maintenance is scheduled in periods of time when it shall have the least possible effect on crops. Finally, the use of appropriate vehicles allows for the minimization of the impact on crops. Nevertheless, in case of damage caused to the farms, the legal indemnification is paid.

The protection of the environment, of flora and fauna, as well as of the country's natural resources, is an issue of outmost importance for the Distribution Division.

The use of materials and equipment in compliance with PPC Distribution specifications in force, as well as with the corresponding European (CENELEC) and international (IEC) standards, the design and construction of distribution networks according to the Hellenic (KESYGHE, KEHE) and International Regulations and Directives, as well as the establishment of regular inspections and maintenance ensure the network's reliable operation with respect for the environment. In this context, international developments in the fields of new materials, new construction methods and projects that can significantly contribute to environmental care are thoroughly examined.

The use of aerial bundled cables (insulated conductors), instead of bare conductors, has been fully adopted in PPC's new networks of low and medium voltage. An essential advantage arising from this equipment is the significant restraining of tree pruning near the networks. Moreover, with a view to reducing tree cutting, aerial bundled cables have been standardized for PPC medium voltage networks installed in forest areas.

The Distribution Division, in cooperation with environmental associations, schedules pilot



interventions on some of its facilities located near wetlands aiming at the protection of endangered species.

The facilities of the Distribution Division designed in recent years to reduce high voltage near big urban areas are called Distribution Centers, i.e. closed type Substations of low or medium voltage with Gas Insulated Switchgear (GIS). Compared to open-air Substations, Distribution Centers are of a much smaller size. In addition, their operation is more reliable, since they are not influenced by external factors, they have no aesthetic impact on the surrounding area and they are perhaps the only possible choice for densely populated areas.

The island connection project, which involves the submersion of underwater cables, is of utmost importance as well. The advantages deriving from the underwater connection of the islands vary. The substitution of autonomous Power Plants has direct environmental benefits such as preservation of landscape, reduced oil dependence, improved service quality due to the reduced number of blackouts and improved voltage quality.

Additional Environmental Actions

Waste Management

The year 2005 has been a twofold turning point as regards the waste management of the company: firstly, the legislation on hazardous and non-hazardous waste management was largely clarified and integrated, whereas its implementation became stricter; secondly, the operation of a number of systems for the collection and recovery of packaging and other waste was either initiated or extended. Further progress is anticipated in 2006 together with the establishment of full cooperation between PPC and all the alternative waste management systems, as well as the fine-tuning of the relevant procedures.

Safety Management Control

- ▶ Support to all operational units in detecting, locating and managing hazardous and non-hazardous waste, as well as in keeping up-to-date records on PCBs, asbestos products, Ni-Cd batteries etc.
- ▶ Inspections and projects for the management of waste such as asbestos, PCBs, Ni-Cd batteries etc
- ▶ Inspections and studies on environmental management pertaining to solid and liquid waste, as well as studies on the environmental impact arising from hazardous and non-hazardous waste.
- ▶ Proposals on the organization of storage areas and the proper management of stored materials (separation, stowage, disposal).
- ▶ Constant training and briefing of PPC personnel on issues of hazardous and non-hazardous waste management by means of relevant documentation.
- ▶ Training seminars on the management of SF6-containing equipment.

Modern Environmental Laboratories

With a view to ensuring the reliability of PPC's materials while protecting the environment, the Company runs 16 specialized laboratories.

In PPC modern laboratories, all materials, machinery, expendables, supplies and equipment undergo various tests, controls and analyses. Furthermore, PPC laboratories are involved in activities such as accreditations, inspections of the delivered materials and equipment, opinion issuing, applied research, updating of specifications and calibration of measuring devices.

PPC laboratories provide solutions to environmental problems in compliance with the Greek legislation and EU directives.

PPC's contribution to facing the climate change challenge

Within the framework of its strategy, PPC keeps abreast with the issue of minimizing CO₂ emissions and combating the greenhouse effect. In addition, the Company closely cooperates with the Hellenic Ministry of Development and the Hellenic Ministry for the Environment, Physical Planning and Public Works in forming national positions, as well as with other European and International bodies.

In this context, PPC participates in the "Energy Wisdom" programme of EURELECTRIC (Union of the Electricity Industry). This programme, which was launched on the initiative of European electric companies participating in EURELECTRIC, aims at improving energy efficiency, as well as at reducing Greenhouse Gas (GHG) emissions. Each company is called to present the actions-measures it has taken from 1990 onwards, aiming at a measurable improvement in energy efficiency, as well as at the reduction of GHG emissions. PPC participates in the programme with 33 projects, which, in the year 2004, contributed with a total minimization of CO₂ emissions corresponding to 7949 kton CO₂ equivalent.

Communication Strategy and Environment

PPC's important work with regard to environmental protection and upgrade is proudly communicated both to its employees and the society in general. PPC communication strategy aims at promoting the environmental image of the Company in every prestige campaign launched, every leaflet published, all the audiovisual material produced, as well as in every relevant event organized. Hence, the publication of PPC annual environmental report, which presents the measures, programmes and actions taken for the achievement of the Company strategic goals regarding environmental protection, is one of the main principles of PPC communication



strategy; a principle to which PPC always remains true.

Conclusion

PPC implements an integrated strategy for the protection of the environment during lignite extraction, as well as during electricity generation, transmission and distribution. The energy saving programme of the Company largely contributes to the reduction of future energy demand.

PPC Management has taken on the commitment to ensure the unimpeded implementation of the environmental policy developed by the Company's Business Units of mines, generation, transmission and distribution and of all parallel support actions, and has fully integrated it into its business plan, both with regard to the design of new Power Plants and the operation and exploitation of the existing ones.

This commitment promises a successful response to the challenge of sustainable development, which is not only one of PPC's main targets, but also a demand of all parties concerned: shareholders, clients, public authorities, associates, suppliers and the society in general.



Environmental Care of the Mines Division

For the Mines Division, environmental protection is an issue that concerns us all and requires the awareness and mobilization of all personnel

Lignite exploitation

Lignite is the most important indigenous energy source of Greece, as well as the core element of the company's development and energy programmes. Lignite exploitation has had a decisive contribution to the development of the Greek energy sector and it is estimated that it shall continue contributing to the Greek energy balance for at least another 40 years.

PPC first engaged in systematic lignite exploitation activities for the purposes of electricity generation in 1951, with the underground lignite mine in Aliveri. Subsequently, PPC entered upon a large-scale mining effort focused on the exploitation of the lignite deposits found in the area of Ptolemais (the LIPTOL Company was set up). The first open-pit lignite mine, with an annual capacity of 1,8 million tons/year, was located in the Main Field and was intended for the generation of electric power, as well as for the production of briquettes, dry lignite, chemicals and nitrogen fertilizers.

The West Macedonia Lignite Center, with an annual production of 55 million tons and total material transportation of 270 million m³, as

well as the Megalopolis Lignite Center, with an annual production of 14,51 million tons and total material transportation of 44 million m³, come under PPC S.A. Mines Division. These lignite mines supply 21 power plants with an installed capacity of 5287 MW, which corresponds to 50% of the total installed capacity in the interconnected network of the country.

Lignite exploitation is based on the continuous method of excavation - transportation - deposition. The mining procedure of a lignite deposit includes extraction, transporting and deposition of materials (lignite and coexcavated waste materials).

The main equipment used consists of electrical bucket-wheel excavators, conveyor belts and stackers. The lignite mined is then transported to the thermal power plants for combustion.

The coexcavated materials are transported and put back mainly in the excavation voids, in an effort to minimize the impact on landscape.

Environmental impact of Lignite Exploitation

The open-pit mining of lignite with this particular method consequently results in:

- ▶ The occupation of extensive areas of land for long periods of time.
- ▶ The alteration of the soil's morphology.
- ▶ The disturbance of the region's flora and fauna.
- ▶ The need to relocate settlements, as well as part of the road and rail network.
- ▶ The emission of air pollutants (dust), solid and

liquid pollutants (waste), as well as the creation of noise and vibrations.

The Mines Division acknowledges that restoration of the land affected by lignite mines is an issue of major environmental, social and economic importance. Therefore, in compliance with EU Directives, the Mines Division proceeds at an accelerating pace to the systematic restoration of the new land, as well as to the protection and upgrade of the environment.



Environmental assessment of Mining activities and issuing of Environmental Permits

All mines of the West Macedonia and Megalopolis Lignite Centers systematically implement projects designed to minimize the environmental impact of their operation.

In accordance with the law in force and the special strategic studies on the restoration of new land, relevant Environmental Impact Assessment

(EIA) studies were carried out and submitted to the Hellenic Ministry for the Environment, Physical Planning and Public Works.

All operating PPC mines (Ptolemais, Amyndeon, Mavropigi, Achlada, Megalopolis and Klidi) operate under approved Environmental Terms (permits).



As for the new mines of Lakkia and South West Field, where extraction activities have not yet commenced, the respective EIA studies have already been submitted and the Environmental Terms shall be approved soon.

In addition, special environmental permits shall be issued for the diversion projects to be constructed on Soulos stream (Ptolemais Mines) and Alfios River (Megalopolis Mines) for the purposes of mining activities. As provided for by national law, prior to the submission of the finalized EIA, all preliminary EIA studies have been submitted for approval to the Hellenic Ministry for the Environment, Physical Planning and Public Works.

In short, environmental terms for the operation of mines include:

- ▀ Special technical implementation studies on the redevelopment and rehabilitation of the mines' final surfaces (treeplanting, agricultural cultivation, formation of lakes etc)

- ▀ Special studies on soil stability, as well as hydrogeological studies (water balance, integrated underground and surface water management etc) in the greater mining area
- ▀ Measures for reducing disturbance to neighboring areas (creation of green spaces, noise and vibration measurements at the borders of residential areas, reduction of dust etc)
- ▀ Wastewater treatment and disposal
- ▀ Environmental quality monitoring in the greater mining area by means of an extended network for monitoring air quality
- ▀ Integrated management and disposal of by-products (obsolete equipment, old tires, batteries, oil - lubricants etc)
- ▀ Fire protection measures to prevent the self-combustion of the lignite
- ▀ Logbooks and up-to-date records on environmental parameters
- ▀ Periodic reporting to all the competent authorities - submission of an annual report

Environmental Management Policy

In order to remain true to the fundamental principles of environmental respect and protection, the Mines Division develops its policy on environmental management focusing on the following:

- ▶ Compliance with the environmental terms (permits)
- ▶ Compliance with the national and European statutory or other regulatory requirements
- ▶ Continuous improvement of the environmental performance in every activity
- ▶ Development and maintenance of an efficient and effective environmental management system

The adverse effects of the production activity were timely identified. Thus, upon cessation of extraction activities, the Division's will to cope with such effects in the best possible way, while remaining consistent with the principles and

objectives initially set, led to a series of actions aiming at maintaining the mining area in harmony with its surroundings.

The main principles set forth for the success of the environmental management policy are the following:

- ▶ Knowledge of the area's environmental conditions
- ▶ Selection of the appropriate methods and techniques of land rehabilitation
- ▶ General land planning of the areas to be restored (land use maps)
- ▶ Regular implementation of environmental protection and restoration programmes in accordance with the approved Environmental Terms (Joint Ministerial Decisions)
- ▶ Monitoring and evaluation of the results of environmental restoration by means of modern Geographical Information Systems (GIS)



The Environmental Action Plan of the Mines Division

Expropriations – Relocations – Land Exploitation

In order to make the most of the country's lignite deposits, PPC is obliged to proceed to the expropriation of extensive land areas, in accordance with Law 797/79.

In compliance with the relative court rulings, PPC indemnifies the owners of such land by paying them significant amounts. The acquisition cost for land with settlements that have to be relocated is particularly high.

The land expropriated so far amounts to 15,600 ha for the West Macedonia Lignite Center and to 3,600 ha for the Megalopolis Lignite Center. Another 4,000 ha have to be expropriated for both centers to complete mining activities.

In order to meet the mining requirements, the settlements of Kardia, Haravgi and Exohi near the West Macedonia Lignite Center (3,000 inhabitants in total) have so far been relocated while the relocation of the Kleitos, Komanos and Klidi settlements is under way.

Similarly, the relocation of Psathi, Marathousa, Gefyraki and Anthohori settlements near the Megalopolis Lignite Center has been completed whereas the expropriation of land areas at Tripotamos, Mavrioi and Katsimbali is under way.

In accordance with Law 2941/12-9-2001, the land created after the mining of lignite deposits is now owned by PPC. This arrangement is compliant to the regime in force in other EU countries such as Germany, where in similar exploitations the expropriated land and the reclaimed new land are considered assets of the mining enterprises.



It is mentioned that the implementation of the new Law offers to PPC the following possibilities:

- ▶ Exchange the rehabilitated land with new areas of land that are necessary for the development of the Mines, after the completion of the rehabilitation and relevant restoration works, contributing thus to the preservation of the region's revenue from agriculture. This exchange ensures that the farmers of the region shall preserve their main means of living, that is to say agricultural cultivations.
- ▶ Explore the most efficient way of making the most of these areas, in cooperation with the Real Estate Corporation which shall soon be set up, boosting thus employment and the development of the area.
- ▶ Set up subsidiaries for the exploitation of the facilities and the development of productive activities (greenhouses, timber production etc), with or without the participation of local authorities, contributing thus to the creation of new jobs and, subsequently, to the development of the area.



projects for the restoration of the land gradually released from the mines, in order to return such land, inter alia, to farming and foresting. To this end, an interdisciplinary team set up by the National Technical University of Athens has carried out special strategic studies on the rehabilitation of the mine's new land. These studies have been taken into account in the formulation of the finalized proposals of the EIA studies.

According to the aforementioned studies, it is anticipated that after the completion of the mining activities at the West Macedonia Lignite Center, 1,130 ha of farmland will be created as well as 7,500 ha of forestland. To date, 2,120 ha of forestland has been planted, mainly on inclined planes formed by depositions, whereas the farmland of the final leveled surfaces amounts to 1,870 ha.

As regards the Megalopolis Lignite Center, the creation of 2,700 ha of forestland has been anticipated, while the remaining part will mainly include farmland with recreational parks, sport centers, buildings, lakes and wet-lands. To date, 520 ha of forestland has been created on inclined planes, as well as 250 ha of farmland on the final leveled surfaces.

Rehabilitation of New land

The West Macedonia and the Megalopolis Lignite Centers systematically implement

More precisely, the land redeveloped to date is grouped as follows:

EXTENSIVE TABLE OF THE REDEVELOPED LAND	PTOLEMAIS MINE (*)	AMYNDEON MINE (*)	WEST MACEDONIA LIGNITE CENTER (*)	MEGALOPOLIS LIGNITE CENTER (*)
Land formed of depositions	304.6	266.2	572.6	23.5
Forestland	1,756.5	369.8	2,126.3	520
Buildings	268.8	48.8	317.6	1,034.5
Farmland	1,500	370	1,870	250
Lakes	47.2	35.5	82.7	0.8
Total	3,877.1	1,090.3	4,967.4	1,828.8

(*) in ha

A) TREEPLANTING

To date, more than 6.5 million trees have been planted in the West Macedonia Lignite Center and more than 800,000 trees in the Megalopolis Center at a rate that now exceeds 600,000 trees per year. The trees planted are mainly species native to the area such as acacias, pines trees, elm trees, Arizona cypresses and eucalyptuses along with fruit bearing trees such as walnut trees, chestnut trees, apple trees, pear trees and pistachio trees planted at selected locations of the mines.



Treeplanting is performed with three different methods:

- ▶ The classic manual method in areas where the use of machinery is inappropriate
- ▶ The ripper method with a bulldozer or a suitably shaped plough connected to a tractor, which allows the planting of 1,000 trees per hour
- ▶ The method of transferring an entire forest root system (mainly for acacia trees)



B) CREATION OF FARMLAND

The creation of experimental farmland with a view to testing the fertility of the rehabilitated land dates back to 1986. The crops selected are the durum and soft wheat, due to the fact that this entire area is usually planted with these crops.

According to the evaluation of the results so far, the productivity of the new land remains at the same levels with the productivity of the wider area and in some cases even exceeds it. At the same time, the productivity of this land can be compared to the productivity of the experimental farms created by covering the new land with fertile soil, 40-50 cm thick, which is extracted from the surface of the expropriated areas.

Beside the cultivation of crops, a pilot greenhouse for hydroponic cultivations and a model orchard are being run at the redeveloped areas of the West Macedonia Lignite Center in

cooperation with N.AG.RE.F (the National Agricultural Research Foundation) and the Technological Educational Institute of Florina. These have been located in the internal deposition area of the Main Field for the purposes of examining the development of all fruit bearing trees planted in the new land, as well as for demonstrating the possibility of developing high added value activities in the area for the farmers.

In the Megalopolis Lignite Center there have been experimental cultivations of specific plant species (e.g. potato, bean trees, tomato) with satisfactory results for potential cultivation, while the experimental crops of grains, oats and vetch produced results that are similar to those achieved in the greater area.

Finally, during the past two years, the West Macedonia Lignite Center has leased to the farmers of neighboring municipalities 800 ha of rehabilitated land in return for the symbolic price of 10 euros per 0.1 ha. In this way, PPC has contributed and continues contributing to the enhancement of the region's revenue from agriculture.

C) SPECIAL WORKS FOR LAND REHABILITATION – CREATION OF ECOSYSTEMS

In addition to large-scale works pertaining to the creation of cultivable land and forestland, a number of special interventions are being carried out aiming at making the most of the restored land.

All restored areas already host ecosystems gathering the flora and fauna of the ecosystems that have been affected or disturbed, while fauna is enriched with the species released from animal husbandry facilities. Lakes and wet-lands have been created at all the depositions, gathering thus a large number of both flora and fauna species, while lakes are enriched with fish.

As far as the West Macedonia Center is concerned, these interventions are focused on the Main Field old mine where mining



operations have been completed. Indicatively, we mention the construction of the Expo Center which is visited every year by more than 5,000 people from Greece and abroad; the Artificial wet-land, adjacent to the Kozani-Ptolemais national road, which evolves into a major ecosystem with the cooperation of university agencies, and is expected to be used as an environmental education reserve; the Small Animal Reserve covering an area of 8 ha which is used by the Forestry Authority and the local Hunting Associations for the enrichment of the area's flora (with hares, partridges and pheasants); the Open Air Theatre which has been constructed by PPC Environment Section with old materials collected from the mines; the Silviculture Park, created in the external deposition of the Main Field and hosting all the different tree species that flourish in Northern Greece; the Railway History Park and last but not least the buildings of the Environment Section and the Fast Training School for the personnel of the Mines Division.

Respectively, in the areas of the Megalopolis Lignite Center that have been restored various projects have been constructed, among which:

- ▶ An Expo Center for informing visitors on the Lignite Center activities
- ▶ A Recreational Park (including a grove, a playground and various playing fields) where various events are held in cooperation with the Municipality of Megalopolis
- ▶ Artificial wetlands by creating artificial lakes some of which have been enriched with fish
- ▶ A moto-cross track, which has accommodated international races on various occasions and has been qualified as a model track by major international bodies related to this sport
- ▶ A runway used by private associations to carry out flights of ultra light aircrafts

Implementation of Environmental Projects based on Environmental Planning for coping with the impact brought about by mining activities

The two Lignite Centers of West Macedonia and Megalopolis systematically take all necessary measures for complying with the Environmental Terms, in accordance with environmental planning.

More precisely, the measures aiming at controlling pollutants, that is air (dust, suspended particles), liquid and solid pollutants (waste) as well as noise, are the following:

A) DUST, SUSPENDED PARTICLES

In order to reduce the dust produced at the mines during transportation of the excavated materials with conventional means, special permanent wetting networks constructed along the main road networks or special tanker trucks for secondary roads are used. Moreover, the lignite transportation tracks are equipped with appropriate covers. In addition, large sections of the mines secondary roads are being asphalted.

B) WASTEWATER

Before being conducted to the natural receptors, the wastewater produced at mines' complexes (offices, changing rooms, workshops) is treated at biological treatment

plants. Oil and lubricants used at diesel-motored equipment workshops for machinery and vehicles are collected by the Waste Disposal Section and sent for recycling, in compliance with the National Collective Alternative Management System of Waste Oil (ELTEPE).

In the year 2005, 850 tons of used lubricants were recycled, whereas more than 9,000 empty lubricant containers ended up as scrap material to metalworking industries of Northern Greece.

In addition, a general effort has been undertaken in accordance with the latest regulations in order to collect and transport used lubricants inside large capacity tanks rather than inside containers.

C) SOLID WASTE – SCRAP AND OTHER MATERIAL STORAGE FACILITIES

In order to achieve a better collection, sorting and clearance of the various scrap materials (iron bars, machinery parts etc), open areas (i.e. kind of open air storage facilities) have been constructed in areas specifically selected for that purpose.

The materials to be cleared are collected in a waste material storage area and are cleared





through relevant tender. Materials that could cause pollution (e.g. electromotor oil) are collected in containers, which will subsequently be cleared. Moreover, materials that could cause hazardous waste (e.g. machinery batteries) are gathered in a waste storage facility in order to be cleared.

In the year 2005, a great number of End-of-Life Vehicles that had been gathered in a special area of the West Macedonia Lignite Center were successfully disposed of. At the same time, procedures for the disposal of 4,500 tons of scrap materials commenced.

It is worth noting that PPC makes great efforts to develop a network for collecting and recycling used batteries and tires in cooperation with the existing management systems of such materials, despite the significant lack of infrastructure.

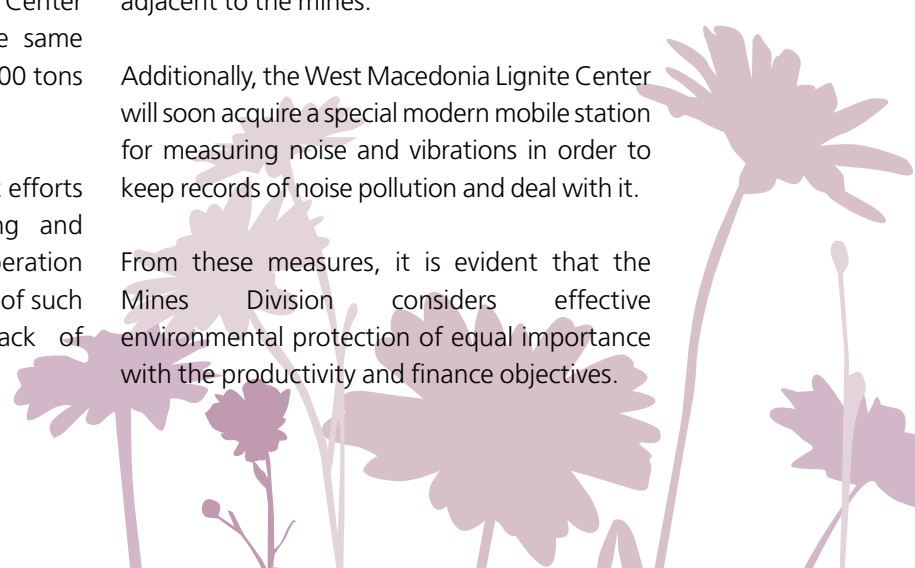
D) NOISE

In order to reduce the noise produced in workshops, measures are taken in accordance with the Mining and Quarrying Activities Regulation (KMLE) and the law in force.

Soundbarriers made of earth are constructed to reduce the noise produced by the machinery and the vehicles used during lignite extraction so as not to disturb the residential areas adjacent to the mines.

Additionally, the West Macedonia Lignite Center will soon acquire a special modern mobile station for measuring noise and vibrations in order to keep records of noise pollution and deal with it.

From these measures, it is evident that the Mines Division considers effective environmental protection of equal importance with the productivity and finance objectives.



Special studies and research programs on the utilization of new land

In addition to the studies required for compliance with the approved environmental terms and Greek law requirements, as well as for meeting the needs of Lignite Centers, the Mines Division in cooperation with other Divisions, carries out special studies on the utilization of the new land following the restoration of the area after lignite extraction.

Moreover, the Mines Division takes part in research programs in cooperation with Universities and other bodies, aiming at the expansion of knowledge on specialized technologies for the rehabilitation of new land.

Indicatively, the following projects and studies are cited:

- ▶ Pilot operation of a hydroponic greenhouse at the West Macedonia Lignite Center
- ▶ Sustainable development of the fertility of the soil formed from mine depositions
- ▶ Research on the agricultural exploitation of the land created from lignite extraction in the Ptolemais and Amyndeon regions
- ▶ GIS planning and organization at the West Macedonia Lignite Center in cooperation with the Greek Biotope/Wetland Center (EKBY)
- ▶ Research on the behavior of heavy metals in the land created on the depositions of lignite mines in the areas of South Field and Kardia (Ptolemais region). Study on the impact on crops (Technical University of Crete)
- ▶ Research program in cooperation with the Technological Educational Institute of Florina on the pilot orchard and the greenhouse

It should be noted that the results of the aforementioned research programs and the experimental cultivations led to the conclusion that the new ground fertility was of equal or superior yield per hectare compared to the

region's natural ground. Additionally, trace elements and heavy metal concentrations in the grains cultivated in the rehabilitated land were smaller or equal to the concentrations in the grains cultivated in the naturally existing land of the greater area.

Furthermore, the West Macedonia Lignite Center supports various scientific bodies in their effort to screen the exploitation capacities of the rehabilitated land by means of developing energy crops such as rape seed oil and sorghum. This effort has a twofold interest for PPC S.A. On one hand, the biomass produced may serve as additional fuel to the Thermal Power Plants of the Ptolemais region, reducing thus CO₂ emissions.

On the other, the conversion of energy crops into biodiesel, as well as their use in Thermal Power Plants would significantly reduce the quantities of conventional fuels consumed during the operation of Lignite fired Plants.

Finally, the West Macedonia Lignite Center has completed the study "Creation of 250 ha of model farms in the West deposition of the Choremio Mine at the Megalopolis Lignite Center" and proceeds to its implementation.



Special Studies and Research Programs on Environmental Protection

Similarly, in order to comply with the Environmental Terms and the Law in force on Environmental Protection issues (air, water, soil), the Mines Division does not only carry out the relevant studies, but also participates in various Research programmes in cooperation with Universities and other Bodies aiming at investigating any impact on the environment and its systematic suppression. In this context, the Mines Division has already worked in partnership with the Hellenic Ornithological Society for creating a wetland and restoring the land at the Choremio and Marathousa lignite mines of the Megalopolis Lignite Center.

Indicatively, the following projects and studies are cited:

- ▶ Investigative hydrogeological study on the water supply of the Municipality of Kozani
- ▶ Development of a water resources management system and methods of artificial enrichment in areas of lignite resources – "Elimia"
- ▶ Study on the composition and technological uses of lignite ash produced by the Thermal Power Plants in the Ptolemais - Amyndeon regions.
- ▶ Study on the potential impact of the Amyndeon mine on the water regime of lake Chimaditida
- ▶ Study on the Hydrogeological conditions of the South Field basin – water balance
- ▶ Hydrogeological study on the drainage and protection of the South Field mine.





PPC's contribution to the development of areas with lignite deposits - financial and social impact

The social and financial impact arising from the development of West Macedonia and Megalopolis energy centers mainly concern the radical change in the productive backbone of the areas in question and the relocation of populations through the creation of local urban centers.

Prior to the commencement of lignite mining, mining areas were areas of farming, foresting and animal husbandry with low productivity and a dwindling population. The development of the energy centers brought about a period of economic recovery and welfare. New jobs were created pertaining to activities different from the traditional productive activities of these areas, the per capita income of the inhabitants increased and reconstruction took off at an accelerated pace.

At the same time, in order to construct the

energy centers, it was necessary to relocate some settlements built on the lignite deposits. To date, 3 settlements have been relocated in the West Macedonia region totaling approximately 3,000 people while another 3 settlements have been relocated in the Megalopolis area accommodating approximately 200 people. A large part of the relocated population was settled in the towns of Ptolemais and Megalopolis, which developed into major urban centers of the Kozani and Arcadia Prefectures.

From 1993 to 1997, PPC financed projects of social regeneration for the settlements of the areas where it develops lignite activities, totaling 1,3 billion GRD.

Since 1997, a levy for the development of industrial areas has been imposed amounting to 0.4% of PPC's annual turnover. This levy is



distributed to the Prefectures of Kozani, Florina and Arcadia where lignite mines and lignite power plants operate. During the period 1997-2002, the amount of 60.5 million Euros was allocated to these three prefectures.

For the period 2003-2007 the total amount to be allocated is estimated at 80 million Euros. To date, approximately 63.2 million euros have already been allocated. The allocation of this levy is estimated according to the amount of power generated by the Thermal Power Plants located in the above-mentioned areas and in compliance with the law in force. The resulting allocations are to be used for the financing of infrastructure works, development and environmental protection. The significant amounts spent on a

yearly basis by PPC in this regard are expected to serve as a major springboard for development and progress in the greater area of these regions.

In addition to the works of social regeneration and the levy for the development of industrial areas, PPC spends more than 1.7 billion GRD (0.5 million Euros) for the redevelopment works and environmental protection at lignite mines (1.2 billion GRD for the West Macedonia Lignite Center and 500 million GRD for the Megalopolis Lignite Center). Moreover, according to the data taken from the statement of accounts regarding the mines' operation (salaries, commissions, contracts assigned etc), the amount of 367 million Euros (125 billion GRD) is spent in the local societies of Kozani and Florina Prefectures.

Objectives and Perspectives

The environmental works carried out by the Mines Division focus on the following activities:

- ▶ Prevention of source-pollution
- ▶ Rational natural resources management
- ▶ Aesthetic and harmonious integration of the rehabilitated land in the nearest and greater surrounding area where mining is carried out
- ▶ Restoration of the green spaces by means of treeplanting and landscaping on the rehabilitated land of the mining area
- ▶ Development of communication channels with the competent authorities, agencies, bodies as well as with local societies
- ▶ Participation in the drawing up of new national and European environmental legislation on mining

Moreover, the Division promotes the development of an Environmental Management System at the West Macedonia Lignite Center with a view to increasing the personnel's awareness and training on environmental issues.

As regards the effort made to achieve these goals, it is a common conviction at all levels of the Mines Division hierarchy that the protection of the environment is an issue that concerns us all and requires thus the awareness and mobilization of all personnel.

Environmental Care of the Generation Division

The Generation Division (G/DI) is responsible for the development of the generation capacity of PPC Thermal and Hydroelectric Power Plants (in continental Greece and on Crete and Rhodes islands), as well as for their best possible operational and commercial exploitation, in accordance with the environmental requirements and the rational management of water resources.



Environmental management policy of the Generation Division

Environmental protection, competitiveness and security of supply are the three main pillars of the EU energy policy. The environmental strategy applied by electric companies is determined by the continuous pursuit to minimize the environmental impact arising from power generation, transmission and distribution.

Environmental protection is one of the main principles that govern PPC strategy and daily operational activity, as it is integrated into the decision-making process of the Company for

achieving its strategic goals. In this context, the G/DI implements its environmental policy through a series of preventive measures, programmes and actions aiming at protecting the environment, while promoting social responsibility and dialogue.

The G/DI has an appropriate and up-to-date organizational structure and follows procedures for the implementation of its environmental policy, which is integrated into its power generation activities.

Main Principles of the environmental policy developed by the Generation Division

The main principles of G/DI environmental policy focus on the following:

- ▶ Strict application of the European and national environmental legislation as an inviolable condition for every activity of the Division.
- ▶ Integrated Approach towards overall environmental protection.
- ▶ Application of the Best Available Techniques both to new and existing Power Plants, in compliance with the Directive on Integrated Pollution Prevention and Control (IPPC).
- ▶ Exploitation of domestic energy resources, mainly of the indigenous lignite and the country's hydro-potential, with respect for the environment. Design and operation of Hydroelectric Projects in compliance with an integrated water resources management and with a view to maximizing the social - environmental benefits arising from the projects' combined use.
- ▶ Dialogue with the parties concerned on the preparation of development programmes or new projects, as well as on the existing operations of the Division.
- ▶ Development of scientific knowledge and expertise via participation in European Union environmental research projects.
- ▶ Coordination with other related policies, such as the policy for occupational health and safety etc.

- ▶ Continuous information exchange and collaboration with other European bodies of the same industrial sector aiming at the development of pollution abatement techniques.
- ▶ Development of realistic programmes for informing the personnel on environmental issues.
- ▶ Development of external communication for informing the public on the integrated environmental protection programmes and measures taken by the G/DI.
- ▶ Evaluation of environment - related performance compared to the results achieved by similar European bodies, as well as to the methods applied by the latter.
- ▶ Reinforcement of environmental issues management.

The Management of the Company has taken on the commitment to ensure the unimpeded

implementation of the environmental policy developed by the G/DI, which is fully integrated into the business plan of the company, both with regard to the design of new Power Plants and to the operation and exploitation of the existing ones. This commitment promises a successful response to the challenge of sustainable development, which is not only one of the main targets of the Company, but also a demand of all parties concerned: shareholders, clients, public authorities, associates, suppliers and the society in general.

The Generation Division takes environmental actions and draws up investing programmes with a view to improving the environmental behavior of its Power Plants. As a reward for this great effort, PPC was recently given the award "Environmental Sensitivity ECOPOLIS 2006" which refers to only a part of PPC's total environmental investments.

The objectives and environmental actions aiming at the implementation of this policy are further explained in the sections mentioned below.



Environmental Action Plan of the Generation Division

Development of new Power Plants on the basis of an integrated environmental assessment

The environment constitutes a key factor for the design of every large-scale energy project (thermal or hydroelectric).

Right from the phase of project site selection, inter alia, the following criteria are taken into account:

- ▶ Development capacities of the region.
- ▶ Consent of the local community.
- ▶ Geomorphologic characteristics and seismicity of the region.
- ▶ Meteorological and hydrological data.
- ▶ Distance and perspective from residential, recreational and archaeological sites, as well as from areas requiring special environmental protection.

Thereafter, all environmental impacts arising from the construction and operation of a project are thoroughly examined whereas all necessary environmental studies are carried out (dispersion of air pollutants, heat transfer and diffusion of cooling water, dam failure design studies, etc.). Furthermore, all important issues that should be taken into consideration during the design phase are identified.

During the project's detailed engineering studies phase, state-of-the-art integrated technology solutions are applied, including pollution abatement technologies.

All the aforementioned criteria have been fully taken into account for the construction of new units, as well as for those under construction that already operate under approved Environmental Terms with regard to their construction and



operation (e.g. New Combined Cycle Natural Gas fired Units at Lavrion, Meliti and Atherinolakkos Thermal Power Plants, as well as at the Hydroelectric Power Plant of Ilarionas, etc.).

In parallel, pursuant to Law 3175/2003, PPC seeks to replace some of its old Units of 1600 MW total capacity, with new high performance, modern technology Units whose operation is more friendly to the environment. In this context, PPC Board of Directors considers as candidate new Units the following:

- ▶ Lignite fired Unit in West Macedonia (400 MW capacity).
- ▶ Combined Cycle Natural Gas fired Unit in Megalopolis (400 MW capacity).
- ▶ Combined Cycle Natural Gas fired Unit in Aliveri (400 MW capacity).
- ▶ Combined Cycle Natural Gas fired Unit (400 MW capacity) in Megalopolis, Keratsini or Aliveri.

Selection of the above Units was based on criteria such as environmental protection, security of supply, stability of the Transmission System and support to areas where PPC develops significant activities.

Environmental assessment of the Generation Division's activities - Compliance with the Environmental Terms "Construction & Operation Phase"

All Thermal Power Plants (TPP) and Hydroelectric Power Plants (HPP) have been subjected to full and detailed assessment of their environmental impact. On the basis of this assessment and in accordance with the legislation in force, the relevant Environmental Impact Assessments Studies have been carried out and submitted to the Hellenic Ministry for the Environment, Physical Planning and Public Works.

All existing Units of PPC Thermal Power Plants already operate under Approved Environmental Terms in accordance with the relevant Joint Ministerial Decrees, with the exception of Units I, II and III at the Megalopolis TPP, the environmental terms of which shall be approved by the Hellenic Ministry for the Environment, Physical Planning and Public Works soon.

Within the framework of renewal of the Environmental Terms for the operation of Thermal Power Plants, Technical Reports have been submitted to the competent authorities regarding the compliance of the existing PPC Units with the new environmental requirements. More precisely, these reports provide a detailed description of the measures to be taken for the operation of the existing PPC facilities in compliance with Directive 96/61/EC on Integrated Pollution Prevention and Control (IPPC), the Best Available Techniques Reference Documents (BREFs), as well as with Directive 2001/80/EC on the reduction of air pollutants emitted from Large Combustion Plants (LCP).

As regards the Hydroelectric Projects constructed since 1987, procedures for the issuing of the Joint Ministerial Decrees on Approval of the Environmental Terms have been successfully completed. With respect to Hydroelectric Projects constructed prior to 1987, it is estimated that the relevant procedures shall be completed within the year 2006.

Pursuant to Directive IPPC, environmental terms for the construction and operation of Thermal Power Plant include law-binding, detailed requirements pertaining to the following elements:

- ▶ Limit values for atmospheric pollutants (SO₂, NO_x, particles, etc.) and wastewater.
- ▶ Limit values for ambient air quality, noise and wastewater receptor.
- ▶ Monitoring and recording of air pollutant emissions
- ▶ Treatment and disposal of wastewater.
- ▶ Treatment and disposal of solid by-products/ hazardous or non-hazardous waste.
- ▶ Transportation and storage of liquid fuel and additive materials.
- ▶ Monitoring of fuel and ash quality.
- ▶ Environment Quality Control in the greater Power Plant area, by means of extensive ambient air quality monitoring networks
- ▶ Hazardous substances management
- ▶ Log keeping
- ▶ Measures to be taken in cases of emergencies and equipment failures
- ▶ Operation of installations according to environmental parameters
- ▶ Periodic reporting to the competent authorities and submission of annual reports. Annual reporting to the competent authorities with regard to the emissions of air pollutants and wastewater listed in the European Pollutant Emission Register (EPER).

Inter alia, environmental terms for the construction and operation of Hydroelectric Projects include:

- ▶ Technical projects and measures for the





protection, management and upgrade of the environment.

- ▶ Maintaining minimal environmental flow downstream of dams.
- ▶ Integrated management of the river basin where the Plant is located, with the aim to establish optimal exploitation schemes of the useful natural resources on the basis of special studies.
- ▶ Quality control of the reservoir water
- ▶ Monitoring the stability of the reservoir and the dam embankments for safety reasons.
- ▶ Special limit values for pollutant load emissions with regard to ambient air quality, wastewater, noise and vibration levels, mainly during the project's construction phase

Extensive programmes for the systematic management, monitoring and recording of all relevant parameters are implemented in all Thermal and Hydroelectric Power Plants.

The results of these programmes are evaluated by PPC expert scientific personnel, as well as by the respective scientific personnel of the competent authorities to which the monitoring results are duly communicated.

It is noted that particular emphasis is given on the management and disposal of solid by-products and hazardous or non-hazardous waste resulting from power generation activities. The G/DI has harmonized its operations with the legislation in force, since the environmental terms "operation phase" also include respective management practices.

Solid by-products and waste include the following: fly and sludge produced by wastewater treatment plants, mineral oils, PCB-containing devices, asbestos-cement products, municipal waste, etc.

Implementation of Environmental Projects in order to achieve compliance and improve the environmental behavior of existing Thermal Power Plants

In order to achieve compliance and to improve the environmental behavior of existing Thermal Power Plants, the G/DI draws up various environmental projects such as:

- (a) Programmes for compliance with the Kyoto Protocol requirements.
- (b) Programme for the reduction of particle emissions.
- (c) Programme for the reduction of SO₂ emissions.
- (d) Solid and liquid waste management programme.
- (e) Programme for the enhancement of energy efficiency and energy saving.
- (f) District teleheating programme from Thermal Power Plants by means of co-generation.
- (g) Programme for the installation of additional online equipment for monitoring air pollutant emissions.

(A) PROGRAMMES FOR COMPLIANCE WITH THE KYOTO PROTOCOL REQUIREMENTS

The Generation Division plays the lead role in achieving the targets of the Company for compliance with the Kyoto Protocol requirements, as well as with the requirements



laid down in the relevant EU and national legislation.

These targets have been integrated into the Division's decision-making process and daily operational activity, as well as into the load management of Power Plants.

In order to honor the commitments of the Company, the G/DI implements the following programmes:

- ▶ Programmes for monitoring and reporting of CO₂ emissions.
- ▶ Programmes for the reduction of CO₂ emissions.
- ▶ Programmes for the use of the Kyoto Protocol "Flexible Mechanisms".
- ▶ Participation in innovative research programmes for CO₂ capture and storage.

Monitoring and reporting of CO₂ emissions

As from January 1st 2005, PPC has taken on the commitment to monitor and report CO₂ emissions by all its facilities that fall within the scope of application of Directive 2003/87/EC. More precisely, this commitment pertains to a total number of 29 facilities of the Company : 8 Lignite-fired Power Plants, 2 Natural Gas fired Power Plants, 1 Natural Gas – Fuel Oil fired Power Plants and 5 Fuel Oil-fired Power Plants in the interconnected network, as well as 13 autonomous Fuel Oil-fired Power Plants on the islands.

The monitoring and reporting of CO₂ emissions for PPC Power Plant Group has been assigned to the Generation Environment Department.

PPC started all necessary preparations for meeting the requirements of monitoring and registering CO₂ emissions, as stipulated in Commission Decision 2004/156/EC, as early as 2004.

In the year 2005, CO₂ emissions of the aforementioned Power Plants were monitored and recorded on the basis of an efficient centrally-planned Monitoring Plan. The Plan in question is based on a unique approach, according to the fuel used, and adjusted in such a way so as to meet each Power Plant's particularities.

The Core element of this Monitoring Plan lies is the Quality Assurance System for Monitoring Greenhouse Gas (GHG) Emissions. Thanks to this system, PPC ensures the control of all GHG emissions-related activities, as well as the recording, monitoring and management of all relative data and information. The QAS – Monitoring GHG Emissions implemented in each one of the 29 PPC Power Plants has the following four-level structure:



The Monitoring Plan implemented in PPC facilities, was submitted to the Hellenic Ministry for the Environment, Physical Planning and Public Works and was approved in January 2006, together with the issuing of the Greenhouse Gas Emissions Permits.

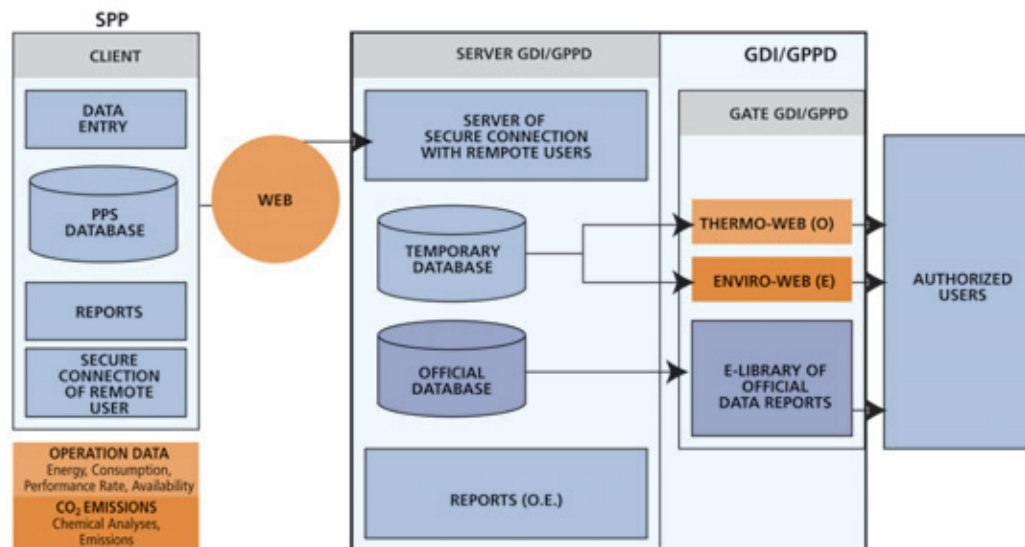
In accordance with the Greenhouse Gas Emissions Permits, the requirements laid down by the Law in force and the internal procedures of each facility, as these are stipulated in the approved Monitoring Plan, the annual reports on CO₂ emissions from PPC facilities were verified by accredited control bodies in March 2006. Thereafter, the verified reports, together with the respective verification declarations, were



submitted to the Hellenic Ministry for the Environment, Physical Planning and Public Works within the time limit prescribed by Law. Furthermore, for the purposes of a systematic integrated management of all information on CO₂ emissions, an ENVIRO software was installed for managing environmental operation data. This software includes:

- ▶ An integrated software for storing and managing environmental data related to G/DI Power Plants, as an extension to the existing THERMO software.
- ▶ Installation of software in G/DI IT center, as well as in G/DI Thermal Power Plants.

THERMO and ENVIRO systems:



THERMO: Thermal Power Plants Operation Monitoring System. ENVIRO: CO₂ Emissions Monitoring System

PPC ensures the optimum environmental and financial management of issues related to emission allowances by taking actions in order to reduce emissions, by purchasing emission allowances, as well as by applying other flexible mechanisms.

For the purposes of monitoring CO₂ emissions in the years to come, the G/DI embarked on the accreditation process of two of its chemical laboratories according to EN 17025 and implements a programme aiming at the improvement of lignite-weighing systems in accordance with the relevant legislation.

Reduction of CO₂ emissions

In order to reduce CO₂ emissions, the G/DI promotes the actions listed below:

Integration of natural gas as a new fuel for electricity generation

In the year 2005, the works for the construction of Unit V at Lavrion TPP of 385.25 MW capacity, made significant progress. The new modern pollution abatement technology and high performance Unit, was put into pilot operation in early 2006. According to estimations, this unit shall have an important contribution to the stability of the South System. Furthermore, within

the framework of Law 3175/2003, PPC has launched a programme for replacing some of its old Units (of 1600 MW total capacity) with new modern technology high performance Units. This programme provides for the construction of three new Natural Gas fired Units of 1200 MW total capacity.

Exploitation and development of the country's hydro-potential

PPC has never given up its intensive effort to make the most of the country's hydro-potential. In the years 1997 – 2005, 8 Units of 533.6 MW total capacity were integrated into PPC interconnected network, while another 16 Hydroelectric Power Plants, of 645 MW total capacity, are under construction.

Implementation of efficient lignite-combustion technologies

Within the framework of the programme providing for the replacement of some of the old PPC Units, PPC Board of Directors also considers as new candidate unit a Lignite fired Power Plant of 400 MW in West Macedonia. For the construction of this Unit, the most efficient lignite-combustion technologies shall be taken into consideration.

Enhancement of Power Efficiency and Energy Saving

The enhancement of power efficiency and energy saving aims at optimizing the operation of Power Plants, thus contributing mainly to the reduction of CO₂ emissions, as well as to raw materials saving and to the reduction of specific emissions and other conventional pollutant emissions. In order to achieve this target, PPC implements special programmes that are further explained in a separate paragraph.

Use of the Kyoto Protocol Flexible Mechanisms

The Kyoto Protocol, as well as the relevant European Community legislation allow for the use of "Flexible Mechanisms" so that member-states can fulfill their commitment to achieve the determined GHG emission ceiling":

- ▶ Emissions trading
- ▶ Clean Development Mechanisms (CDM) and Joint Implementation (JI) project activities which are friendly to the environment (i.e. energy-saving projects, projects for the exploitation of renewable energy sources, GHG abatement projects etc.), which are implemented in developing countries or countries in transition.

The concept of implementing CDM and JI projects lies in the fact that the effect of limiting GHG emissions is the same, irrespective of where action is taken. Hence, it is logical to encourage the reduction of such emissions at regions where the cost is low. This is achieved through the aforementioned mechanisms that offer to liable companies the opportunity to implement projects for the reduction of GHG emissions, not necessarily within their installations, but at regions where the cost is significantly lower.

Given the fact that the cost of implementing emission reduction projects in developing

countries is particularly low, the CDM flexible mechanism has yet another significant advantage: the transfer of technology and expertise from the developed countries (EU) to developing countries which further contributes to the development of the latter and the reduction of social and economic disparities.

Within this framework, PPC S.A has an active participation in the Kyoto Protocol flexible mechanisms, mainly with regard to CDM projects.

More precisely, since 2005, PPC participates in two major Carbon Funds together with various big European and Japanese companies:

- the Carbon Fund managed by Natsource and
 - the Carbon Fund managed by ICECAP.
- Additionally, PPC participates in 2 major CDM





projects of the World Bank (Umbrella Carbon Facility) for the destruction of HFC23 in China.

The use of the aforementioned mechanisms shall allow PPC to cover more than 60% of its emission requirements for the years 2005-2012, contributing at the same time to:

- Meeting the Kyoto Protocol targets for global reduction of GHG emissions.
- Enhancing economic development in developing countries.
- Maintaining the cost of PPC GHG portfolio at low levels, thus minimizing the cost born by the Greek consumer..

Participation in innovative research programmes for CO₂ capture and storage

PPC keeps up with the environmental developments in CO₂ capture and storage. In this context, the Company participates in innovative research projects aiming at the direct or indirect reduction of CO₂ emissions, such as:

- ▀ The **CASTOR** project: post-combustion CO₂

capture, transport and storage technologies.

- ▀ The **ENCAP** project: pre-combustion CO₂ capture technologies.
- ▀ The **C2H** and **ISCC** projects: Innovative Technology for Solid Fuel Gasification with simultaneous CO₂ release.
- ▀ The **RECOFUEL** project: Solid Recovered Fuel (SRF) combined combustion.
- ▀ The **LIGPOWER** project: Improvement of cleaning equipment – reduction of boiler deposit slagging - enhancement of performance and availability.
- ▀ The **DRY COAL** project: integration of an innovative method for pre-drying lignite into SPPs – improved level of performance.

The aforementioned projects are funded by the Research Fund for Coal and Steel under the Sixth Framework Programme for Research, Technological Development and Demonstration (FP6).

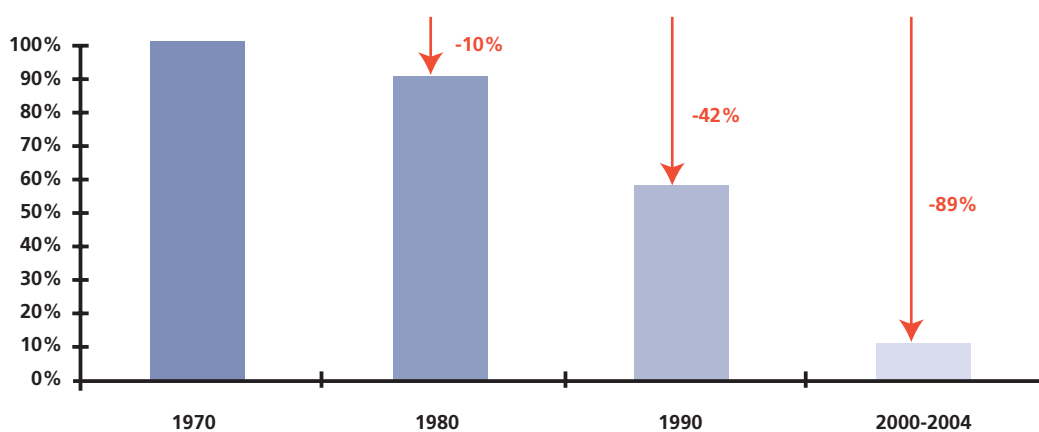
(B) PROGRAMME FOR THE REDUCTION OF PARTICLE EMISSIONS

In order to reduce particle emissions from Lignite-fired Power Plants, PPC implements a programme for replacing and upgrading the existing Electrostatic Precipitators (ESPs), as well as for adding new state-of-the-art high performance ESPs, in accordance with the provisions of Directive 96/61/EC on Integrated Pollution Prevention and Control, and the Best Available Techniques Reference Documents on Large Combustion Plants. The implementation of the programme to G/DI's Power Plants so far has led to an impressive improvement in ambient air quality at the power plants' regions.

Within the scope of the programme in question, the G/DI has proceeded since 1987 to the replacement of the existing ESPs at lignite Units I and II of Kardias TPP; units I, II, III and IV of Ptolemais TPP; units I and II of LIPTOL TPP; units III and IV of Kardias TPP and of the fly ash ESPs at unit III of Megalopolis TPP. In addition, aiming at the continuous improvement of the environment, the electronic and construction features of the existing ESPs have been modified. In accordance with 2006 - 2010 PPC business plan:

- ▶ The project for the upgrade of the existing ESPs and the installation of new ESPs at Units I-IV of Ag. Dimitrios TPP, reaching a total contractual cost of 130 million Euros, is in progress. The project is due for completion in 2008.
 - ▶ The project for the installation of new Lignite ESP's at Unit III of Megalopolis TPP, reaching a contractual cost of 16.4 million Euros, was completed in March 2006.
 - ▶ Projects for enhanced maintenance and improvement of the existing fly ash and lignite ESP's at Units I and II of Megalopolis TPP, aiming at achieving acceptable particle emissions in accordance with European regulations and the Greek law, are currently under way.
 - ▶ Furthermore, a project for the reduction of particles emitted from oil-fired power plants is being implemented. This project provides for the use of combustion improvement additives, as well as for the replacement of the existing oil burners with new ones (of the steam atomization type).
- All the above projects, combined with the introduction of natural gas to the national energy balance, resulted in the reduction of particles emission specific factor from Large

Percentage reduction of particles emission specific factor from large Combustion Plants as compared to 1970





Combustion Plants by approximately 47% (1990-2004).

(C) PROGRAMME FOR THE REDUCTION OF SO₂ EMISSIONS

The installation of flue gas desulphurization (FGD) systems in lignite-fired Power Plants aims at the effective abatement of sulphur dioxide emissions. Two FGD Systems are already in operation:

- ▶ at Unit IV of Megalopolis TPP
- ▶ at the new Meliti TPP in Florina

In parallel, aiming at further improving ambient air quality in the Megalopolis region, the following projects are in progress:

- ▶ Installation of flue gas desulphurization systems at Unit III of Megalopolis TPP; the project is due for completion in the 1st semester of 2008, and its contractual cost amounts to 84.7 millions Euros.
- ▶ Upgrade of the flue gas desulphurization system at Unit IV of Megalopolis TPP; the relevant budget amounts to 10 million Euros.

Within the framework of the programme for the reduction of SO₂ emissions, PPC has also embarked on a programme for adjusting liquid fuel reception and transportation facilities and

storage tanks to the use of low sulphur fuel oil (<1%) in its Power Plants. The Atherinolakkos TPP operates on low sulphur fuel oil since its commissioning date .

(D) SOLID AND LIQUID WASTE MANAGEMENT PROGRAMME

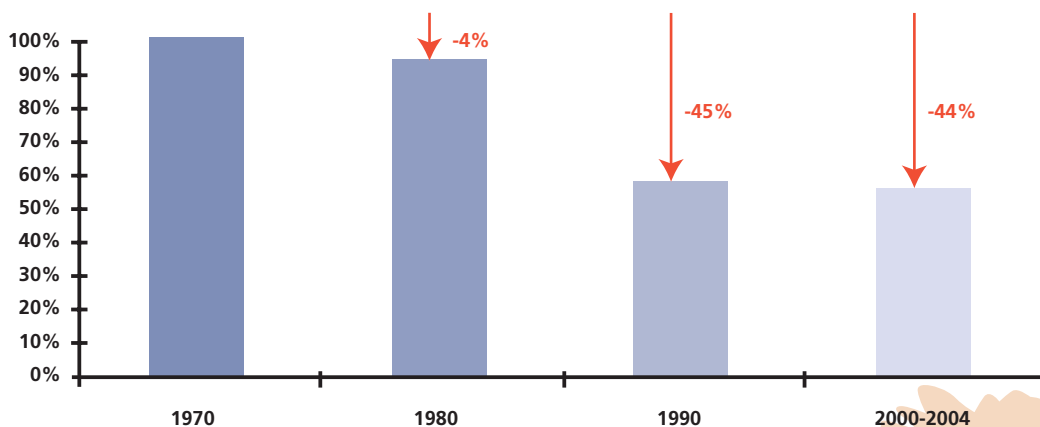
Installation of improved wastewater treatment plants

The environmental investment programme for the improvement of the existing industrial wastewater treatment plants provides for the following:

- ▶ Improvement of the collection network of the Industrial Wastewater Treatment Plant at Lavrion TPP
- ▶ Installation of an Industrial Wastewater Treatment Plant at Units I-III of Megalopolis TPP (contractual cost of 4.5 million Euros)
- ▶ Installation of an Industrial Wastewater Treatment Plant at Aliveri TPP (contractual cost of 880,000 Euros)

The technical specifications of the aforementioned projects include, inter alia, the requirements laid down in the Best Available Techniques Reference

Percentage reduction of SO₂ emission specific factor from Large Combustion Plants as compared to 1970





Documents on Large Combustion Plants.

Solid waste management

Within the framework of developing a central solid waste management policy, the G/DI has proceeded to the study, designing and environmental licensing of an adequate Industrial Waste Management Site situated at the deposition areas of the Kardia exhausted mine, in the region of Kozani. Site selection was based on the proximity factor, which constitutes a fundamental principle of the national and European community legislation on waste management.

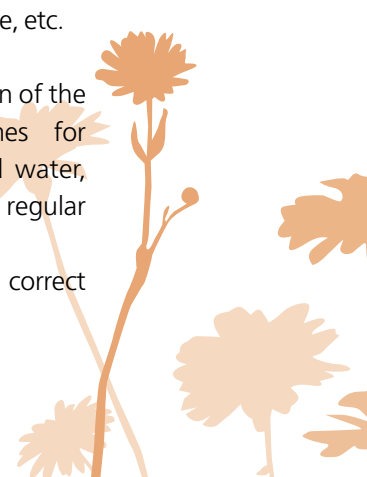
For the purposes of putting the site into operation, a Joint Ministerial Decree (JMD) on Approval of the Environmental Terms was issued and signed by three competent ministries. The Site, which is already run by PPC S.A, meets all the requirements provided for by the national and European legislation and BREFs, as well as the environmental terms of the aforementioned JMD. In application of JMD 13588/725/28-03-

2006, the General Secretary of the Region of West Macedonia issued the decision 38526/1261/19-04-06 for granting to PPC permit to collect, transport and dispose of asbestos cement waste. Waste management is carried out in perfectly insulated cells.

In compliance with the environmental terms, various important infrastructure works have been carried out in authorized PPC Industrial Waste Management Site: arrangement and sealing of the cells' bottom and slopes, collection and treatment of foul drains, flood and fire protection measures, inner and outer road network, enclosure and treeplanting around the Site, etc.

Measures for the control and supervision of the Site include, inter alia, programmes for monitoring surface water and ground water, sediment measurements, as well as regular reporting to the competent authorities.

In order to ensure the environmentally correct



management of the industrial waste generated by PPC facilities in the Megalopolis region, the G/DI has already embarked on studies necessary for the environmental licensing of a suitable industrial waste management site scheduled to operate within the area of an exhausted mine in the Megalopolis region.

(E) PROGRAMME FOR THE ENHANCEMENT OF ENERGY EFFICIENCY AND ENERGY - SAVING

PPC implements an upgrade programme in order to enhance energy efficiency and energy saving while reducing specific CO₂ emissions. These measures aim at optimizing the operation of PPC Units while ensuring direct environmental benefits. The aforementioned measures include the application of Best Available Techniques in accordance with BREFs on Large Combustion Plants. The programme provides for the upgrade of the following equipment and machinery:

- ▶ steam turbines
- ▶ cooling towers
- ▶ boilers
- ▶ auxiliary systems

The main projects have already been completed: upgrade of two steam turbines (units III and IV of Kardias TPP), upgrade of five cooling towers (Ptolemais, Kardias and Amyndeon TPPs) and various other upgrade projects (such as the refurbishment of the boiler at unit II of Ptolemais TPP).

In parallel, the following projects are scheduled:

- ▶ Upgrade of cooling towers at Units I, II, III and IV of Ag. Dimitrios TPP. Construction shall be carried out in phases; the project is due for completion in the 1st semester of 2008; the relevant budget amounts to 5.6 million Euros.
- ▶ Upgrade of steam turbines and condensate preheating system at Units III and IV of Ag.



Dimitrios TPP. The project is due for completion in the 1st semester of 2008; the relevant budget amounts to approximately 42.80 million Euros.

- ▶ Upgrade of condensate preheating system at Units I and II of Ag. Dimitrios TPP. The project is due for completion in the 1st semester of 2007; the relevant budget amounts to 5 million Euros.
- ▶ Upgrade of cooling towers at Units I and II of Kardias TPP; the relevant budget amounts to 3 million Euros.
- ▶ Upgrade and repair of the cooling tower at Unit III of Megalopolis TPP. The project is due for completion in the 1st semester of 2008; the relevant budget amounts to 7.10 million Euros.
- ▶ Supply and installation of an Efficiency Measurement Online System at the Units of Ag. Dimitrios TPP. Awarding procedures have been completed; the relevant budget amounts to 946,000 Euros.
- ▶ Supply and installation of Efficiency Measurement Online Systems at the Units of Aliveri, Lavrion and Ag. Georgios TPPs. The project's technical specifications are finalized



and the Invitation to tender shall be issued soon; the relevant budget amounts to 1.2 million Euros.

- ▶ Upgrade of lignite consumption measurement systems (belt-weighing devices).
- ▶ Installation of automatic solid fuel samplers and systems for determining the lowest caloric capacity of lignite.

(F) URBAN AND RURAL DISTRICT TELE-HEATING PROGRAMMES BY STEAM POWER PLANTS THROUGH CO-GENERATION

The combined generation of heat and power, also known as "co-generation", and the relevant technologies are applied in Greece, particularly so during the last decade, in order to supply thermal energy to cities adjacent to Thermal Power Plants, mainly for urban use, as is the case for central heating.

PPC, in collaboration with several municipal authorities, has proceeded to the implementation of a series of energy generation projects in the form of hot water for district teleheating purposes, in an attempt to provide a method of continuous heating of urban residences harmless to the environment. In brief, these projects are the following:

- ▶ Ptolemais city district teleheating, 50 MWth capacity from Unit III of Ptolemais TPP.
- ▶ Ptolemais city district teleheating, 25 MWth capacity from Unit I of LIPTOL TPP.
- ▶ Kozani city district teleheating, 67 MWth capacity from Units III/IV of Ag. Dimitrios TPP.
- ▶ Kozani city district teleheating, 70 MWth capacity from Unit V of Ag. Dimitrios TPP.
- ▶ Megalopolis city district teleheating, 20 MWth capacity from Unit III of Megalopolis TPP.
- ▶ District teleheating of the greater Amyndeon city area, 25 MWth capacity from Units I/II of Amyndeon TPP.
- ▶ Option to provide 70 MWth capacity for the district teleheating of Florina city from Meliti TPP, following the installation of the necessary equipment by the Municipality of Florina.

The production of thermal energy in Thermal Power Plants is carried out through partial steam bleeding that activates steam turbines. This steam is then conducted to appropriate heat exchangers where the water of the district teleheating network of the nearest city to the TPP is pressurized.

District teleheating networks of the areas of Ptolemais and Kozani have already been successfully in operation for several years, thus providing residents with high thermal power availability. Thanks to the appropriate

billing policy applied by municipal authorities, this district teleheating project has led to a significant improvement of the residents' quality of living, offering less expensive heating power and contributing to the reduction of air pollutant emissions from the central heating systems of the urban tissue.

As a result, there has been an increased interest from the part of municipal authorities in the supply of additional thermal power by the nearest TPP.

In response to such demand, PPC already proceeds with the implementation of the following projects:

- ▶ Additional thermal heat supply of 40 - 80 MWth capacity to the Municipality of Ptolemais by the Units of Kardia TPP.
- ▶ Expansion of the district teleheating network of Kozani with the supply of steam from Units III - IV of Ag. Dimitrios TPP (total thermal capacity of 134 MWth).

The technical specifications of the projects mentioned above are compliant to the requirements laid down in BREFFs.

(G) PROGRAMME FOR THE INSTALLATION OF ADDITIONAL ONLINE EQUIPMENT FOR MONITORING AIR POLLUTANT EMISSIONS

This project, of total budget amounting to 3.7 million Euros, aims at improving existing methods of monitoring specific pollutant emissions.

The Invitation to Tender for the installation of online systems for monitoring the environmental behaviour of Ag. Dimitrios, Kardia, Megalopolis (Units I, II and III) and Ptolemais TPPs, is under way.



Implementation of Environmental Programmes to remedy the impact arising from the construction of Hydroelectric Projects

- ▶ Programmes aiming at the rescue of cultural legacy.
- ▶ Programmes aiming at coping with problems due to flooding of crop fields and residences.
- ▶ Programmes aiming at maintaining environmental flows.
- ▶ Programmes aiming at the restoration of the Hydroelectric Projects' environment.
- ▶ Programmes aiming at the relocation of ichthyofauna.

(A) PROGRAMMES AIMING AT THE RESCUE OF CULTURAL LEGACY

The area occupied by the reservoir of a Hydroelectric Power Plant, due to its extent, may encompass unexplored sites of antiquity or monuments of the Byzantine era.

In such a case, the G/DI shall subsidize excavation research carried out under the responsibility of the Hellenic Ministry of Culture and, depending on the findings of this research, shall take the appropriate measures, as in the cases of the reservoirs of Messochora and Ilarionas Hydroelectric Projects. With regard to the reservoir of the Ilarionas Hydroelectric Project, PPC shall carry out an extensive archaeological study in the area that shall be flooded after the construction of the reservoir, in collaboration with the 17th Ephorate of Prehistoric and Classical Antiquities of Kozani.

Furthermore, appropriate measures are taken in order to preserve and highlight Byzantine monuments. For instance, the Ag. Georgios Myrofyllos Monastery located on the bank of Acheloos River would have been flooded by the Sykia Hydroelectric Project which is under construction. Given the clear intention of the State to proceed with its completion, it was decided to lower the water level of the Sykia

lake by 5 m, resulting in a significant reduction of the energy generated by PPC S.A., as well as of the storage volume by 60 million m³. Moreover, as far as the State is concerned, it was decided to construct a protective embankment around the monastery and to restore the area. The cost of these works will amount to approximately 12 million Euros.

It is worth mentioning the case of Panaghia Tornikiou Monastery. It is a Byzantine monument near Ilarionas dam, which risks being flooded once the reservoir is filled. The G/DI has already elaborated a relevant study and shall soon proceed- in cooperation with the 11th Ephorate of Byzantine Antiquities of Veria- to the relocation of the monastery, which is now in decay, to a neighboring rise outside the reservoir as well as to the restoration and maintenance of the monument.

Finally, the G/DI has carried out special studies, as well as a Preliminary study, on the measures to be taken with regard to the Osios Nikanoras Monastery which is situated in a steep location of the Ilarionas future reservoir and shall be flooded once the reservoir is filled.

(B) PROGRAMMES AIMING AT COPING WITH PROBLEMS DUE TO FLOODING OF CROP FIELDS AND RESIDENCES

Care is also given by the G/DI to man-made environment, especially in order to deal with problems caused by the flooding of crop fields and residences.

Thus, at the Messochora Hydroelectric Project on Acheloos River, which is currently under construction and where a significant number of residences in the villages of Messochora and Armatoliko are expected to be flooded, provisions have been made to fully safeguard

the interests of the affected inhabitants. Such measures include pecuniary compensation, preparation of town rehabilitation plans for the settlements of Messochora and Armatoliko and, thereafter, construction of all works (infrastructure and residential) necessary for the relocation of the inhabitants.

Moreover, a drainage tunnel of 1 km shall be constructed below the Messochora village in order to improve the stability conditions of the area that presents serious creeping problems.

(C) PROGRAMMES AIMING AT MAINTAINING ENVIRONMENTAL FLOWS

Once the construction of a dam is completed, a reservoir is formed that results in a modification of the natural river flow between the dam and the outlet of the bypass channel, as well as in its replacement by the outflow of the HPP Units.

On this account, a small unit is usually installed at the foot of the dam, allowing for a minimum continuous water flow sufficient to preserve downstream ecosystems as in the cases of the Messochora, Ilarionas, Skopos-Papadia (region of Florina) and Ag. Varvara (region of Veria) dams which are under construction. Another means to cope with this problem is to construct a re-regulating reservoir, as in the cases of the Stratos, Pournari I and Assomata dams.

(D) PROGRAMMES AIMING AT THE RESTORATION OF THE HYDROELECTRIC PROJECTS ENVIRONMENT

In an effort to minimize the impact of Hydroelectric Projects, the G/DI implements various corrective measures on the basis of environmental impact assessment studies and in accordance with the environmental terms.

These actions involve rehabilitation works, such as those around Arachthos River in the city of Arta, treeplanting operations, as those in the vicinity of Stratos dam on Acheloos River etc.

More precisely, it is noted that within the

framework of the construction of the re-regulating dam of Ag. Varvara on Aliakmonas River, the G/DI has constructed near the reservoir a new waste-burial site for the Municipality of Veria. The old landfill of Veria, which was situated inside the area where the reservoir shall be constructed, has been planted with trees.

In addition, the G/DI has constructed inside the reservoir two artificial islands, which serve as refuge for wild birds, while the banks of the lake serve as footpaths for recreational purposes. Finally, two large fishing platforms have been constructed for the purposes of amateur fishing in the reservoir to be constructed.

(E) PROGRAMMES AIMING AT THE STUDY, PROTECTION AND RELOCATION OF ICHTHYOFAUNA

In order to ensure the free movement of aquatic vertebrates along Acheloos River (lower course), which was disrupted by the construction of the Kremasta, Kastraki and Stratos dams, an effort was made to restore fish mobility at least up to the point where the Kastraki dam is built.

To this end, the G/DI carried out a study on the construction of an eel passage at the reservoir of Stratos HPP, as well as on the enrichment of the reservoir with various species (river trout etc.) grown in fishbreeding plants. This pilot project shall lead to useful conclusions.

Furthermore, the G/DI also carried out a study on the installation of eel passages at Stratos HPP. In accordance with this study, a Pilot Plant for the collection of Upstream Migrating Eels has already been constructed and put into operation downstream of Stratos HPP.

Nevertheless, according to several special studies recording ichthyofauna species by both observations and field measurements, rich ichthyofauna has been developed in reservoirs. The G/DI, in cooperation with the Hellenic Center for Marine Research (HCMR), shall



carry out a special Study - Research on the ichthyofauna of Aliakmonas and Geropotamos Rivers, both before and after the construction of Ilarionas and Skopos-Papadia dams. This quantitative and qualitative research on the fish species that dwell in various parts of the rivers, both downstream and upstream of the dams shall determine the measures to be taken for preserving ichthyofauna.

This two- year project is the first to be implemented on a Greek river in accordance with the provisions of Water Framework Directive 2000/60/EC on establishing a framework for community action in the field of water policy.

Special Studies – Programmes

Special studies and programmes are carried out aiming at achieving full compliance with the legislation in force, as well as at meeting the requirements of future legislation. The following programmes and studies are mentioned as reference:

- ▶ Programme for monitoring PPC's compliance with the Plan for Reducing SO₂, NO_x and suspended particles Emissions from Large Combustion Plants pursuant to Directive 2001/80/EC.
- ▶ Studies for the environmental licensing of Industrial Waste Management Sites run by the Company.

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- ▀ Safety Studies and notifications concerning Thermal Power Plants that fall within the scope of Directive SEVESO II (1996/82/EC).
 - ▀ Submission of Technical Reports on the application of Best Available Techniques in PPC facilities, in accordance with the relevant provisions of Directive 96/61/EC (IPPC).
 - ▀ Research on the utilization of the ash produced by lignite fired TPPs, of desulphurization by-products and the ash grinding mills located in the Ptolemais region.
 - ▀ Solid Waste Management Plan for all PPC installations that fall within the scope of Directive IPPC
- ▀ Implementation of Decision 2000/479/EC on adoption of the European Pollutant Emission Register (EPER) in accordance with Directive 96/61/EC (IPPC).

Implementation of Research Projects in collaboration with Educational Institutions and Bodies

In addition to the environmental studies, measurements and programmes as stipulated by the legislation, the G/DI implements a series of projects in collaboration with Higher Educational Institutions and Bodies aiming at evaluating the environmental impact caused by the operation of its Power Plants, as well as at developing innovative pollution abatement technologies.



Some of the recently completed research projects are the following:

- ▶ Pilot application of the 2nd BREF Document "Economics and Cross - Media Effects" under Directive 96/61/EC (IPPC), at the Amyndeon and Chania TPPs, aiming at developing a methodology for the evaluation of Best Available Techniques for BAT implementation (by the National Technical University of Athens).
- ▶ Source identification of suspended particles emission and chemical control of toxic content at the Aliveri TPP area (by the Aristotle University of Thessaloniki).
- ▶ Operation analysis of the flue gas desulphurization plant at Unit IV of Megalopolis TPP (by the National Technical University of Athens and the School of Engineering of the University of Patras).
- ▶ Examination of the Acheloos riverbed in order to identify sediments and specify their position.
- ▶ Research on the condition of Aaos and Pournari HPP reservoirs.

The G/DI also participates in European Research Programmes for the development and implementation of innovative pollution abatement techniques such as the CAFENOX project, which was completed in the 1st semester of 2005, as well as the LOTHECO project aiming at increasing the Units' performance etc.

Some of the projects to be scheduled are cited below:

- ▶ Research programme for the identification and quantification of the sources of suspended particles emissions at the wider area of Rhodes TPP (by the Aristotle University of Thessaloniki).
- ▶ Study on the evaluation of ambient air quality

at the Akrini settlement in the region of Ellispondos at the prefecture of Kozani (by the Technological Educational Institute of West Macedonia under the auspices of the West Macedonia District).

Rational Management of Water Resources during Hydroelectric Power Plant Operation

The reservoirs constructed by the G/DI are not used only for energy generation. In most cases, Hydroelectric Projects (HEPs) serve multiple purposes. Thus, in addition to energy generation, they are also used for irrigation, water supply, flood control, industrial cooling, recreational activities etc.

The fifteen (15) major Hydroelectric Power Plants operated by the G/DI provide a net reservoir volume equal to 6,5 billion m³ of water, thus contributing significantly to the management of the country's water resources and to meeting water requirements of local communities (water supply, irrigation and other uses).

As a result, Hydroelectric Power Plants making the most of domestic resources, reduce foreign energy dependency. In addition, they substitute fossil fuels contributing thus to the reduction of CO₂ emissions and to the limitation of the greenhouse effect.

Power Generation

The power generated by hydroelectric power plants varies depending on annual water availability, as well as on the country's energy demands and covers approximately 10% of the annual energy needs.

In addition to generating considerable amounts of power and installed capacity with particularly high availability, Hydroelectric Power Plants also provide multiple services to the national interconnected system, such as:

- ▶ Control of interconnections and load variations in general.
- ▶ Generation of reactive power for the needs of





the system, which contributes to voltage regulation.

- ▶ Provision for system peak needs, which results in the optimal operation of thermal power plants.
- ▶ Provision for spinning reserve due to the quick loading capability.
- ▶ Cold reserve of the system installed capacity in order to deal with the adverse effects resulting from power-generation shortage.

Water supply and Recreational activities

G/DI reservoirs offer high storage capacity of high quality water. Hence, they supply large volumes of potable water to several regions of approximately 2.5 million residents (in Arta, Preveza, Lefkada, Agrinio, Karditsa and soon in Thessaloniki).

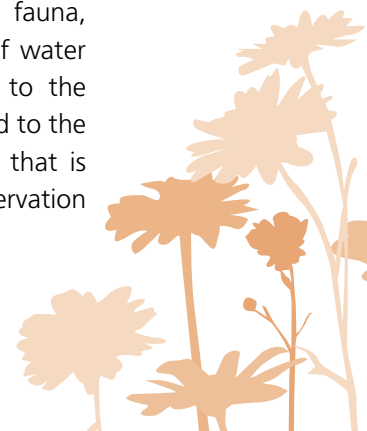
The primary aim is to preserve the high quality of the water, since it is a natural resource invaluable for life, which is currently in shortage due to increasing consumption and quality degradation. In order to achieve this goal, the personnel should make continuous efforts towards reconciling all kinds of pressing demands for anthropogenic activities in the artificial lakes (river transport, fish

breeding, marine sports, recreation, etc.). The G/DI consents to activities that do not present any risk to the environment and to water quality and concern mainly recreational activities. The high quality of the reservoirs' water has been proved by several studies that were mainly carried out by the Hellenic Center for Marine Research (HCMR) and other agencies.

Water supply for irrigation purposes

G/DI reservoirs supply large quantities of water during the summer peaks of July and August for irrigation of extensive areas downstream of the dams. It is estimated that approximately 500,000 acres are irrigated in large plains (Agrinio, Arta, Thessalia, Emathia, Pieria, Kavala, Xanthi etc.), increasing the cultivated land value, as well as the annual income of the farming population.

In this way, hydroelectric facilities contribute to the employment of a large part of the population while preserving flora and fauna, which would be devastated in case of water shortage. Therefore, they contribute to the overall upgrade of the environment and to the protection of the environmental flow that is assumed as a prerequisite for the preservation of riverain life and vegetation.



Flood protection

By constructing dams on the major Hellenic rivers, the G/DI has created the necessary conditions for boosting the country's agricultural economy and social development. More precisely, dams offer protection against floods at downstream riverside areas and as a consequence they allow for the effective utilization of extensive areas of farmland. Without the risk of flooding, thousands of acres of fertile land are cultivated near the estuaries of the rivers where PPC has constructed projects for power generation (Rivers Ladonas, Acheloos, Arachthos, Aliakmonas, Nestos, Aaos, Tavropos, Louros, Glafkos, Agras, Edesseos etc). Furthermore, flood protection has an environmental dimension as well, since, by preventing serious damage, it has a positive effect on the environment.

The protection that a dam offers against floods depends on its net reservoir volume, as well as on the size of the flood it is called to control (intensity, duration and water volume of flood).

In all cases of extreme weather conditions, PPC's dams, reservoirs and other flood protection projects have provided effective protection to the inhabitants, riverain ecosystems and properties of downstream riverside areas. More precisely, the period of December 2005 – January 2006 saw rainfalls of unprecedented intensity and duration that resulted in a large volume of water inflow into the Hydroelectric Power Plants of the Rivers Acheloos (Kremasta, Kastraki, Stratos I and II HPPs) and Nestos (Thisavros and Platanovrisi HPPs). Nevertheless, the large water reservoirs of Kremasta, Pournari I and Thisavros HPPs, harnessed the power of water and literally saved the life and property of thousands of people, since there was not any victim or damage of any kind. The recent spring flooding of Evros River, which flows from Bulgaria, is also worth noting; contrary to Nestos River, whose increased inflow from Bulgaria was largely

controlled by the large water reservoir of Thisavros HPP, the flow of Evros River cannot be regulated due to the absence of an appropriate dam.

Protection against drought - water shortage

The reservoirs of Hydroelectric Power Plants protect several regions of the country from extreme water shortage situations brought about by the prolonged droughts that frequently occur in Mediterranean areas. Therefore, they protect the natural environment and the welfare of millions of citizens.

Minimum downstream flow

The operation of Hydroelectric Plants, in accordance with the environmental terms set for their operation, provides sufficient water supply for the preservation of the riverain ecosystem downstream of the dams. If there were no dam and its respective reservoir, in several cases there would be no water flowing on the riverbed, especially during the summer.

Monitoring of water resources quantity and quality

Aiming at the hydrologic support of both new hydroelectric projects development and at the operation of the existing ones, the G/DI maintains a model water resources monitoring network. This network, being in operation for more than 40 years, consists of two parts: a highly reliable rain gauging network comprising more than 180 measurement stations located mainly in mountainous areas, and a hydrometric network comprising nearly 50 river flow measurement stations. The latter is unique in Greece in its capacity to systematically collect comprehensive, reliable information suitable for a river flow estimation on a continuous or daily basis.

Besides their obvious usefulness for the Company's needs, the data collected are used in order to ensure the reliable design of public and

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private projects and are necessary for the country's compliance with the provisions of Directive 2000/60/EC regarding the development of river basin management plans, the preparation of environmental impact assessment studies and, generally, the monitoring of water systems quality. These data have already served as a basis for the preparation of three Management Studies entitled as "Development of Systems and Tools for Water Resources Management at the Departments of Epirus - Central Greece - Thessalia, Peloponnesus, Macedonia - Thrace" which were carried out by the Hellenic Ministry of Development.

However, in addition to the monitoring of water quantities, a continuous monitoring of physical/chemical quality parameters at certain hydrometric stations has commenced in recent years, pursuant to the environmental terms being imposed regarding the operation of Hydroelectric Power Plants. Seven stations of this type are already in operation at characteristic sites along Nestos River, in collaboration with the Aristotle University of Thessaloniki (REMOS telemetry network, led by Professor A. Psilovikos); and these are expected

to be expanded to other rivers in the future. In an effort to further improve the quality of collected information while reducing human errors and the impact of adverse weather conditions, the G/DI has systematically promoted the upgrade of its network through the introduction of Best Available Techniques, both with respect to the measuring instruments and to the transmission and storing of information.

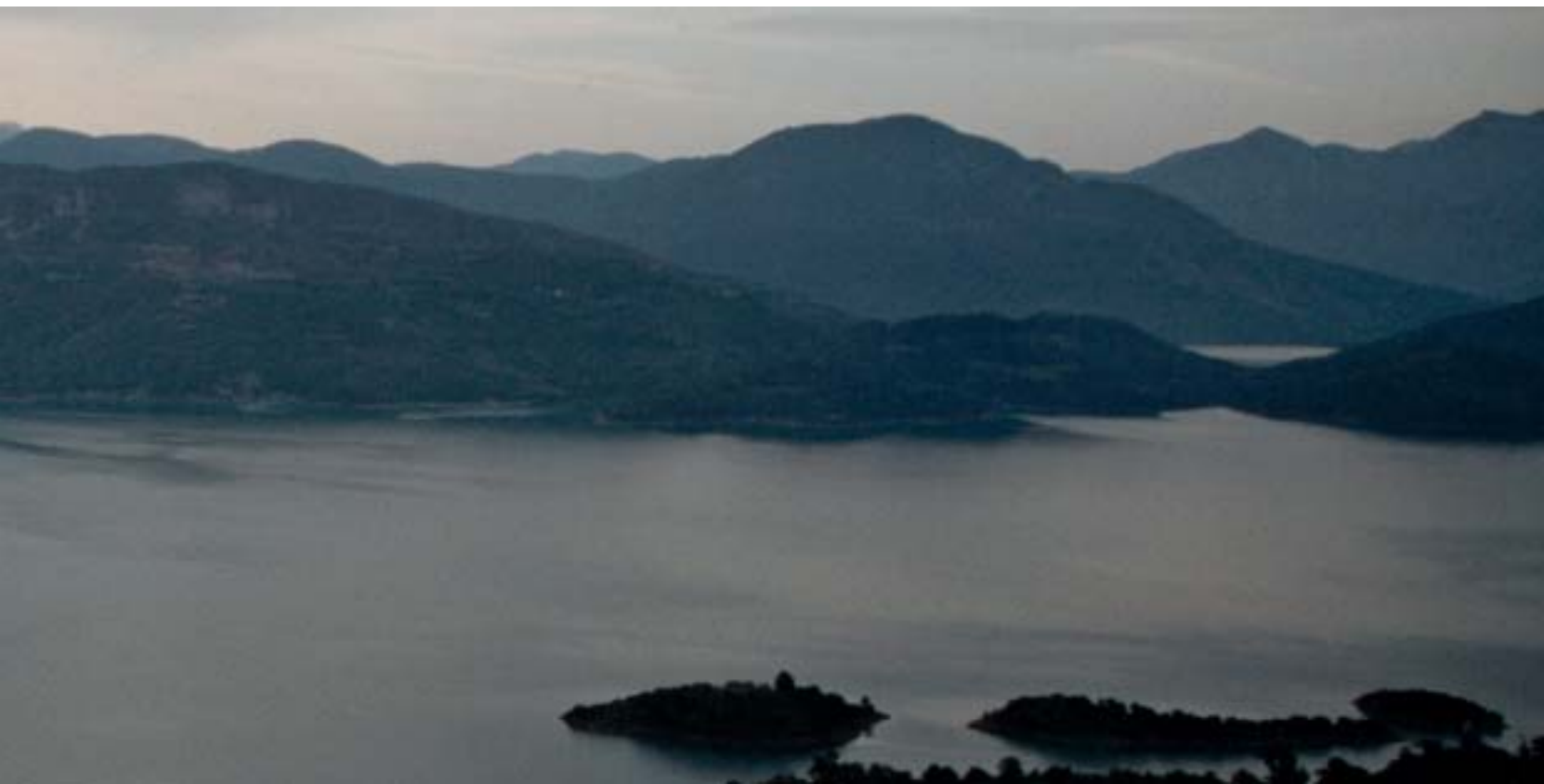
Active participation in the preparation of the new national and European environmental legislation

The executives of the Generation Environment Department, within the framework of their participation in EURELECTRIC's working groups, are systematically being informed about the developments in the national and European environmental legislation and they actively participate in its preparation. Working in partnership with the executives of the other Departments of the G/DI, as well as with national representative bodies, they examine the new issues and contribute through their experience to the formation of national positions. Continuous



updating regarding evolutions in environmental legislation contributes to the timely planning and implementation of the required measures. Some of the current issues being systematically followed up are:

- ▶ Participation in the drawing up of BREFs on Large Combustion Plants (LCP), on Industrial Cooling Systems and on Economics and Cross - Media Effects, under the auspices of the European Commission.
- ▶ Drawing up of the Guidance Document on the adoption of the European Pollutant Release and Transfer Register (E-PRTR) in accordance with EU Regulation 166/2006.
- ▶ EU proposals on the Thematic Strategy on Air Pollution within the framework of the CAFE Programme, as well as on the Proposal for the Directive concerning "Quality of Ambient Air and cleaner air for Europe".
- ▶ Participation in the EU Consulting Team for the revision of Directive 96/61/EU.
- ▶ Revision of Directive 2001/81/EC by EU.
- ▶ Community Strategy on Mercury.
- ▶ Implementation of Directive 2000/60/EU on establishing a framework for community action in the field of water policy – preparation of PPC's positions with respect to specialized themes of the Directive pertaining to hydroelectric exploitation, in accordance with the guidance and accompanying documents of the Directive, as these are drawn up by the EU Strategy Team and the relevant working groups of EU member-states.
- ▶ Proposed Priority Substances Directive under the Water Framework Directive (2000/60/EU).
- ▶ Proposal for the Directive on the Assessment and Management of Floods.
- ▶ Proposal for the Directive on Waste – Thematic Strategy on Waste Prevention and Recycling.
- ▶ Revision of Directive 2001/80/EC by EU – preparation of PPC's positions.
- ▶ Preparation of PPC's positions on the 2nd National Plan on the Allocation of greenhouse gas emissions.
- ▶ Participation in the drawing up of the National Physical Planning Plan.



Certification of the Environmental Management Systems applied in G/DI Power Plants according to ISO 14001

The value of achieving certified Environmental Management Systems (EMS) for Power Plants is now widely recognized. For this reason, ISO certification constitutes the primary aim of G/DI's Environmental Policy.

In order to ensure the implementation and continuous evaluation of its environmental policy, the G/DI promotes the gradual ISO 14001 Certification of the Internal Environmental Management Systems that are already implemented in its Power Plants. In this context, PPC has already achieved the Development, Implementation and ISO 14001 Certification of the Environmental Management Systems implemented at the Steam Power Plants of Ag. Dimitrios (lignite-fired TPP) and Chania (fuel

oil-fired TPP), as well as at the two Hydroelectric Power Plants of Nestos. The same procedures shall be applied to all remaining Power Plants.

The Environmental Management System (EMS) is the overall management system that includes the Company's organizational structure, planning activities, responsibilities, practices and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy of the Company. In other words, it is a useful tool for organizing the activities of the Company in such a way so as to improve its environmental, social and financial performance.

The principles of EMS are further described in the plan shown below:

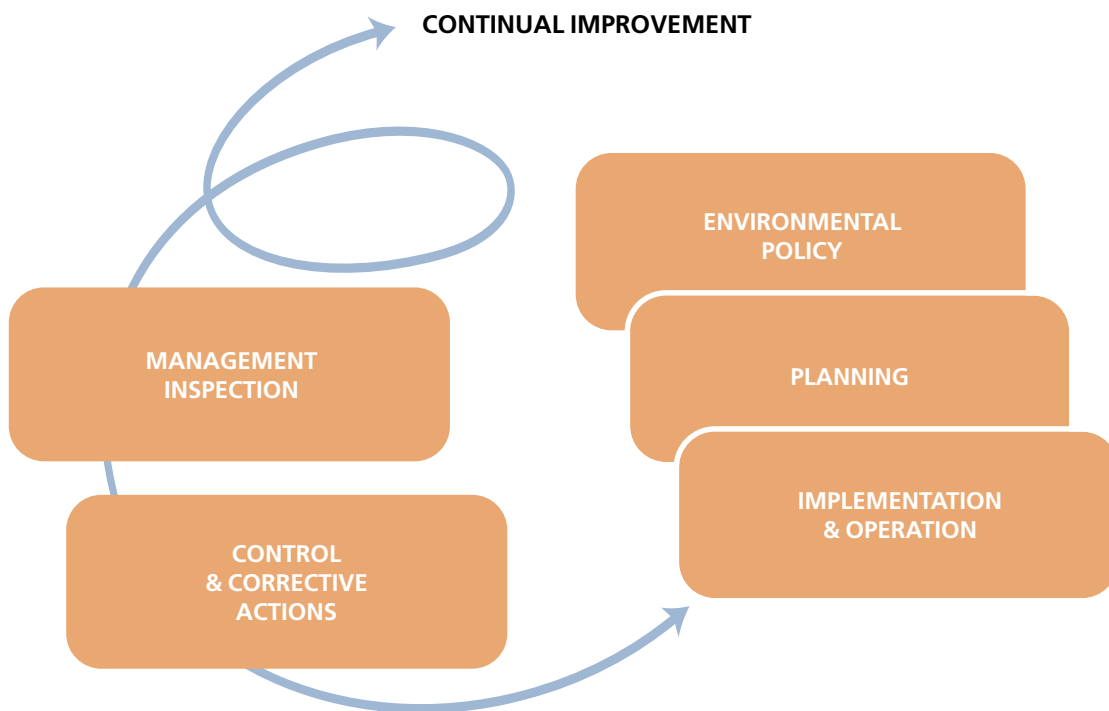


Figure: the Principles of EMS



In order to develop and implement Environmental Management Systems according to ISO 14001 in its aforementioned Power Plants, PPC had to proceed to the actions mentioned below:

- ▶ Define the Environmental Policy of Power Plants
- ▶ Proceed to System Planning:
 - Identify the activities of Power Plants that interact with the environment and evaluate their environmental aspect.
 - Set environmental objectives and targets.
 - Define the actions to be taken so as to improve the environmental performance of Power Plants and create environmental management programmes-actions and timetable for their implementation.
- ▶ Ensure the implementation and operation of the EMS, as well as the special training of the personnel participating in the EMS implementation.
- ▶ Ensure internal audits and Corrective Actions.
- ▶ Review the EMS by the Environmental Management Committee.

Experience so far has shown that the implementation of Environmental Management Systems according to ISO 14001 constitutes, among others, an important tool for ensuring the awareness of the personnel involved in the EMS implementation, achieving, thus even the most demanding environmental targets. As reference, we mention the development of an Internal Operation Management System for the Ag. Dimitrios TPP, which was implemented following the development of the EMS according to ISO.

In order to ensure the monitoring, operation and control of the EMS that was developed and is being implemented in the aforementioned Power Plants, the Generation Environment Department signed a relevant contract on the development, installation and implementation of special software. Installation works are due for completion in late 2006. The software in question shall also be installed in all Power Plants owned by PPC.

Environmental Training of Generation Division Executives

Intensification of the personnel's environmental training and briefing, aiming at the improvement of the environmental awareness of PPC on matters of electricity generation, takes place in collaboration with the sCommunications Department, as well as with the Training Department and includes:

- ▶ Elaboration and implementation of training programmes on current and forthcoming environmental legislation issues (national, European and international) and on application of Environmental Management Systems in the Generation Division Units and Power Plants.
- ▶ Briefing of the competent executives on the Environmental image of the Company – Implementation of a regular meeting schedule for the exchange of experience and proposals aiming at improving internal communication.
- ▶ Internal conferences on specific environmental issues.

Most of the scientific personnel of G/DI's Departments and Thermal Power Plants in charge of environmental management issues have already attended specialized environmental seminars and obtained the title of Environment Auditor, approved by the Institute of Environmental Management and Assessment (IEMA).

In 2005, a training seminar was held for the personnel of Power Plants on the implementation of Environmental Management Systems according to ISO 14001.

Furthermore, in May 2006, a two-day training seminar was held by the Generation Environment Department for the competent executives of Thermal Power Plants that fall within the scope of the emissions trading scheme. The seminar's theme was the monitoring and reporting of CO₂ emissions with emphasis on Quality-Assurance Systems.

Objectives and Perspectives

The Generation Division objectives resulting from the main principles of its environmental policy include:

- ▶ Compliance with the requirements of the new environmental legislation – operation of all Facilities on the basis of the Best Available Techniques.
- ▶ Replacement of certain old Units with new High-Performance and Modern Technology Units.
- ▶ Integrated approach to environmental issues, right from the phase of the planning and design of new Units.
- ▶ Compliance with the Kyoto Protocol requirements, as well as with the relevant national and European legislation in the most optimal way from an environmental and financial point of view.
- ▶ Certification of Environmental Management Systems according to ISO 14001.
- ▶ Optimization of the scheduled environmental investments in Power Plants.
- ▶ Upgrade of the environmental behavior and energy efficiency of existing Units.
- ▶ Systematic follow up of international developments in statutory and technological issues and pollution abatement technologies for Large Combustion Plants, as well as in issues related to water and Hydroelectric Projects management.
- ▶ Intensification of internal communication and training, as well as improvement of the environmental image of the Company.

Environmental Care of the Transmission Division

PPC is systematically addressing the issue of the harmonious coexistence of the Transmission System with the environment. The Corporation's primary aim is to cause the lowest possible aesthetic impact on the environment.



Environmental impact caused by the operation of the Transmission System

The environmental factors examined with regard to the transmission system are the following:

- ▶ Landscape
- ▶ Groundwater aquifer
- ▶ Noise disturbance
- ▶ Flora
- ▶ Fauna
- ▶ Risks caused by abnormal situations
- ▶ Electric and magnetic fields
- ▶ Man-made environment
- ▶ Land uses
- ▶ Protected areas

Impact on landscape

The Transmission System has little impact on the landscape, which is taken into account during studies on its expansion. Efforts have been made to minimize such impact by means of proper siting of new Transmission Lines (TL), Substations (SS) and Extra-High Voltage Substations (EHVS).

During the construction and upgrade of Transmission Projects, the Transmission Division makes sure that transmission line towers are painted, where appropriate, and that trees are planted along the fence of Substations and

Extra-High Voltage Substations, so as to reduce their visual impact on the environment. Furthermore, the Division avoids installing transmission lines on crests and areas where there is an unobstructed view of the horizon. PPC creates around Extra-High Voltage Substations green spaces with fast-growing trees so as to ensure that the facilities are not perceptible to the human eye, offering thus to the surrounding area a "green lung" that contributes to its development and upgrade. As far as the new Substations and Extra-High Voltage Substations are concerned, PPC is already using green and grey colours for the primary equipment in order to minimize the visual impact.

Impact on groundwater aquifer and surface water flow

Thanks to the small ground area that tower foundations occupy and the large distance separating one tower from the other, no damage is done to the currents or flow direction of surface-water.

Moreover, as far as the Substations and the Extra-High Voltage Substations are concerned, the following measures are taken :

- ▶ Design and construction of a drainage network with channels and drainage wells for rainwater collection

► Construction of sewage pits according to town planning requirements for the personnel's sanitary needs. Collection and transportation of waste (e.g. mineral oil, acidic and waste from batteries) to appropriate facilities by specialized companies, with a view to allowing maximum recycling.

► Construction of a transformer bed inside new Substations, which is connected to a tank in order to prevent leakage of transformer oil into the environment in case of major transformer breakdown.

On health

FROM NOISE DISTURBANCE

► Noise from Substations

– Extra-High Voltage Substations

The noise-producing sources of Substations - Extra-High Voltage Substations are mainly transformers and autotransformers, due to the vibration of their windings and the operation of the cooling ventilators. Nevertheless, in accordance with specifications, the total noise level at the border of Substations - Extra-High Voltage Substations does not exceed 50 dB. This noise limit also applies to the vicinity of Substations - Extra-High Voltage Substations, in conformity with Presidential Decree 1180/6.10.81.

► Noise from Transmission Lines

Under normal operation and good weather conditions, transmission lines do not emit any perceptible noise. Nevertheless, whenever noise is generated it can be the result of the following phenomena:

► Noise due to the CORONA phenomenon:

The CORONA phenomenon is an electrical phenomenon. Whenever it occurs on a high voltage transmission line it produces a characteristic "crackling" sound. The main factors that determine the intensity of the noise are the line's voltage, the distance from the line, as well as the weather conditions. The noise generated from the CORONA phenomenon is more intense when humidity levels are high and less so under normal weather conditions.

► Noise generated by the wind:

This noise is mainly generated by the incidence of the wind against the metallic elements, insulator chains and line conductors of transmission towers. The occurrence of this noise does not depend on whether the transmission line is in operation or not.

FROM HAZARDOUS SUBSTANCES

The system equipment does not include any elements that could cause a blast or a leakage of hazardous substances in case of accident or abnormal conditions.

Consequently, PPC is not faced with the very acute problem of the collection, disposal and discharge of hazardous substances that electrical companies of other countries have to deal with. As for the small PCB quantities involved in the system, a special project has been drawn up for the withdrawal and shipping of such substances to appropriate areas abroad.

FROM ELECTRIC AND MAGNETIC FIELDS

In accordance with the international and national regulations that integrate the results of the scientific research on human protection, it may be stated that the electric and magnetic fields of industrial frequencies emitted by PPC's facilities present no health hazard since they are constantly below the limits set forth by the strict national and international regulations.

The common limits set by the ICNIRP guidelines and the recommendation issued by the Council of the European Union on the exposure of the public to 50 Hz frequency fields are the following:

► For magnetic induction: $B = 100 \mu\text{T}$

► For electric field intensity: $E = 5 \text{ kV/m}$

The limits mentioned above are in force in Greece in accordance with the Joint Ministerial Decision No. 3060 (FOR), Government Gazette 512/B 25.4.2002: "Civilian protection measures against devices emitting low frequency electromagnetic fields".

The observance of the maximum limits laid down in the regulations ensures human protection against electric and magnetic fields.

The abovementioned limits are not considered as risk limits, since they include very high safety factors in order to remedy for any lack of clarity resulting from the limited knowledge about the field influence, as well as to meet the requirement for prevention of adverse effects.

The Hellenic Transmission System observes the limits set by the aforementioned regulations.

More specifically, the magnetic field values, which have been the subject of scientific research during the last 15 years due to their potential impact on human health, are tens to thousands times lower than the limits set by the Regulations.

Nevertheless, during the transmission system planning stage, appropriate design takes place in order to further reduce electric and magnetic field values by applying the optimal phase arrangement.

The programme for the upgrade of single-circuit Transmission Lines and their replacement by double-circuit lines aims at increasing transmission capacity and consequently at reducing magnetic field values. Similar results are achieved by elevating Transmission Lines in areas where building construction came after the initial installation of Transmission Lines.

In cases of major complaints, we measure the fields in our facilities. These measurements confirm our calculations, and what's more, they are tens to thousands times lower than the limits set by the relevant strict regulations.

On Flora and Fauna

Given that the transmission system does not emit air pollutants or generate liquid or solid waste, the impact on flora is low. Furthermore, the System does not cause any significant drop in agricultural production since the foundations of the towers



occupy small ground areas and are installed in regions of low productivity, just as the Substations and Extra-High Voltage Substations. Besides, all agricultural activities are allowed under and near the transmission lines.

As regards the fauna of the region where transmission lines, substations and extra-high voltage substations are installed, the impact is once again low. Thanks to the large distance between the towers and the relatively small ground area they occupy, the ecosystem, particularly the development and life of all animal species, is not disturbed.. Furthermore, the migration or movement of wild animals is by no means obstructed.

On the contrary, transmission line towers and conductors serve as supports on which birds may rest. During the construction works of transmission lines, substations and extra-high voltage substations, the animal species of the area, mainly the birds, may leave the area due to the noise. Experience has shown, however, that once such projects are completed and the calm and quiet of the area is restored, these animals return.

In addition, care is taken so that the construction sites of transmission line projects and substations are situated outside the protected areas.

Environmental Management policy of the Transmission Division

Transmission facilities (lines, substations and extra-high voltage substations) are of special nature and they have a long service life of approximately 50 years. Given that regulations and conditions may be modified several times during service life, these facilities should be constantly upgraded to meet the ever-changing technological and environmental requirements. PPC has taken the necessary measures during their design, construction and maintenance with a view to protect the environment.

The transmission system consists of 10,945 km of overhead lines, 200 km of underground cables, 185 km of submarine cables, 220 substations and 20 extra-high voltage substations. Transmission lines have been mostly installed in agricultural

areas while most substations are located at city borders.

In the course of the maintenance and upgrade of the Transmission System, all national and EU Directives and laws are taken into consideration so as to minimize the environmental impact.

State-of-the art technologies already applied by European countries are used during the design, construction and maintenance of the Transmission System. Maintenance is scheduled in periods of time when it shall have the least possible effect on crops. Finally, the use of appropriate vehicles allows for the minimization of the impact on crops. Nevertheless, in case that damage is caused to the farms, the legal indemnification is paid.

Environmental Action Plan of the Transmission Division

Transmission Lines Design

During the design of the transmission system, significant emphasis is given on the siting of lines, substations and extra-high voltage substations in order to prevent or minimize public reaction. To this end, the General Town Planning, as well as the scheduled or potential expansions of existing settlements are taken under consideration. More specifically, particular attention is given to highly populated areas.

During the design phase of transmission projects, PPC seeks to meet the following criteria:

- ▶ Ensure the maximum distance possible between transmission lines and settlements so that the former do not interact with the man-made environment.

- ▶ Avoid special protected areas.
- ▶ Construct Substations and Extra-High Voltage Substations at the load's center of gravity in order to avoid the installation of distribution lines of great length.
- ▶ Ensure that the nature of the soil at the site of Substations and Extra-High Voltage Substations allows for minimum leveling interventions.
- ▶ Transmission projects are carried out near a suitable road network so that there is no need to build new roads for transporting heavy equipment

(A) ON SITE EVALUATION

The evaluation process aims at controlling and minimizing subjective reactions as much as possible.

The proposed routing of a transmission line or substation - extra-high voltage substation under construction is observed at a distance of 1-2 km from any protected area, land use or human activity.

Observers draw up tables for each access distance zone describing the size of the visual field occupied by the transmission project and evaluate the degree of visual nuisance. Evaluation starts with a 100% coverage of the landscape at a distance of 1km, passing to a partial coverage of 50% at a distance of 2 km and attaining zero level at further distances.

The closer we get to the project under construction the more apparent its impact becomes. Consequently, the remarks on the first 2 km distance zone are the most important for decision-making.

(B) COMPUTER ASSISTED EVALUATION

Computer-assisted evaluation is carried out by use of modern software tools such as GIS, CAD tools, etc. as well as on the basis of data and information collected from different bodies.

These data, which are gathered and processed during the drawing-up of Environmental Impact Assessment Studies on Transmission Lines, Substations and Extra-High Voltage Substations, include the following:

- ▶ Maps of the Hellenic Military Geographical Service
- ▶ Orthorectified maps of the Hellenic Ministry of Rural Development and Food
- ▶ Land use maps of the Hellenic Ministry for the Environment, Physical Planning and Public Works
- ▶ Protected areas maps of the Hellenic Ministry for the Environment, Physical Planning and Public Works
- ▶ Aerial and satellite photos
- ▶ Data on sites designated as archeological sites

- ▶ Town planning maps and settlement boundaries
- ▶ Climate data
- ▶ Geological maps

Another important tool is the GIS system of the Transmission Division, which provides data and information on the Division's existing facilities.

Data processing allows for the optimal identification of the areas where the project shall be installed (influence zones), as well as of the areas to be considered as forbidden (exclusion zones).

Following the recording and evaluation of the special characteristics of all alternative sites, as well as the weighing of the advantages and disadvantages they present, a single site is selected as the proposed site.

Methods for harmonizing Transmission Projects with the environment

PPC systematically addresses the issue of the harmonious coexistence of the transmission system with the environment. The following methods are applied in order to reduce the visual nuisance of Transmission Lines, Substations – Extra-High Voltage Substations:

▶ Transmission Lines, Substations and Extra-high Voltage Substations Siting:

Transmission lines, substations – extra-high voltage substations are installed near landmarks such as forests, road networks, industrial zones etc. and at a distance from isolated elements such as houses, small-scale bridges etc.

Factors such as the region's climate conditions and geological background are of utmost importance for an effective data analysis, since phenomena such as extreme weather conditions or crumbling soil may cause serious damage to Transmission Lines. Therefore, further interventions to the environment are required.

▶ Transmission line routing

The location of transmission line towers, as well

as the heights and lengths of the openings are selected on the basis of the soil's morphology and the specifications of transmission line standard materials. Therefore, the installation of transmission projects in high-altitude or mountain areas is avoided. Obstacles such as currents, canyons, main roads etc. are met by the projects in suitable locations. Finally, hillsides are preferred so that the lines do not appear on the horizon, causing thus visual nuisance.

► Parallel Transmission Lines

Efforts are made to install transmission lines at short distances from one another in order to allow the merging of several lines into one multiple-circuit line, provided that this does not cause a significant alteration to the landscape.

► Integration of Transmission Lines into the Forest Environment

In the event that the transmission line passes through forest areas or through other dense vegetation, steel towers are painted dark green so that they blend with the environment.

► Shorter Transmission Lines

Such lines make a decisive contribution to the reduction of the environmental impact caused by the Transmission System. Generally, their armless poles do not incorporate bridges, from which conductors are suspended, but on the contrary are provided with fixed suspension points. Since conductors do not have a large swing radius, the width of the channel required for a given voltage of the transmission line increases. Consequently, we have lower poles and thus smaller overturning torque both on the main body and the foundation.

During the upgrade of single circuit transmission lines and their replacement by double circuit ones, PPC is trying to use the same foundation space. "Narrow" towers have already been tested and installed in a number of upgraded lines. Depending on the technical conditions, special poles are allowed to be installed mainly in urban areas in order to reduce visual impact.

Moreover, research is underway for a more significant reduction of the volume of transmission lines, while ensuring the same level of reliability.

► Construction of towers in compliance with aesthetic requirements

A systematic international study on this subject is carried out in order to ensure the aesthetic harmonization of the towers with the environment. The objective is that transmission towers are considered as elements that embellish the surrounding area in the same way as vegetation or stylish buildings.

The following are considered as criteria of aesthetic construction:

- Simplicity of the form consisting of delicate elements with no visible connections.
- Harmony and balance between the various parts of the construction.
- Unobtrusive forms integrated into the surrounding area or architectural design pleasant to look at.
- Underground installation of transmission lines reaching Substations situated within settlements, wherever possible.

► Smaller Substations

The increased demand of cities for high quality electric power and the need for minimizing visual nuisance resulted in the construction of new high voltage substations of closed type (located within buildings). Such substations operate today in various major European urban areas. The supply is underground, given that it is impossible to pass high voltage overhead lines in densely populated areas.

Similar closed type substations have been in operation in Athens since the early 1970s. Today, there are seven such substations in Athens, one in Thessaloniki and one in Atherinolakos (Crete) that operate with remarkable results.

In spite of the high cost involved, PPC intends to

construct such substations in densely populated areas or in highly polluted areas in the near future. Moreover, since 1994, a part of the air insulated (AIS) substations (a 20 kV side) has been installed within a building.

During the construction phase of Transmission projects, the Transmission Division implements the stricter requirements, as stipulated by the ministerial decisions concerning noise and dust reduction, as well as waste disposal, so as to cause the lowest possible impact on the environment.

In areas with large forests, care is taken to restore

the surrounding area by appropriate treeplanting operations.

Furthermore, before and after the commencement of works, the Transmission Division cooperates with the forestry authorities. In addition, during the phase of foundation excavations, an employee of the archaeological authorities, remunerated from PPC funds, is entrusted with the task of locating any relics or antiquities not immediately visible. If relics or antiquities of any kind are found, PPC S.A. complies with the recommendations of the competent bodies.



Objectives and perspectives

The aim of the Company is to minimize the impact caused by the transmission system on the environment.

With a view to reduce the environmental impact, PPC is focused on the following principles:

- ▶ Implementation of all relevant regulations regarding the minimal aesthetic and environmental impact.
- ▶ Training of personnel on environmental issues
- ▶ Installation of transmission lines, substations and extra-high voltage substations of smaller size so that they are better integrated into the surrounding area.
- ▶ Follow-up of international developments on environmental issues pertaining to the Transmission System.
- ▶ Efforts to produce and manage digital information
- ▶ Implementation of an Environmental Management System according to ISO 14001.
- ▶ Suitable coloring of substations' and extra high voltage substations' primary equipment that blends into their surroundings.

Environmental Care Of The Distribution Division

The Distribution Division shall continue with unimpaired interest the development of networks all over Greece, always taking care of the surrounding area. Our objective shall always lie in the optimal service of electricity consumers and the minimization of interventions in the environment resulting from the operation of distribution networks. Proof lies in our work.



Environmental Impact caused by Distribution Networks

Despite the fact that electricity is unquestionably a commodity essential to society, inextricably linked with the quality of our everyday life, today there is a general concern on the potentially negative impact resulting from its use.

In the case of Distribution Networks, this concern is focused on the impact of the installations – medium and low voltage – and substations interconnecting

the high voltage network with the medium voltage network, as well as the medium voltage network with the low voltage network, both on the natural and man-made environment.

Nevertheless, in order to honor its stated commitment to social responsibility and environmental sensitivity, PPC Distribution Division takes all necessary measures in order to minimize the environmental impact.

Environmental Management Policy - Actions For Environmental Protection in the Distribution Division

The use of materials and equipment according to PPC Distribution specifications in force and the corresponding European (CENELEC) and international (IEC) standards, the network design and construction according to the Hellenic (KESYGHE, KEHE) and international regulations and internal directives, as well as regular inspections and maintenance ensure the networks' reliable operation and respect to the environment. The island interconnection project, which involves the submersion of underwater cables, is of utmost importance as well. The advantages deriving from the underwater interconnection of the islands are the following:

- ▶ **Substitution of autonomous power plants**
Environmental benefits – landscape preservation
Reduced oil dependence

▶ Improved service quality

Reduced number of blackouts
Improved voltage quality

▶ Increased integration of renewable energy sources

Additional environmental benefits
Exploitation of the high renewable energy potential of the Greek islands

Aesthetic Interventions For The Harmonious Integration Of Distribution Networks

Use of aerial bundled cables

The aerial bundled cables (insulated conductors) fully substitute the bare conductors in the new low voltage networks. An essential advantage arising from the use of this equipment is the significant restraining of tree pruning in the vicinity of these networks.

ENVIRONMENTAL REPORT

Today, a low voltage network of approximately 35,000 km with aerial bundled cables (about 35% of the total overhead network) is installed.

Moreover, in order to reduce tree cutting, aerial bundled cables have been standardized for medium voltage networks installed in forest areas.

Construction of compact substations

Instead of two-pole constructions, the Distribution Division installs compact substations. These substations are small, nice looking kiosks in which the equipment necessary for the operation and protection of a medium/low voltage substation is placed. These substations substitute the two-pole constructions in spaces which place high aesthetic demands such as squares, traditional settlements etc.

Underground networks

In a number of settlements considered of high importance from a cultural or tourist perspective (e.g. traditional settlements), as well as in certain densely populated city centers with narrow streets and chaotic town development, distribution networks are a source of aesthetic nuisance.

Aiming at remedying for this visual nuisance, the Distribution Division has constructed underground



networks in cooperation with local authorities. The total cost of underground network projects to date amounts to 25 million Euros. PPC has co-financed these projects with a contribution of approximately 13 million Euros.

Nowadays, PPC undertakes the construction of aesthetic upgrade works following a request of the municipality concerned, which in turn, bears the cost of the project in question.

Measures For The Protection Of Wild Fauna And Natural Resources

PPC Distribution Division cooperates with environmental associations in scheduling pilot interventions on PPC facilities located in wetlands for the protection of endangered bird species. Such a project of great importance was carried out at Chalastra of Thessaloniki in cooperation with the Greek Center of Wild Animal Sheltering.

It is worth noting that according to the data released by the Hellenic Ministry of Rural Development and Food, PPC is imputed with less than 1% of the total number of wildfires. The reason why fires do not break out in the vicinity of distribution networks lies in a series of preventive measures taken on a yearly basis. These measures include tree pruning in order to maintain safe distances from the networks, cutting of unstable branches or trees (e.g. burned or dried-up trees), clearing of the adjacent vegetation (deforestation, pesticide sprays) around selected poles, installation of aerial bundled cables, cleaning of the glass or porcelain insulators or installation of synthetic insulators where necessary due to increased air pollution, installation of phase separators in low voltage networks with bare conductors (areas with strong winds, large openings etc) and systematic supervision of the networks with the use of ultra modern infrared cameras.

Environmental Management Of Substations And Distribution Centers

In addition to the above-mentioned measures aiming at the protection of the natural

environment, special emphasis is given to issues related to the protection of public health. For instance, both indoor and outdoor transformers that are installed in PPC low/medium voltage substations (about 140,000 in Greece) do not require PCB insulation. Instead, they use ordinary mineral oil which is not toxic.

Special draining installations are built in order to collect, control and dispose of the distribution transformer oil after use. Such projects have been carried out in the past at warehouses owned by the Islands Region Department and the Macedonia-Thrace Region Department. Such a project has been recently completed at the Regional Warehouse of Rio that is owned by the Peloponnese - Epyrus Region Department. The project in question includes an oil collection cabin for ten transformers at a time, as well as five oil collection tanks in order to ensure oil removal without causing any leakage to the environment.

Electric power is transmitted through high voltage networks. Nevertheless, when it reaches consumption centers (cities etc), the voltage should be reduced from high to medium in order to be distributed to consumers. The facilities used by PPC Distribution Division in recent years to reduce voltage close to large urban areas are called Distribution Centers i.e. closed type, Gas Insulated Substations of high/medium voltage (GIS).

Distribution Centers are of a much smaller size compared to open-air substations. Moreover, their operation is more reliable, since they are not influenced by external factors, have no aesthetic impact on the surrounding area and are perhaps considered as the only possible choice for densely populated areas. During the drawing up of specifications and technical requirements, as well as during equipment operation, the appropriate measures are taken in order to guaranty its safe operation.

The following centers are:

ALREADY IN OPERATION	SCHEDULED TO BE CONSTRUCTED
<ul style="list-style-type: none"> • 13 Distribution Centers in Attica • 1 Distribution Center in Thessaloniki • 1 Distribution Center on the Island of Rhodes 	<ul style="list-style-type: none"> • 2 Distribution Centers in Thessaloniki • 1 Distribution Center on the Island of Rhodes • 1 Distribution Center in Heraklion Crete

Hazardous & Non-Hazardous Waste Management

The Distribution Division applies an integrated management policy for hazardous or non-hazardous waste such as Polychlorinated Biphenyls (PCBs), asbestos products, mineral oil and tires, in accordance with the Law in force.

The Distribution Division shall continue forming its policy and developing its business activities by keeping up with the technical and social developments and taking care of environmental issues.

Renewable Energy Sources

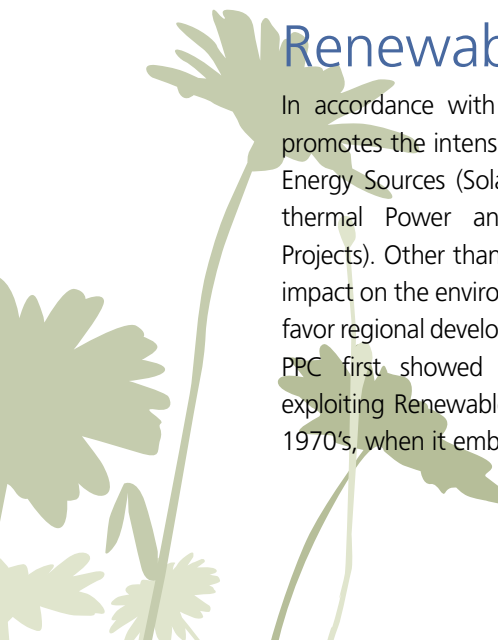
In accordance with its business plan, PPC also promotes the intensive exploitation of Renewable Energy Sources (Solar Power, Wind power, Geothermal Power and Small-Scale Hydroelectric Projects). Other than ensuring the lowest possible impact on the environment, these forms of energy favor regional development.

PPC first showed interest in developing and exploiting Renewable Energy Sources back in the 1970's, when it embarked on preliminary research

projects. Ever since, the Company entered upon a great effort aiming at integrating Renewable Energy Sources into the country's energy balance.

The setting up of the Renewable Energy Sources Department (D/RESO) in 1981 is a tangible evidence of the corporation's interest in new and environmentally-friendly sources of energy.

To date, PPC has constructed wind parks of 37 MW and photovoltaic cells of 308 kWp expanding from





the frontier region of Samothraki to Crete. The regions where wind parks operate appear in the table below. During the years 1998-2001, PPC completed the construction of two wind parks with a total capacity of 10 MW (Xirolimni I and Xirolimni II) in Sitia province in the island of Crete. These parks were first commissioned in 2000. In cooperation with the corporation Rokas S.A., PPC's Subsidiary, PPC Renewables S.A., completed the construction of 8.4 MW Wind Parks on the islands of Kos and Leros, which were granted permit to operate in May 2002. Furthermore, PPC ensured the incorporation of 13

projects with a total installed capacity of 42.16 MW into the Operational programme "Competitiveness" (OPC) under the 3rd Community Support Framework (CSF).

The Company's interest in the fields of research and development is constantly revived through projects such as the Hybrid System on the island of Kythnos and the DIESEL-WIND-HYDROELECTRIC Mixed System on the island of Ikaria (small-scale hydroelectric project of 3.8 MW & 2.4 MW wind park).

New wind parks of a total capacity of 20 MW are scheduled for construction in the near future. In addition, an innovative hybrid system on the island of Ikaria shall also be constructed within the framework of the Operational Programme "Competitiveness", following a tendering procedure.

We are making a continuous effort to develop Greece's major geothermal fields. Our objective is to build an 8 MW power plant on the island of Lesvos. The exploratory drillings are 50% funded by the OPC. The development of Renewable Energy Sources, a tangible proof of our environmental concern, supports our effort to promote environmental awareness to Greek citizens.

REGION	INSTALLED CAPACITY IN kW
Andros	1575
Ikaria	385
Karpathos	275
Kythnos	665
Lesvos	2025
Limnos	1140
Samothraki	220
Samos	2925
Chios - Psara	5500
Evia	5100
Crete	16800

The usable geothermal energy resources of our country are estimated to 200-300 MW. Above all, the exploitation of these resources aims at enhancing the energy balance of the Cyclades, Dodecanese and Lesvos islands, by utilizing their local resources. At the same time, it aims at promoting local development through the utilization of non-electric (thermal) applications.

In the field of small-scale hydroelectric projects, PPC has ensured the incorporation of 4 projects, with a total capacity of 18.88 MW, into the OPC/3rd CSF.

PPC already examines the possibility of exploiting biomass for electricity generation. On this account, the Company has participated with the Hellenic Center for Renewable Energy Sources (CRES) in feasibility studies carried out within the context of the European Programmes JOULE & ALTENER.

The Department of Renewable Energy Sources has installed air quality monitoring networks at Power Plants. As a result, 30 stations performing air pollution measurements are in operation today.

The operation of the environmental data collection and processing system does not only fulfill the

environmental terms and conditions, but also demonstrates the transparency of PPC activities and the Company's commitment to State regulations.

The results of air quality measurements are electronically transmitted to all the parties concerned (i.e. the Prefecture Administration and the Local Authorities of the regions where PPC develops activities). Furthermore, we examine the possibility of establishing special on-line records of the data collected – after they have been finalized in cooperation with the Hellenic Ministry for the Environment, Physical Planning and Public Works – which shall be accessible to all people concerned.

Their collection system presupposes an organizational structure and experience already acquired by the Department of Renewable Energy Sources in its capacity as a construction Unit.

Their data presentation shall take place in accordance with the guidelines of the Hellenic Ministry for the Environment, Physical Planning and Public Works, which has assumed before the European Union the responsibility to establish a National Environmental Data Network. PPC can support this effort.

Actions for the Protection of the Environment on the Islands

The Islands Region Department also belongs to the Distribution Division. Since the Islands Region Department develops its activities in a sensitive field, as is the case of the islands, it pays particular attention to environmental protection. In accordance with the Law in force, the Islands Region Department has received from the Hellenic Ministry for the Environment, Physical Planning and Public Works, the Environmental Terms for the Operation of almost all power plants belonging to this Department. In compliance with the approved environmental terms, many projects aiming at the

protection of the environment have been completed, while others are under way. Indicatively, the following projects are cited:

Noise Reduction projects

In order to reduce noise pollution in the areas near Power Plants, noise reducers have been installed at the suction end of the units' air intake at Lesvos, Samos, Syros and Chios Power Plants. The noise reduction project at Skyros Power Plant has been completed. Furthermore, other noise reduction projects are under way such as those at Thira,

Lesvos, Siphnos, Simi and Anaphi Power Plants. Finally, the noise reduction studies for the Local Power Plants of Simi and Siphnos have already been completed.

Air quality measurement stations

In cooperation with the Hellenic Ministry for the Environment, Physical Planning and Public Works and the local authorities, air quality measurement stations have already been installed on the islands of Kos and Samos. The installation of similar projects is scheduled for other regions as well.

Architecture

All buildings and facilities are constructed in perfect harmony with the landscape (Cycladic or Aegean), without disturbing the general view of the islands.

Industrial wastewater management projects

Projects for the management of industrial wastewater produced by the Thermal Power Plants of Paros, Samos, Karpathos and Lesvos have been completed. Moreover, studies and tendering for the implementation of similar projects at the Thermal Power Plants of Kalymnos, Ikaria, Limnos, Skyros and Mykonos are under way. The studies in question provide for modern recycling methods as well as for the minimization of the final waste volume.

Power Plants' Certification with regard to CO₂ emissions

In the context of meeting the Kyoto Protocol requirements, all PPC Power Plants have been certified by independent bodies regarding CO₂ emissions.

Treeplanting Operations

Trees have been planted near Power Plants in full harmony with the surrounding area. Indicatively, we mention the treeplanting operations in the vicinity of Kos, Lesvos, Karpathos and Samos Power Plants.

Air pollutant measurements

All air pollutants emitted from PPC Power Plants are monitored and measured at least twice a year in accordance with the approved Environmental



Terms for Operation. Thereafter, the data collected undergo statistical analysis.

Environmental training of the Islands Region Department Executives

The enhancement of internal communications and training, aiming at improving the environmental image of the Company on the islands, is carried out in cooperation with the Department of Communications and the Training Department, as well as with the Environment Departments of other PPC Divisions and includes the following:

- ▶ Development and implementation of training programmes for the personnel who is competent in environmental legislation issues (national, European and international), future developments, as well as in the implementation of Environmental Management Systems in the Units and facilities of the Distribution Division.
- ▶ Briefing of the competent executives on the environmental image of the Company.
- ▶ Regular meetings for exchanging experience and improving internal communications.
- ▶ Internal meetings on specific environmental issues.

Most executives of the Islands Region Department have already been informed about all the relevant issues and are able to deal with them in the most satisfactory way.

Objectives and Perspectives

In accordance with the principles that govern its environmental policy, the objectives of the Distribution Division include the following:

- ▶ Integrated approach to environmental issues from the planning and design phase of new Distribution Units and networks.
- ▶ Optimization of the environmental investments scheduled for Power Plants.
- ▶ Environmental assessment, upgrade and improvement of the environmental behavior and performance of existing Units.
- ▶ Systematic follow-up of international developments on statutory and technical issues regarding Large Combustion Plants and pollution abatement technologies.
- ▶ Enhancement of internal communications and training.
- ▶ Improvement of the environmental image of the Company.

Additional Environmental Actions

In order to guarantee the protection of the environment and of all employees who work hard for the Company, PPC has set up Support Units to provide assistance to all production branches.

Effective waste management and employee safety, environmental management systems, ultramodern control and analysis laboratories, as well as the way in which we communicate our work to Greek consumers are a tangible proof of our environmental awareness and sensitivity.

Waste Management

The overall responsibility for the implementation of policies regarding the management of hazardous and non-hazardous waste has been assigned to the Occupational Health and Safety Department (DYAE) of the Company. The year 2005 has been a twofold turning point as regards the waste management of the Company: firstly, the legislation on hazardous and non-hazardous waste management was clarified and integrated to a great extent, whereas its implementation became stricter; secondly, the operation of a number of systems for the collection and recovery of packaging and other waste, as stipulated by Law 2939/Government Gazette 179A/6.8.2001, was either initiated or extended. Further progress is anticipated in 2006 together with the establishment of full cooperation between PPC and the existing alternative waste management systems, as well as the fine-tuning of the relevant applicable procedures.

(a) PCBs

PPC continues the implementation of the

programme to decommission all PCBs- and devices filled with or even contaminated by them. Within the framework of this programme, all PCB-related waste is exported abroad in cooperation with licensed operators with whom the Company has signed long-term contracts. The programme is due for completion in 2008. Furthermore, all insulating fluid-containing devices that have been decommissioned from the network are subjected to a thorough control, even when there is no suspicion of contamination.

During 2005, 141 tons of PCB-related waste were successfully decommissioned and disposed of (in addition to the 900 tons decommissioned in previous years).

(b) Asbestos

The actions initiated in previous years were continued. In order to guarantee the protection of the employees' health, non-friable asbestos products have been decommissioned from workplaces in many instances, although there was not any relevant obligation by the Law.

In the course of 2005, a total of 49 tons of asbestos and asbestos-related products were decommissioned and disposed of (in addition to the 50 tons disposed of in previous years).

(c) Ni-Cd Batteries

PPC continued the implementation of a programme for the management and exportation of NiCd-related waste on the basis of long-term contracts signed with licensed operators. During the year 2005, 43 tons of NiCd-related waste (in addition to the 350 tons disposed of in previous years) were decommissioned and disposed of.

(d) SF6

Support actions which had been undertaken in previous years were continued.

(e) Waste Mineral Oils

Actions undertaken in previous years were continued. More precisely, in order to promote the safe collection and disposal of waste oils, PPC has signed a contract with ELTEPE S.A, the national collective alternative management system of waste oil.

Within the framework of this, as well as of previous contracts, 1,917 tons of waste oils (insulating, lubricating as well as hydraulic oils) were decommissioned and disposed of in the course of 2005.

(f) Other liquid hazardous waste

During 2005, a total of 7 tons of hazardous liquid waste were properly decommissioned and disposed of (in addition to 35 tons which had been decommissioned in previous years).

(g) Other solid waste outside the scope of alternative management systems

In the course of 2005, a total of 4950 tons of solid waste, mostly metals, were disposed of and sent for recycling. Moreover, the

Corporation has an active participation in the recycling of paper, ink, toners etc.

(h) Lead-acid accumulators and portable batteries

As regards lead accumulators, the year 2005 saw no decommissioning of such equipment, since the full activation of the relevant alternative management system SYDESYS and the subsequent signing of a centralized contract for the disposal of lead accumulators on a continuous basis are still pending. Nevertheless, this situation is expected to change drastically in the course of 2006.

As for portable batteries, the corresponding alternative system AFIS S.A., which is already in operation with satisfactory results, ensures their decommissioning from all operational units on a continuous basis.

(i) End of Life Cycle Vehicles (ELVs)

In the year 2005, only 20 End of Life Cycle Vehicles were disposed of. Yet, these vehicles were not collected by the relevant alternative management system EDOE, since neither the system nor its recycling partners had then fully developed activity. Nonetheless, it is expected that the stock of ELVs shall drastically dwindle in 2006 in accordance with the procedures established by the system.

(j) Used tyres

During 2005, 1730 used tires were sold to retreaders. On the contrary, no tyres were sold or disposed of through the relevant alternative management system, pending its nationwide development.

The year 2006 is certain to witness the drastic diminishing of the stock of used tyres and their subsequent continuous outflow through the system.



(k) Waste Electrical and Electronic Equipment (WEEE)

The disposal of WEEE through the relevant system Anakyklosi Syskevon S.A. is one of high priorities of the Company for 2006, given that a permanent cooperation has not been established yet.

(l) Management Actions

In the year 2005, PPC intensified actions for enhancing its infrastructure and ensuring the implementation both of its environmental policy and the applicable legislation. In this context, PPC was called to:

- ▶ Face up to the legal challenges with regard to environmental issues in collaboration with the Departments involved as the case may be.
- ▶ Provide technical and procedural support to the central and regional Units on matters of

waste management and transfer of the relevant know-how.

- ▶ Supply Units with the necessary equipment for temporary waste storage, pending collection, as well as with spill-control materials.

Within the framework of continuous efforts to protect the environment, as well as the health and safety of its employees and of the general public as well, DYAE:

1. Keeps abreast of developments in national and European environmental legislation.
2. Promotes a two-way cooperation with all the competent authorities, organizations, chambers and environmental agencies, central and local.
3. Provides, where necessary, coordination and guidance on environmental issues to other Units of the Company.

Safety Management Control

- ▶ Support to all operational units in detecting, locating and managing hazardous and non-hazardous waste, as well as in keeping up-to-date records on PCBs, asbestos products, Ni-Cd batteries etc.
- ▶ Inspections and projects for the management of waste such as asbestos, PCBs, Ni-Cd batteries etc
- ▶ Inspections and studies on environmental management pertaining to solid and liquid waste, as well as studies on the environmental impact arising from hazardous and non-hazardous waste.
- ▶ Proposals on the organization of storage areas and the proper management of stored materials (separation, stowage, disposal).
- ▶ Constant training and briefing of PPC personnel on issues of hazardous and non-hazardous waste management.
- ▶ Training seminars on the management of SF6-containing equipment. In this context, actions in 2005 include:
 - a. Publication of the manual: "Guidelines on the Management of Hazardous and non-Hazardous Waste"
 - b. Issuing of an information leaflet on "Waste Management by Public Power Corporation S.A." for distribution at HELECO 2005.
 - c. Production of a training video on "PPC S.A. Management of Hazardous and non-Hazardous Waste."
 - d. Organization of training sessions on the management of SF6 containing equipment.



The Environmental Management System of the Organization Department

The Environmental Management System is a Documented Management System that includes policies, objectives and targets, manuals, procedures, records and programmes. This system allows for the rational management of resources in order to implement the environmental policy and targets of the Company (in accordance with Community Regulation 761/2001 allowing voluntary participation by organizations in a Community Eco-Management and Audit Scheme - EMAS).

Services provided to PPC Units by the Organization Department

The Organization Department provides to PPC Units full EMS consulting services such as:

- ▶ Project Management Services
- ▶ Extended documentation services
- ▶ Support services during System implementation
- ▶ Services in organizing operational control and measurement procedures, as provided for by the EMS.
- ▶ Training services with regard to the implementation, operation and internal audit of the EMS
- ▶ External Environmental Auditor services
- ▶ Interconnection and simultaneous operation of the EMS with other management systems (Quality, Health and Safety Systems etc.)

Related Projects of the Organization Department within PPC S.A.

The Organization Department pursues the implementation of an Environmental Management System according to ISO 14001/2004 at the Department of the West

Macedonia Lignite Center, on the basis of a contract signed between the Organization Department ("Consultant") and the Department of the West Macedonia Lignite Center – Mines Environment Department ("Consultees").

During 2005, the project made significant progress (establishment of guidelines, procedures and documentation), whereas efforts were made to promote it by means of efficient communication.



The Tests - Research and Standards Center

For the last 25 years, the Tests – Research and Standards Center (TRSC) has been responsible for the quality control at PPC, performing inspections on its equipment and facilities so as

to secure the Corporation’s reliable operation. TRSC laboratories attempt to provide solutions to environmental problems in compliance with the Greek law and EU Directives.

Environmental Management Policy - Environmental Action Plan of the Tests – Research and Standards Center

The TRSC performs tests, controls and analyses of PPC materials, machinery, expendables, supplies and equipment in its 16 modern laboratories. Furthermore, the TRSC is involved in activities such as accreditation and opinion issuing, inspections of the materials and

equipment acceptance, applied research, updating of specifications and calibration of measuring devices.

TRSC laboratories attempt to provide solutions to environmental problems in compliance with the Greek law and EU directives.

Actions taken for the Protection of the Environment against solid or liquid waste produced at Power Plants

The TRSC examines issues such as the pollution load received by a receptor or the performance of the liquid and solid industrial waste treatment systems and attempts to provide solutions to environmental problems by means of chemistry, technology and environmental management principles.

waste produced by Power Plants take place in compliance with the resolution of the EU Council COM (91/102) – SYN 335/22.5.21.

- ▶ The measurements performed inside TRSC laboratories ensure both an accurate assessment of the current situation of Power Plants (pollutant quantities corresponding to waste on a monthly basis etc.) and the notification of the results compared to the limits set by the Law in force for each individual region. These measurements are accompanied by remarks or suggestions for potential interventions in the existing waste treatment facilities.

- ▶ The systematic physical and chemical control of industrial wastewater aims both at the compliance of power plants regarding environmental issues and the safeguarding of the Company interests.

Moreover, the Industrial Wastewater Treatment Systems performance and efficacy is examined through the calculation of their pollution load before and after entering the above system.

- ▶ The control, management and disposal of solid

- ▶ The TRSC, in cooperation with the environmental sections of PPC Thermal Plants, performs regular controls on the solid waste (liquid and fly ash, sludge etc.) produced by the Thermal Power Plants of the North System, in order to ensure full compliance with the environmental terms.

- ▶ Furthermore, the TRSC has participated and still participates in various research programs in cooperation with PPC Departments and other agencies. Indicatively, we cite the project ELIMEIA which pertains to the exploration of possible further contamination of the groundwater aquifer by the deposition of products produced at the exhaust gas desulphurization unit of Megalopolis TTP.





Actions for the protection of the environment against liquid or solid industrial waste produced by the Autonomous Power Plants located on the islands

- ▶ The TRSC supports environmental control issues by performing samplings and regular controls on the industrial waste produced by Autonomous Power Plants on the islands.
- ▶ Through its Research Section, the Center prepares projects pertaining to the treatment of waste produced by machinery, the recovery of useful fuel, as well as the on-line monitoring of pollution factors involved in the operation of the Autonomous Power Plants located on the islands.



Laboratory Analysis of environmental samples - Quality and Pollution Control

The liquid environmental samples analyzed by the TRSC are related either to urban pollution (waste produced by human settlements and power plants) or to industrial pollution (liquid or solid industrial waste). The TRSC investigates surface water pollution (rivers and lakes), groundwater pollution as well as sea pollution.

and wastewater treatment plants, as well as by the cleaning of fuel tanks

- ▶ Suspended particles emitted by Steam Electric Power Plants chimneys not retained by Electrostatic Precipitators (ESPs)
- ▶ Suspended particles emitted by Power Plants



The solid waste produced by power plants used for calculating the pollution load of heavy and toxic metals includes:

- ▶ Urban waste,
- ▶ Fly and wet ash,
- ▶ Sludge produced by water softening plants

(chimney inspections accompanied by ESP performance controls or inspection of the surrounding area.)

Furthermore, thanks to its equipment, the TRSC examines the quality of potable water, borehole water or deionized water that serves as coolant in boilers.

Quality-Pollution Control Parameters

The TRSC calculates the exact value of various physicochemical parameters such as: acid value (pH), conductivity (U), color, suspended solids, total dissolved salts, dissolved oxygen (DO), five-day biochemical oxygen demand (BOD5) which refers to the amount of organic biodegradable matter, chemical oxygen demand (COD) for chemical toxic waste, total alkalinity, total temporary and permanent hardness, total petroleum hydrocarbons, nutrients (NO₃⁻, NO₂⁻ and PO₄³⁻), unwanted substances (S₂⁻, SO₃²⁻, SO₄²⁻, NH₄⁺, Cl⁻, phenols), heavy & toxic metals etc.

Laboratory equipment

High quality analyses are achieved through the excellent equipment and technical infrastructure used by the TRSC, including among others:

- ▶ Ultramodern atomic absorption spectrometer and graphite furnace
- ▶ Inductively coupled plasma spectrometer
- ▶ Ion chromatography of anions and cations
- ▶ "Oil in water" device for the selective detection of total petroleum hydrocarbons
- ▶ UV-VIS spectrophotometer, pH meters, conductivity meters, BOD5 measuring devices etc.

Communication on Environmental Issues

Communication strategy on Environmental Issues

The communication strategy of PPC S.A. mainly aims at promoting the strategic targets of the Company, one of which is the protection and restoration of the environment. Communication strategy on environmental issues is focused on the following measures and actions:

- ▶ Planning and development of external communication. Development of the corporate image in relation to the implementation of integrated environmental strategy of the Company. Since 2001 we have been trying to create a fresh image of PPC in the public's mind, integrating the new profile of the Company. An essential parameter of this image is sustainable development, that is to say development and preservation of the environment at the same time.
- ▶ Communication Support to the Management in managing crises related to environmental issues.
- ▶ Planning and development of internal communication aiming at promoting environmental awareness to all PPC personnel and its trade unions and briefing them on the

environmental programs of the Company. Internal communication is achieved by means of a network of communication correspondents in every Department, as well as in remote or large Units of the Company.

- ▶ Support to the Human Resources Departments of Business Units in developing Communication Programs on environmental issues in cooperation with the competent Environment Units.

Communication Activities

Advertising Campaigns

The primary aim of the Communications Department is to promote the environmental strategy of PPC S.A. in every prestige campaign and every advertising campaign on special issues, such as the energy-saving campaign which was first launched in the summer of 2005 and which shall be repeated in 2006.

Production of printed and audiovisual material (videos and CDs) relating to the environment

PRINTED MATERIAL

- Editing and publication of numerous brochures and books related to the environment and presenting the Corporation's work on

ENVIRONMENTAL REPORT

environmental protection, i.e. "PPC Wetlands" in collaboration with Universities. More precisely, in the year 2005 the Communications Department proceeded to the publication of a special brochure on the Transmission Business Unit, the Report 2004, as well as the Annual Report for the Financial Year 2004, where reference is made to environmental issues.

- Publication of an Environmental Report on a yearly basis. The first Environmental Report was published in 2003. Ever since, PPC pursued its republication with a renewed syllabus, description of activities and a report on the achievement of PPC SA goals as regards environmental protection.

CHILDREN'S BOOKS

The children's series "PPC and Electricity" has already been released featuring, among other topics, the measures taken by PPC in terms of environmental protection. Furthermore, the children's book "Lignite: a trip full of surprises" was republished in 2005.

VIDEOS

Production of videos for all PPC Business Units, which include special sections regarding the



environment. Production of a promotion video to be shown at HELECO '05.

Environmental Events

- Presentations and Press conferences
- Provision of accommodation to third parties, organization of visits and guided tours in PPC facilities where environmental programs are applied.
- Participation and promotion of the Company in the context of expos where reference is made to environmental issues, i.e. the Thessaloniki International Trade Fair.
- Organization and participation in meetings, conferences and cultural events, i.e. in the one-day conference on combating CO2 emissions which was held at the West Macedonia Energy Center in 2005.

Sponsorships

In the context of its communication strategy, PPC sponsors universities and other entities to hold conferences, carry out research and perform various other activities related to the environment. The amount that PPC spent on meetings and conferences in 2005 amounted to 11,000 Euros, while the amount spent on similar sponsorships, such as the purchase of litter bins for the Municipalities of Megalopolis and Gortyna and the partial coverage of the operational cost of an antipollution boat for the island of Samos, amounted to 60,000 Euros.

PPC's website on the Internet

On PPC's webpage, there is a special extensive

reference to the environment. Special reference is made to the activities of each PPC Business Unit regarding environmental protection, as well as to Renewable Energy Sources and Human Resources. Moreover, PPC's website offers various photos and the latest Environmental Report.

Articles

- Articles published in newspapers and trade

union periodicals and advertisements on special occasions mainly concerning issues of renewable energy sources and measures taken by PPC in the context of its activities, for the protection of the environment and human health.

- Articles published in ELECTRON, PPC S.A.'s internal communications review, on environmental issues.

Objectives and Perspectives

The organization and operation of PPC Support Units shall be further continued in all production branches, having as for primary aim the protection of the environment and employees' safety.

Our constant communication both with the society in general and our employees is the tangible proof of the great work we accomplish with respect to environmental protection.