



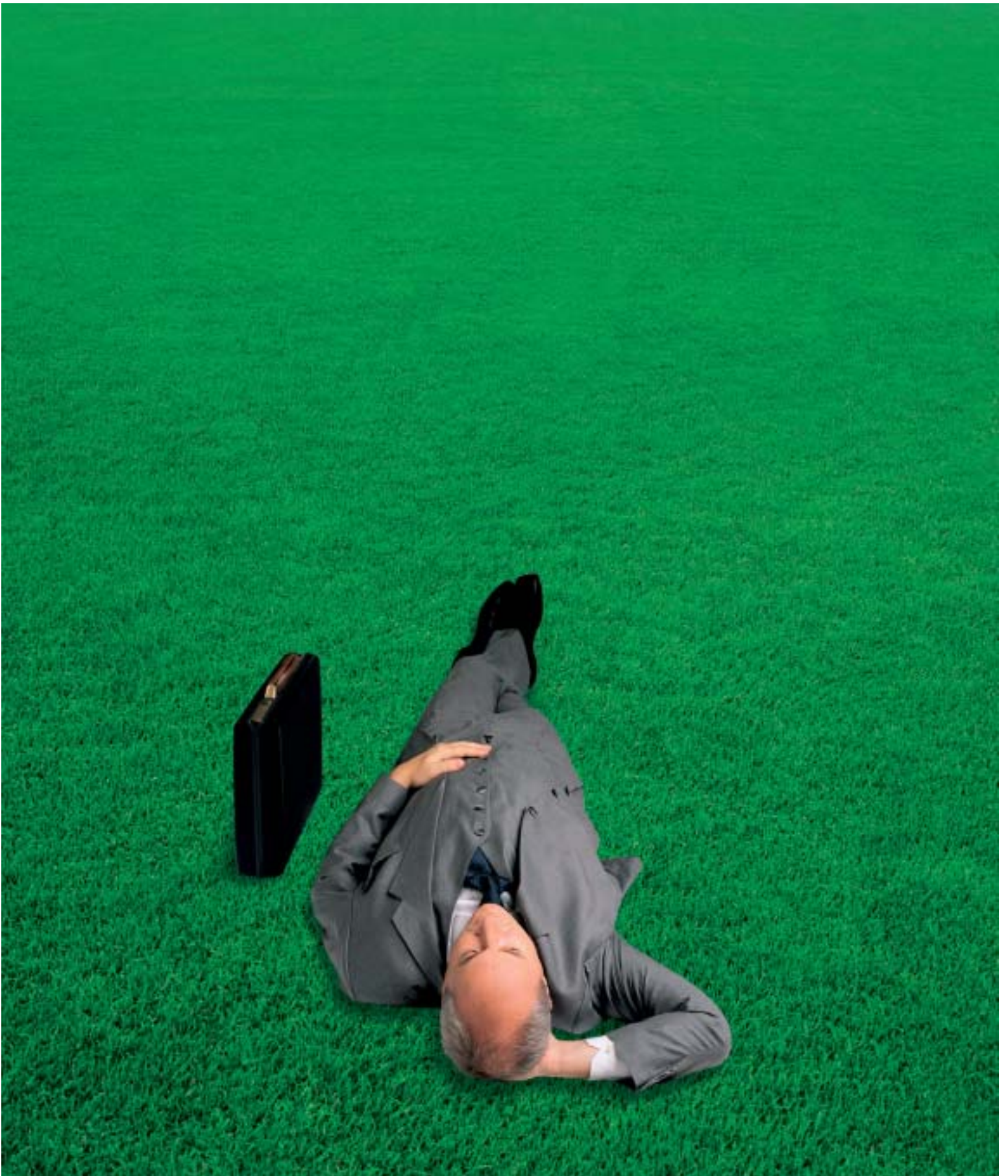
Hrvatska  
Elektroprivreda  
and the Environment  
2001 – 2002



HRVATSKA ELEKTROPRIVREDA D.D.



Foreword by the President of the Management Board / Basic information on the company / Key principles of environmental protection employed in the HEP Group / Acknowledgements and awards – HEP socially responsible company / Renewable energy sources and energy efficiency / Outline of the most important environmental activities / Overview of environmental costs / Looking ahead / Attachments



Hrvatska Elektroprivreda and the Environment – 2001–2002 – is the Third Environmental Report of our company. The First Report was published in 1999 and gave a broad overview of numerous activities that Hrvatska Elektroprivreda carried out in the period from its incorporation in 1990 until the end of 1998. The Second Report, published in 2001, encompassed the years 1999 and 2000, and we started to publish the environmental report on biannual basis. This Third Report upholds the same approach with a small exception, I believe a justified one. In addition to data relating to the years 2001 and 2002, we included some environmentally important events which took place in the first half-year of 2003. First of all this relates to the State Award for Environmental Protection presented to Hrvatska Elektroprivreda, as a socially responsible company, by the Ministry of Environmental Protection and Physical Planning on the occasion of the World Environment Day. This award is the confirmation of our assertion that complex systems such as ours can achieve adequate, lasting and visible environmental results only by organized actions over a longer period of time. The second important achievement of Hrvatska Elektroprivreda is the award of "Green Certificate" granted for a hundred percent electricity generation from renewables, which proves that electricity generation in our hydro power plants is environmentally friendly. These achievements are even more important to Hrvatska Elektroprivreda since they were realized in the period characterized by preparations for and start of implementation of its organizational and business restructuring within the framework of Croatian energy sector reform. In line with the laws regulating the functioning of the energy sector, and in order to adjust itself to the European Union standards and to gradually introduce market principles in its business operations, Hrvatska Elektroprivreda was restructured on 1 July 2002 into HEP Group, consisting of Hrvatska Elektroprivreda d.d. as the parent company and subsidiary companies of core electricity activities (electricity generation, transmission, distribution and supply) and ancillary activities (supply of heat, process steam and natural gas). The care for the environment in competitive business conditions and under changed state of affairs defined by energy laws, in terms of restructured Hrvatska Elektroprivreda, is gaining in importance. We created preconditions for the desired energy efficiency increase at end-users (customers) by incorporating our subsidiary company specialized in providing energy services and financing energy efficiency projects – HEP-ESCO. The best example of energy efficiency in our thermal power plants is the new gas/steam combined cycle cogeneration unit at TE-TO Zagreb site. Its electricity output of 200 MW and thermal output of 150 MJ/s is realized with a very high fuel utilization rate of 80 percent. Furthermore, the unit fires natural gas in place of fuel oil, which used to be the main fuel at that particular site, and contributes to lower pollutant emission into the air. In TE-TO Zagreb, and in all other thermal power plants, systems were set up for continuous monitoring of atmospheric emissions which will be connected into an integral system for monitoring and control of emissions generated by Hrvatska Elektroprivreda. A range of other activities and achievements that are presented in this report bear evidence on the resoluteness of Hrvatska Elektroprivreda to keep its position among important socially responsible companies in Croatia by protecting Croatian natural, cultural and historical values and the environment. Along with enhanced business performance and improved quality of products and services, adequate care for the environment under emerging competitive conditions will be an additional guarantee that Hrvatska Elektroprivreda will maintain its position as the leading power company in Croatia.

Ivo Čović, B.Sc.  
President of the Management Board



Hrvatska Elektroprivreda, a company founded in 1990 and restructured into HEP Group in 2002, carries out the activities of electricity generation, transmission and distribution and power system operation and control across the territory of the Republic of Croatia.

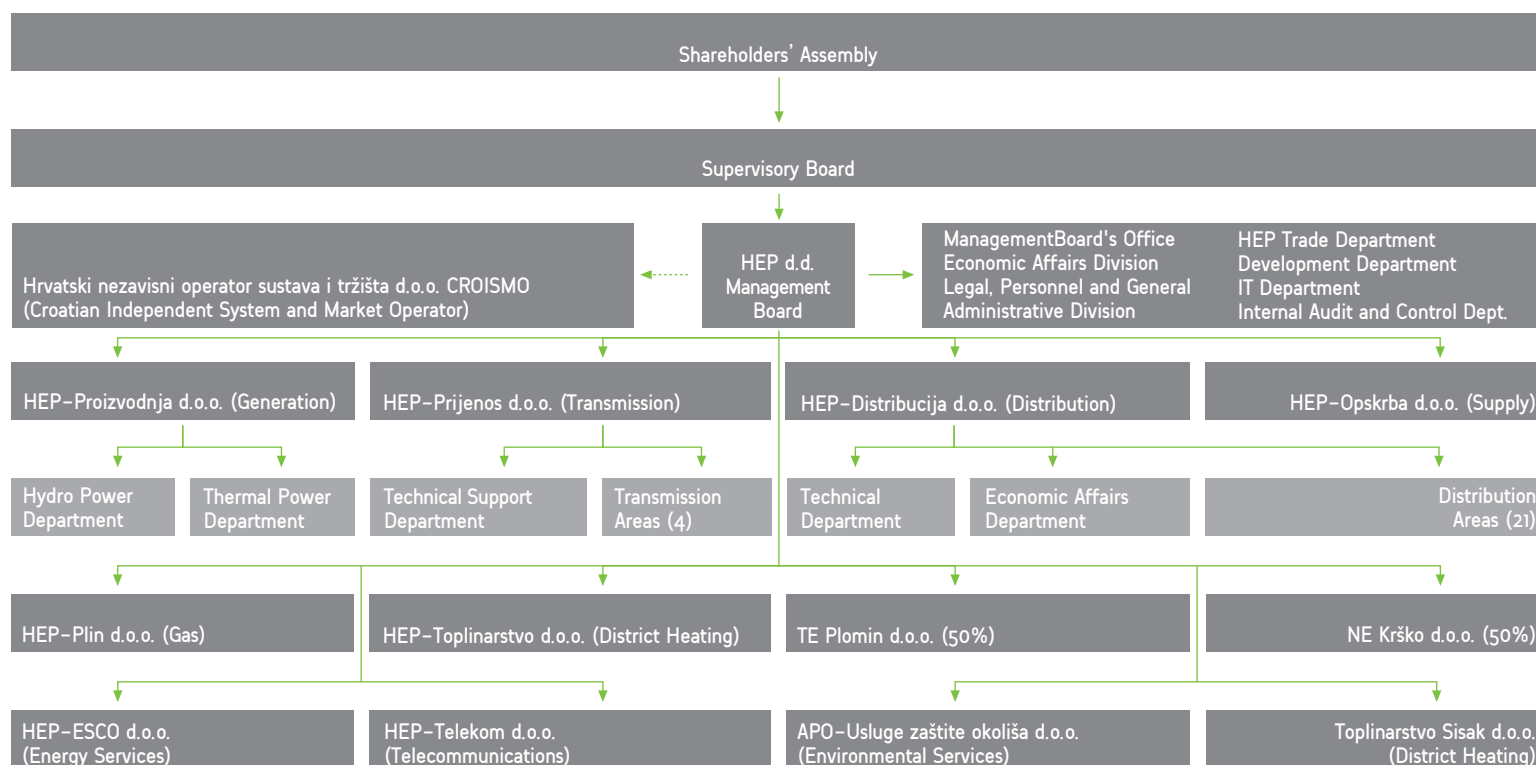
Power generating capacities of the company HEP-Proizvodnja d.o.o. (Generation) consist of twenty-six hydroelectric power plants with total installed capacity of 2,063 MW and eight thermal power plants with total installed capacity of 1,519 MW. Together with 210 MW and 354 MW in joint venture companies TE Plomin d.o.o. and NE Krško d.o.o. respectively, in which HEP's share is 50 percent, total available capacity delivered to the Croatian power system amounts to 4,019 MW. With imperative power imports, Hrvatska Elektroprivreda meets about 94 percent of total electricity demand in Croatia, which in the year 2002 totalled 15.8 TWh. The remaining six percent of electricity is generated in industrial cogeneration plants, mainly covering own needs of such industrial customers, and in privately owned small hydro power plants.

The companies within HEP Group employ 14,953 workers and supply electricity to more than 2 million customers connected to the Croatian power system. Electricity supply is carried out via 137 switching stations and 7,238 km of high voltage transmission lines, and via 23,721 switching stations and 121,465 km of medium and low voltage distribution lines operated, constructed, expanded and maintained by the companies HEP-Prijenos d.o.o. (Transmission) and HEP-Distribucija d.o.o. (Distribution), respectively. A separate, newly established company for power system management and electricity market organization – Croatian Independent System and Market Operator d.o.o., manages Croatian power system. This company will be divested from HEP Group into a fully independent company in state ownership.

Subsidiary companies of HEP Group that are engaged in ancillary activities – HEP-Toplinarstvo d.o.o. (District Heating), Toplinarstvo Sisak d.o.o. (District Heating) and HEP-Plin d.o.o. (Gas) generate and distribute heat in central district heating systems of the towns of Zagreb, Osijek and Sisak and distribute natural gas across the territory of the three counties located in eastern Croatia.

APO-Usluge zaštite okoliša d.o.o. (Environmental Services), a consultancy and engineering company specialized in environmental protection, and HEP-ESCO d.o.o., a company specialized in energy services and energy efficiency project funding, are also HEP Group members.

### HEP Group Organizational Structure



One of key objectives of the Croatian energy policy is its adjustment to European and world standards. To achieve this, institutional, legislative, organizational, incentive and promotional prerequisites have to be created.

A long-term development vision of Hrvatska Elektroprivreda is based on the principles of sustainable development of the company and sustainable development of electricity activities in Croatia. The awareness of true environmental values paves the way towards company's business success.

Hrvatska Elektroprivreda is developing the state-of-the-art environmental management system based on the Management Board's Business Program, which outlined the organizational structure and inaugurated systematic care for the environment.

Restructuring, privatization and changes in the electricity market characterize the present-day electricity sector. Hrvatska Elektroprivreda carries out comprehensive restructuring of its business system in line with the national energy development strategy, environmental protection strategy of the Republic of Croatia and new Croatian energy laws and EU standards. The restructuring targets at improved efficiency and reduction in operating costs, recognizing at the same time market developments and incorporating European standards and criteria of environmental protection and sustainable development into own business practices.

In business and organizational terms, HEP d.d. represents a very complex company, which fact calls for an efficient institutional establishment of the environmental management system. The introduction of the Environmental Management System – EMS at HEP Group level figures prominently in the background documents for the elaboration of HEP's Environmental Plan (2002). In the light of the ISO model, the document reaches the planning stage, i.e., it details the activities and steps to be taken prior to the implementation and operational establishment of the EMS, the activities that were launched at the top level of corporate management, other management levels and core business functions of HEP.

The implementation of an advanced environmental management system in HEP pursuant to ISO 14001, started with the adjustment of HEP's General Environmental Principles of 1996, in line with the most demanding world standard. Thus, background documents for HEP's Environmental Plan at the level of HEP Group, which include the document "HEP's Environmental Policy", enabled the elaboration of environmental plans at the level of individual organizational units of core electricity activities. The Environmental Plan of Sisak TPP was completed already in December 2000, and in late 2002 respective plans for the establishment of systematic care for the environment were prepared in the Transmission Area Zagreb and Distribution Area "Elektra Zagreb".

The implementation of EMS in thermal power plants TE-TO Zagreb and Rijeka TPP is under way, along with employees' training programs that have already been completed in the light of ISO 14001 standard.

In order to approach environmental protection in a systematic way, the setting of a new organizational structure is planned which will identify competencies and responsibilities of persons at all organizational levels within HEP's business system and define communication channels and information flows. Organizational incorporation of environmental issues into HEP's business activities is lead by its Development Department with pro-active involvement of experts from individual subsidiary companies of HEP Group. HEP's Management Board set up the Environmental Procedures Coordination and Standardization Team.



The Team's primary tasks are: operative implementation of strategic objectives in the field of environmental protection, coordination and implementation of activities aimed at the conservation of environment, management of environmental impacts and adjustment to legal requirements. The Team, lead by the Development Department, involves the members of all core organizational units of HEP Group and connects HEP Group's top management and the process level at which environmental impacts primarily occur. As regards operational implementation, environmental activities are often organizationally allocated to the safety at work and fire prevention. Primary task of an environmental engineer, who is therefore often an expert in the safety at work, is to independently resolve environmental issues within his/her own plant in line with legal provisions and general rules and guidelines of HEP, supported by the Team and other functions of HEP specialized in environmental protection.

Thanks to the activities of the Team in 2001 and 2002, many prerequisites have been created for progressive and systematic integration of environmental issues into company's business operations. An example of continuous improvement in this field are the preparations for the implementation of guidelines set in the Rule Book on Environmental Accounting, made by the economic affairs and IT departments of HEP Group.

In parallel with the development of environmental management system pursuant to ISO 14001 and systematic environmental accounting, i.e., monitoring of environmental costs and investments which will be established in 2004, transparent and reliable data will be provided for HEP Group's business system that will make the decision-making process in this very important business segment efficient and rational.

A member of HEP Group – APO–Usluge zaštite okoliša d.o.o. carries out a number of expert activities for HEP related to environmental protection, including the maintenance of a database – Industrial Waste Inventory, management of HEP's industrial hazardous waste, development of internal acts in the field of environmental protection, development of environmental impact studies, introduction of environmental management system through cleaner production projects and others. APO is also the contractor for the development of a number of national environmental projects, such as National Environmental Strategy within the project "Croatia in the 21<sup>st</sup> Century", and the draft of the Waste Management Strategy of the Republic of Croatia. APO deals with the majority of environmental issues, and especially with the assessment of the state of the environment, identification of existing pollution and elaboration of proposals and measures for their mitigation, establishment of environmental management system – EMS and introduction of ISO 14001, and with safe and long-term waste management.

Being one of the largest investors in environmental protection, HEP has also established extensive business co-operation with leading scientific and research institutions in the Republic of Croatia.

#### HEP's Environmental Policy\*

By adopting this environmental management policy, Hrvatska Elektroprivreda, the leading national business system in the field of electricity generation, transmission and distribution, expresses the commitment:

- : to consistently adjust its business activities to relevant national laws and regulations in the field of environmental protection and requirements set out in other documents to which it is a signatory
- : to organize and carry out its business operations so as to make their environmental impact consistent with world best practices;
- : to set environmental objectives and targets and to assess their implementation periodically;
- : to continuously and systematically improve its own environmental management practices.

\* pursuant to the background documents for HEP's Environmental Plan, 2002

#### HEP's Main Environmental Principles

- : Incorporate environmental issues into HEP's development plans and strategy, and environmental protection criteria into its planning and decision-making processes.
- : Use the resources in a rational way, reduce emissions into the air, water and soil, and reduce the quantity and hazards of waste.
- : Preserve biological, environmental and other natural wealth of the environment in the vicinity of HEP's installations by implementing measures designed to protect flora and fauna and natural, cultural and historical heritage.
- : Install and maintain continuous environmental monitoring systems at each location where HEP's installations are situated and publish the monitoring results.
- : Encourage the use of renewable energy sources and cogeneration units.
- : Develop and study the application of cleaner production and efficient technologies in electricity generation, transmission and distribution.
- : Educate and train HEP's employees to protect the environment.
- : Cooperate with state administration bodies and local authorities and with institutions and non-governmental organizations involved in environmental protection.
- : Advocate rational use of energy and energy savings both with HEP's customers and at the national level.
- : Urge equipment suppliers, consultants, design engineers and other collaborating companies and business partners of HEP to develop their own environmental policy on the basis of these principles.

In the past ten years the operation of HEP's plants and their effects on the environment have been systematically monitored in line with the requirements of environmental legislation. HEP regularly keeps the Environmental Emission Inventory, Industrial Waste Inventory, TPPs Wastewater Inventory, Atmospheric Emission and Air Quality Inventory, and monitors water quality in the vicinity of hydro power plants. By continuous investments in environmental protection HEP succeeds to control environmental impacts, especially emissions into the air. The comparison of specific emissions of individual pollutants per unit of electricity produced shows that HEP belongs to the electricity industries with the lowest specific emissions in Europe.

In 2001 and 2002, all HEP's installations operated in accordance with relevant permits and legal acts that regulate the protection of individual environmental parameters, such as air and water protection, biodiversity conservation, waste management and noise attenuation.

The operation of generating capacities is systematically monitored and adjusted to relevant regulations through organized monitoring programs. Additional analyses of the status and quality of individual environmental parameters and the documentation developed by independent authorized companies contribute to realistic presentation of HEP's impact on the environment, on which competent state institutions, local self-government units and stakeholders are promptly informed.

Basic obligations derived from the environmental legislation are contained in the document "Environmental Laws Important for Power System Operation and Development – Guidelines" (HEP's Bulletin No. 89/2000). The guidelines were developed with an aim to provide more complete information and education to HEP's employees for carrying out environmental activities in their work environment. At the end of 2001, concrete "Instructions for Waste Management in Hrvatska Elektroprivreda" were prepared, as well as "Instructions for the Implementation of Obligations from the Rule Book on Environmental Emission Inventory" (HEP's Bulletin No. 95/2001). While the former document is intended for employees in charge of waste management, the latter serves as general information to all employees of HEP about the principles and purpose of environmental emission inventory. These documents also give an overview of all obligations of HEP that derive from the effective laws and regulations and give instructions on how to fill relevant forms. The publishing of documents in HEP's internal bulletins is a part of the program aimed at facilitating the acceptance, understanding and implementation of obligations imposed by environmental laws and regulations. The next step will surely be to automatize and computerize such activities to the maximum, in which process the IT department support in the HEP Group will be very important. In addition to the above activities, HEP plays an active role in drafting new regulations in close communication with relevant state administration bodies, and takes an active part in the Affiliation of Environmental Protection in Economy within the Croatian Chamber of Commerce.

Environmental Emergency Action Plans have been elaborated in all generating facilities that had such legal obligation. Within the preparations for EU accession, an "Overview of EU Laws and Regulations in the Field of Electricity and Environment" has been prepared.

For its achievements in environmental protection Hrvatska Elektroprivreda won the 2003 award in the field "General Contribution to Environmental Protection – Socially Responsible Companies".

The World Environment Day, celebrated on 5th June each year, is one of the most significant events that promote global awareness of the environment, draw mass-media and political attention and drive actions directed towards environmental protection. On the occasion of the Day, the Ministry of Environmental Protection and Physical Planning of Croatia presents awards to meritorious companies, institutions, associations and individuals for their achievements in the field of environmental protection.



The objective of this award is to endorse the interest and dedication of individuals and organizations in the implementation of environmental protection measures at all levels. Croatian Association for Air Protection and the City Government of Zagreb nominated HEP for this reputable award. HEP's nomination for the award was based on its achievements in environmental protection, resulting from a range of activities HEP undertook to preserve the environment. HEP is the most important electricity producer in Croatia and owns all thermal power plants, and it accounts for the majority of atmospheric emissions in the energy sector. The care for the environment can be seen in the application of the state-of-the-art environmental technologies in generating units and the installed continuous air emission monitoring systems from thermal power plants which enable the supervision and control of emissions. Data and values from the environmental impact analyses are continually published in the publication "HEP and the Environment".

HEP is directly involved in the projects of biodiversity conservation. In addition to the Project of White Stork Protection, activities are underway for the protection of fish (especially in the Drava river basin) and bats. Locally, HEP implements programs for the improvement of municipal infrastructure and economic and entrepreneurial environment in local communities in the vicinity of HEP's plants.

Furthermore, HEP intensifies its co-operation with non-governmental and professional associations engaged in environmental protection and energy sector, and with associations for consumer protection and educational institutions.

We highlight the Best Student Award presented by HEP to students of primary and secondary schools achieving the best results in mathematics and physics national contests. This award shows that HEP pays special attention to future generations of Croatian technical leaders and gives support as well to all those that care for our children – the Ministry of Education and Sports, schools, teachers and parents.

Improved environmental awareness of customers and care for the environment – shown by more and more citizens – resulted in the creation of criteria for environmental acceptability of products. In certain cases, the customer is willing to pay more for an environmentally sound product, and the trend of so called "green consumption" gradually spreads to the electricity industries worldwide. The term "green energy" or "green electricity" relates first of all to electricity generated by use of renewable energy sources (hydropower, biomass, landfill gas, solar and geothermal energy). For the time being, only ten countries in the world trade in "green energy". "Green certificates" and "green tariffs" are used as promotional mechanisms for "green energy" and methods of trading.

In 2003, HEP-Proizvodnja d.o.o. was awarded an international "green certificate" for a hundred percent electricity generation from renewable sources, first of all for its hydro power plants of the Production Area North, and thereupon for all other hydro power plants.

This ranked HEP among the best "green" electricity industries of the world. The certification was carried out in accordance with the TÜV standard "CMS-Kriterien Erzeugung EE" for electricity producers from renewable sources. The certification procedure for hydro power plants is conducted by a specialized company that examines the environment and the technology, system for recording generated energy, ratio of sold to generated energy, as well as business organization of individual generating facilities.

The liberalization of the electricity market enables the customer to choose its electricity producer. Along with intensive promotion of energy from renewable energy sources, "green energy" market is being developed, as well as all the accompanying mechanisms that make it operational. HEP plans to offer to its customers the "green tariff" in the future. Since new EU Electricity Directive requires 22 percent of total electricity generation to be from renewables by the year 2010, by certifying its own "green energy" HEP adjusts itself to the EU legislation.



The Republic of Croatia takes the high fifth place in Europe for the share of renewable energy sources in electricity generation (40–60 percent of electricity is generated in hydro power plants). In 1994, HEP has voluntarily, without legal obligation, started to promote small renewable sources, primarily by encouraging private investments. Promotional publications have been published about the locations and investment possibilities for small hydro power plants, small thermal power plants and wind power plants, including technical conditions for connection of small power plants to the network. Three power purchase agreements with small hydro power plants were concluded and one agreement with a small thermal power plant. The construction of a 5.6 MW windfarm on the island of Pag is currently underway – based on the first power purchase agreement HEP signed (in 2001) for the electricity generated in a windfarm in Croatia. With an annual output of 15 GWh, this wind power plant represents a pilot project, the results of which will serve for setting guidelines and for developing larger-scale projects of alternative and supplementary electricity sources.

Promotion of the use of renewable energy sources, cogeneration units and energy efficiency on the demand side is one of basic principles of HEP's environmental policy.

In addition to energy generation from renewable energy sources, HEP Group has started to develop demand side management measures and energy efficiency measures. In co-operation with the World Bank and Global Environment Facility – GEF, a joint energy efficiency project was launched for the Republic of Croatia.

The project is aimed at encouraging the development of renewable electricity market and at further reduction in the emission of greenhouse gases. The analyses and study background documents suggested that there is a significant market potential for energy efficiency projects. Consequently, HEP established its daughter company HEP-ESCO d.o.o. in 2002, to manage this particular project and other projects of the kind. Demand side management includes numerous measures and procedures employed to decrease energy consumption and achieve more favourable consumption schedule, retaining at the same time the same comfort and quality of energy use. These are the procedures identified as more cost-effective than the investments in energy supply. Demand side management measures and programs include provision of information and advice on efficient energy use and reduction in energy costs, introduction of energy efficient loads, load shaving (shift of energy consumption from peak load periods – applying both to electricity and gas). The application of such measures lessens energy consumption growth and the need for construction of new energy capacities in generation and transmission having adverse environmental impacts and cuts down customer costs. Energy efficiency measures of HEP-ESCO d.o.o. relate to the savings in electricity and heat consumption. According to the analyses carried out, target market segments were identified – building industry (schools, hotels, commercial and residential buildings), industry, street lighting, thermal systems and water supply systems. A number of projects are in different stages of development encompassing almost all market segments. Two of such projects are about to be implemented. The first one is the Rehabilitation of Street Lighting in the City of Zagreb, within which a part of street lighting will be improved in the first step. Expected savings in installed capacity and energy have been estimated at over 30 percent. The project of rehabilitating the lighting systems in the schools of the town of Karlovac encompasses five primary schools, and the savings have also been estimated at ca 30 percent. The implementation of energy efficiency improvement projects generates direct savings for owners of such facilities and results in additional benefits, such as reduced energy consumption, lower emission of pollutants into the air and water, and lower waste quantities.



HEP is pro-actively involved in a number of international environmental initiatives, renewable energy sources and energy efficiency projects. First of all, we have to mention the sustainable development project "Energy Wisdom Programme" (EWP) of the European Union of the Electricity Industry – EURELECTRIC. The objective of this project is to point out to a valuable contribution of the European electricity sector to the reduction in greenhouse gases emission.

HEP participates in the preparations for the ratification of the Kyoto Protocol within the UN Climate Change Convention and in the project of critical load mapping of forest ecosystem in the Republic of Croatia. Similar example is the expert co-operation with the Croatian Cleaner Production Centre in the implementation of cleaner production projects in HEP's thermal power plants. The projects that were implemented, with minimum investments, in Sisak TPP, Rijeka TPP, TE-TO Osijek and TE-TO Zagreb have resulted in significant cash savings generated through lower consumption of resources (fuel and water), and in lower environmental emissions.

For example, the installation of a vertical steam-water heat exchanger in TE-TO Zagreb, manufactured in the plant, reduced steam emissions into the air by 7000 t/year and, consequently, the generation of an equivalent quantity of boiler water and consumption of chemicals and energy required for its treatment. Fuel consumption has also been reduced, as well as proportionate emission of flue gases from TE-TO Zagreb.

HEP also takes active part in the development of the national Project of Renewable Energy Sources, aimed at creating basis for the development and encouragement of the use of renewable energy sources in Croatia, to reduce environmental pollution loading. The project is supported by GEF and implemented in co-operation with the World Bank, European Bank for Reconstruction and Development, Ministry of Economy, and Energy Institute "Hrvoje Požar".

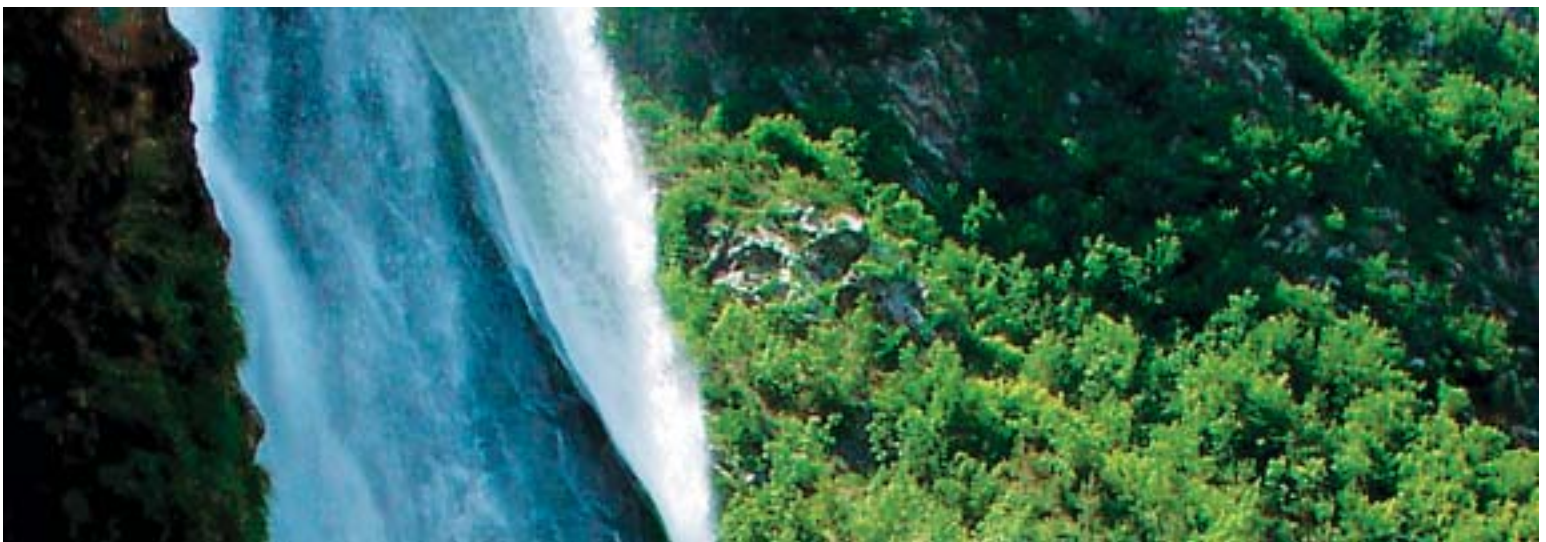


As one of the most important energy undertakings in Croatia, HEP provides professional and financial support to numerous national projects related to the reduction in greenhouse gases emission.

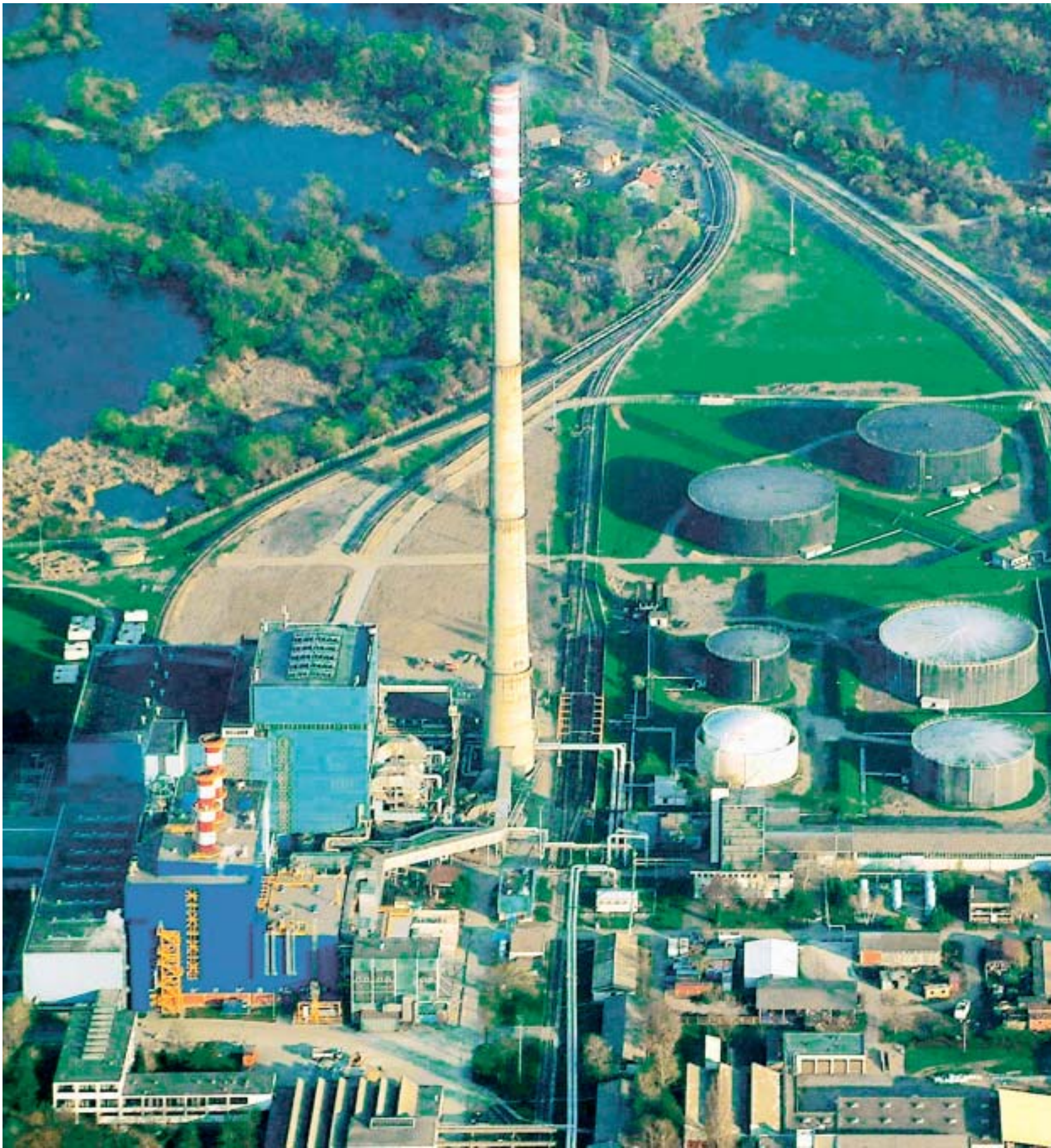
The anticipation of environmental legislation resulted in continuous investments in new technologies and in providing training for HEP's experts with an aim to control emissions and environmental impacts.

A step forward in this direction is the installation of automatic systems for continuous monitoring of atmospheric emissions in all thermal power plants in 2001 and 2002. The installation of automatic systems enables continuous control over the products of fuel combustion. The integration of all equipment for continuous measurement into a unified system for monitoring and control of thermal power plants' emissions – CISEM (central information system for air emission monitoring) – is under way at the level of HEP. The mentioned system will be gradually upgraded with information sub-systems for monitoring OF other environmental parameters.

In the scope of environmental impact monitoring, HEP carries out a range of measurements and researches into groundwater and surface water quality in the vicinity of its generating facilities. HEP also operates air quality monitoring stations in the vicinity of EL-TO Zagreb and Plomin TPP, and performs air quality control at the locations not having stationary air quality monitoring devices.



In 2002, a highly efficient combined-cycle cogeneration unit was constructed at the TE–TO Zagreb site. Since this unit fires natural gas as primary fuel and represents a partial replacement for the existing units firing fuel oil, this combined cycle cogeneration unit contributes to the reduction in pollutant emissions into the air, reduces the use of process water and waste quantities generated. The installed electrical equipment and instruments, well as overall technical design of the project represent the state-of-the-art, highly efficient technical and technological solution that respects relevant Croatian and world regulations and standards. By construction of the new unit, TE–TO Zagreb became one of the largest power plants in HEP in terms of electrical and thermal output and very high efficiency rate (75 to 80 percent). Such a high efficiency rate ensures low specific emission of CO<sub>2</sub>, the most important greenhouse gas. The reduction in sulphur dioxide emissions was achieved by the use of natural gas with minimum sulphur content, while the reduction in nitrogen oxide emissions was achieved by uniform gas combustion in gas turbine combustion chamber of the new unit. Automatic measuring instruments for CO, SO<sub>2</sub>, NO<sub>x</sub> and smoke number were installed for continuous monitoring of atmospheric emissions. Measuring results will be stored in the HEP's system with the possibility of data transfer into the emission monitoring system of the City of Zagreb. Noise abatement measures – both construction and process type – were applied by the installation of noise attenuators at air intakes, flue gas exhausts and in the ventilation system. The walls and roof of the operating building were made of acoustically insulated plates and slabs. The water discharge and treatment system of the new unit is connected to the existing wastewater and cooling water discharge and treatment system in order to avoid the impact of the gas fired cogeneration plant on hydrological conditions at site. The mentioned fact is especially important since one part of discharged cooling water is used as the so called biological minimum that recharges the nearby Savica Lake which was in 1991 assigned the status of a significant landscape with a special zoological reserve.





The fitting of a gas turbine power plant (GTPP) Zagreb West into the existing plant of EL–TO Zagreb resolved the issue of continuous air quality monitoring in the vicinity of the plant (monitoring of meteorological indicators and nitrogen dioxide), instigated in September 2000. Trial emission assessment in GTPP Zagreb West suggests that the values of atmospheric emissions are below permitted limit values and that there are no additional impacts on air quality in the plant's surrounding. The reconstruction of steam generator burners was completed in Unit 2 of Sisak TPP. The reconstruction aimed not only at achieving better unit's performance, but also at air quality improvement. The reconstruction resulted in the reduction in nitrogen oxide emission when firing gaseous fuel and carbon monoxide and solid particles reduction when firing liquid fuel. Similar improvements (replacements and reconstructions) are planned in other thermal power plants. The rehabilitation of wastewater treatment plant was completed in Sisak TPP, and the implementation of similar cleaner production improvements/projects aimed at water (and other) savings is planned in other thermal power plants as well. In Plomin 2 TPP, which burns low sulphur coal, fuel supply has been resolved by an enclosed system to prevent environmental pollution during fuel transport. The systems for the reduction in atmospheric emissions and the wastewater treatment plant have also been constructed with an aim to maintain emissions below legally permitted limit values. In 2001, three emission measuring stations were installed for air quality monitoring at Plomin 1 and 2 TPPs site. These stations will become a part of national air quality monitoring network. The measurements suggest that, after the connection of Plomin 1 TPP to a new, high stack, the air quality in the surrounding area is of the first category under Croatian standards. The most important investments in water quality protection in the past period were the reconstruction of the internal wastewater discharge system in Plomin 1 TPP and its connection to the wastewater treatment plant of Plomin 2 TPP. The integrated wastewater treatment and discharge system has significantly improved the efficiency of water purification and possibility of water quality monitoring. The rehabilitation of slag and ash disposal site was completed in 2002 and today this site represents one of the best arranged waste disposal sites in the Republic of Croatia. It should be underlined that, under the contract signed in the spring of 2000, TPP Plomin d.o.o. delivers all fly ash and synthetic gypsum (REA) produced in the new unit to the cement plant Holcim Croatia d.o.o. (the former TC Koromačno cement plant) where it is being used as secondary raw material. Fly ash, as a product of coal dust combustion and flue gas cleaning in electrostatic precipitators of thermal power plants, represents the legal supplement to the cement in accordance with Croatian and European standards. Synthetic gypsum is also a byproduct of flue gas desulphurization and, similar to fly ash, falls into the category of non-hazardous industrial waste. The utilization of such residuals as raw material in the cement plant contributes to the preservation of natural resources. In 2001 and 2002, a total of 81,276 ton of fly ash and 30,800 ton of synthetic gypsum and 11,312 ton of slag were utilized in this way.

Twenty-six hydroelectric power plants operate within HEP system. Total installed hydro capacity is 2,063 MW, accounting for 54 percent of generating capacities in Croatia. In their majority, hydro power plants represent multipurpose installations that satisfy the interests of water users in an integral way.

Apart from electricity generation, hydro power installations play an important role in water supply, water quality control, irrigation and drainage of agricultural land, flood control and protection against erosion processes, and create conditions for the development of tourism and recreation.

Especially valuable recreational and attractive resort areas are the reservoirs of hydro power plants (e.g. the Bajer lake, Peruća, Prančevići, etc.) which are important in view of ornithological properties of particular catchment areas (e.g. the Krka and the Cetina rivers). It should be emphasized that a part of regular business activities of hydro power plants relates to the conservation of biodiversity of the catchment area, whereby the maintenance of biological minimum in natural riverbeds is of special significance (e.g. maintaining a minimum flow of 8 m<sup>3</sup>/s throughout the year in the Drava River).

Environmental impact of hydro power plants is continuously researched, from the preliminary stage of construction to annual researches during plant's operation. Within technical observations, systematic research into the impact of hydro power plants on individual environmental parameters is carried out, such as water quality, drainage of excessively humid soil in the hinterland, ichtyopopulation, etc. In line with legal regulations, hydro power plants collect floating debris from upstream flows and directly improve general state of the watercourse. The planning and preliminary activities relative to the construction of new hydro power plants (Podsused HPP, Drenje HPP, Novo Virje HPP, Lešće HPP) are the most significant phases in the organization of environmental activities in HEP's hydro power sector. Special attention is paid to the harmonisation of HEP's research programmes at new locations with the programmes of other users of water resources.

As regards electricity transmission and distribution activities of HEP, basic environmental impacts are initial impacts which occur during construction of facilities (transmission lines, distribution network, etc.).

Requisite environmental conservation activities are carried out consistent with legal provisions and requirements set in construction and operation permits for the facility, including environmental impact studies.

One of the impacts is the occurrence of electromagnetic fields during the operation of such facilities. The study analysis carried out in 2001 included the measurements performed at 25 different sites housing HEP's facilities. The analysis suggested that under usual operating conditions, electromagnetic fields in selected typical facilities (substations, transmission lines, overhead lines, underground cables) did not exceed limit values set in the EU Council Recommendations. Croatian legislation is at its beginning in this field, and the contribution of HEP to this segment is therefore very important.

The corridors of high voltage lines that span over forestland and agricultural areas are maintained exclusively by mechanical felling, without using biocides (pesticides and similar substances). The construction of the 110/10(20) kV Sušak substation in the City of Rijeka can be mentioned as an example of increased use of environmentally friendly cables, as compared to overhead lines that prevailed in the past. The connection of this substation to the network is envisaged by combination of cable and overhead line in order to achieve positive visual effects in an urban environment and enable the use of valuable urban area for other purposes.





As regards distribution activity, low voltage network bushings are adjusted to the architectural design of urban environments, especially in old city centres at the coast. In the continental part of Croatia, the conservation of the white stork is a continual activity that HEP carries out in co-operation with the scientists employed with the Ornithological Institute of HAZU (Croatian Academy of Science and Arts). Special platforms are mounted on transmission poles, and towers onto which bird nests are relocated to prevent plant outages and enable undisturbed nesting of storks.

The basic environmental activity in electricity transmission and distribution business relates first of all to safe and regular waste management, especially the disposal of devices and equipment containing insulation oils with polychlorinated biphenyls (PCB). PCB waste management, which started in 1994, is carried out as planned in line with legal provisions and international guidelines on persistent organic pollutants.

Subsidiary companies of HEP Group engaged in the production and distribution of heat and process steam implement projects aimed at rationalizing the operation of thermal energy sources and enhancing energy efficiency in heat generation and consumption.

The programme for the metering of delivered thermal energy in apartments, i.e. installation of electronic indicators of the heat consumed, resulted in significant energy savings (e.g. in the Vrbič, district of Zagreb, up to 20%). The interconnecting station that links the eastern and the western hot water network was constructed on the territory of the City of Zagreb, aiming to increase energy efficiency and optimize the operation of EL-TO Zagreb and TE-TO Zagreb generating plants. Thus, the reliable supply to customers on the territory of the City of Zagreb is ensured and the possibility of mutual backing between the heating plants in case of major heat supply failures at one of the locations is provided. The interconnecting station is located in a fully enclosed building with built-in efficient noise abatement equipment in the ventilation and process section of the plant, with optimum thermal insulation and cooling system, and with process wastewater discharge via the existing sewage system.

The construction of a thermal storage is under preparation at EL-TO Zagreb and TE-TO Osijek sites, aimed at optimizing generation, enhancing operational flexibility and increasing availability of heat and electricity generation. It should be stressed that the construction of a thermal storage is significant also in terms of environmental protection since higher efficiency of the plant results in lower specific emission of greenhouse gases. The thermal storage construction project in TE-TO Osijek is in the phase of obtaining construction permit, while in EL-TO Zagreb the construction is envisaged for 2005.

The company HEP-Plin d.o.o. – operating within HEP Group since 2002 – is the second largest natural gas distributor in Croatia. HEP-Plin d.o.o. carries out the activities formerly performed by "Elektroslavonija" Osijek, an electricity distribution company, and supplies natural gas to 54 percent of all households located in the three counties of eastern Croatia. The company promotes the use of natural gas as environmentally friendly fuel and supplies gas to its customers respecting the highest environmental protection standards.













HEP's environmental protection expenses in the period 2000 to 2002 ranged between HRK 74 and 88 million per year (1 € = 7.60 HRK) accounting for 1.0 to 1.2 percent of total operating expenses.

This is a significant decrease compared to preceding years, and especially 1999 when such expenses amounted to ca HRK 140 million. The main reason lies in lower investments in environmental protection in thermal power plants, first of all because the majority of facilities and systems of Plomin 2 TPP which asked for major investments in environmental protection were completed. Apart from the investment in the continuous emission monitoring systems and equipment in all thermal power plants, which were principal environmental investments during the period covered by this report, the remediation and expansion of slag and ash disposal site at the Plomin TPP location and the rehabilitation of wastewater treatment system in Sisak TPP represent key investments in this period. By reducing investments in environmental protection in their absolute amount and with relation to the investments in tangible assets during the same period (from 4.9 percent in 1999 to 0.6–1.3 percent), the major part of total expenditures for environmental protection represent regular operating costs, which slightly rose and ranged between HRK 52 and 56 million per year. Thus, their ratio to the total operating expenses of HEP was retained at the level between 0.7 and 0.8 percent.

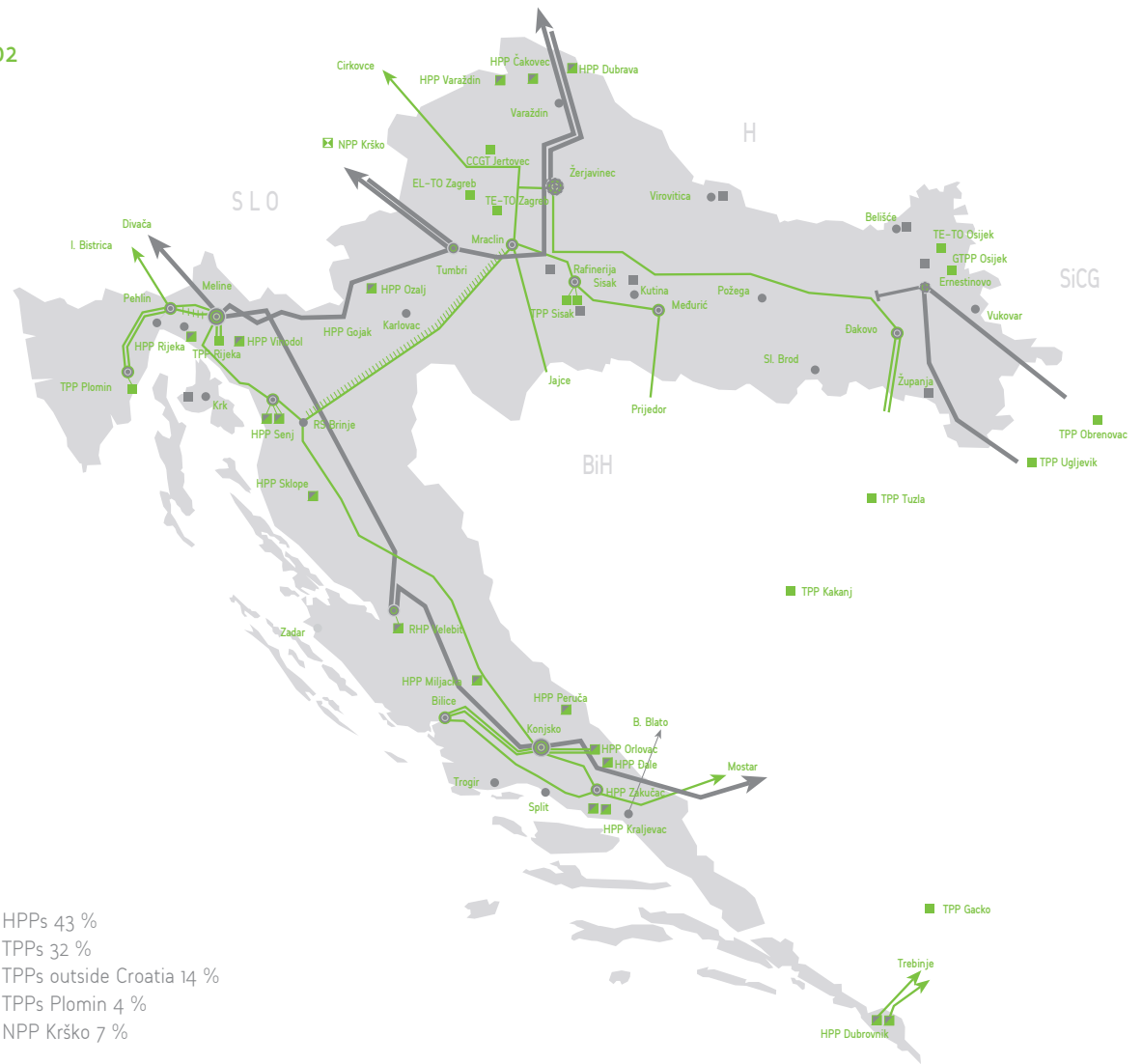
As the leading undertaking in the electricity market, HEP holds an important position among the promoters of environmental conservation and sustainable development in Croatia. Although in the period in question HEP was focused on its restructuring and organizational reshaping, the newly established HEP Group has significantly contributed to environmental protection. The organization of environmental activities has been harmonized at HEP Group level, and numerous projects and activities for the preservation of individual environmental parameters are underway or have already been successfully completed. By winning "green energy" certificates the start of energy trading and introduction of "green tariffs" is enabled – being important steps in HEP's business development and adjustment to capital market requirements. This is also a confirmation of environmental acceptability and important export potential for HEP's products. We are aware of new market challenges, especially those related to the EU market, and of the need to adjust our business standards to new circumstances, having the implementation of sustainable development principle and environmental conservation as an imperative. The activities aimed at improving the quality of the environment bring about economic benefits in a long run. Therefore, our objective is to continue developing the environmental management system in HEP Group with an emphasis on the implementation of environmental information system and associated environmental accounting system. By prospective ratification of the Kyoto Protocol and in view of the obligations derived therefrom, new measures will be applied and implemented in order to reduce greenhouse gases emissions. The integration of environmental protection into HEP's business operations and its continual improvement will enable successful implementation of the above activities. We will maintain our communication with general public on all aspects of our industry, especially during the planning and preparation for construction of new generating facilities and reconstruction and upgrading of the existing ones. Along with our continual commitment to sustainable development, special attention will be paid to the projects of broader social significance. Thereby, we will try to build partnership relations with non-governmental organizations, local communities and other stakeholders.

Attachments

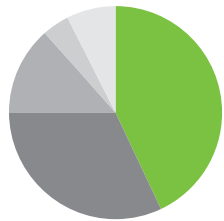
## Croatian electric power system 2002






-  400 kV Double circuit line
-  400 kV Single circuit line
-  220 kV Double circuit line
-  220 kV Single circuit line
-  220 kV "Heavy" line
-  S/S 400/220/110 kV
-  S/S 400/110 kV
-  S/S 220/110 kV
-  Thermal power plant
-  Hydro power plant
-  Industrial thermal power plant
-  NPP Krško

The map shows only generating facilities and 400 kV and 220 kV transmission network. 110 kV network has not been plotted.



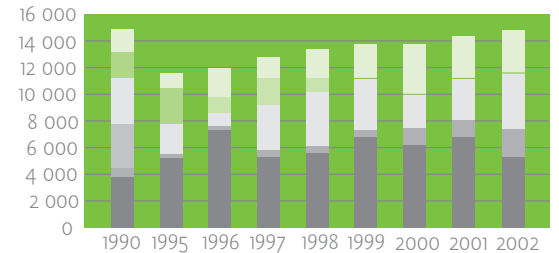
## Generating capacities 2002










-  HPPs 43 %
-  TPPs 32 %
-  TPPs outside Croatia 14 %
-  TPPs Plomin 4 %
-  NPP Krško 7 %

Voltage level	Switchyards		Lines (km)	total	overhead	cable
	No.	MVA				
400/x kV	5	3400	400	1157	1157	
220/110 kV	12	3150	220	1245	1245	
110/x kV	142	6695	110	4836	4714	122
HEP's property	120	5612				
35/10 (20) kV	359	4103	35,20,10	36984	27234	9750
10 (20)/0,4 kV	23362	6587	0,4	84481	65340	19141
High voltage (400, 220, 110 kV)	159	13245		7238	7116	122
Medium & low voltage	23721	10690		121465	92574	28891
HEP's property						
High voltage (400, 220, 110 kV)	137	12162		7238	7116	122
Medium & low voltage	23721	10690		121465	92574	28891

## Power generation per fuel (GWh)



-  import
-  diesel
-  nuclear (NPP Krško)
-  fuel oil/natural gas
-  lignite (TPPs outside Croatia)
-  hard coal (TPPs Plomin)
-  hydro power plants

## Generating capacities owned by HEP

Hydro power plants	available power (MW)			type of power plant
	generator	total	technical minimum	
HPP Zakučac	2x108+2x135	486	50+80	A
RHP Velebit	2x138/(-120)	276/(-240)	80	A
HPP Orlovac	3x79	237	50	A
HPP Senj	3x72	216	3x33	A
HPP Dubrovnik	2x108	216	50	A
HPP Varaždin	2x43+0.46	86	2x18	P
HPP Vinodol	3x28	84	0	A
HPP Čakovec	2x40.3+1.1+0.38	80.6	2x15	P
HPP Dubrava	2x40.3+1.1+0.38	80.6	2x15	P
HPP Kraljevac	12.8+2x20.8+4.8	46.4	1	A
HPP Gojak	3x16	48	3x2	P
HPP Peruča	2x20.8	41.6	5	A
HPP Đale	2x20.4	40.8	6	A
HPP Rijeka	2x18	36	2x9	P
HPP Miljacka	4.8+3x6.4	24	1	P
HPP Sklope A	1x22.5	22.5	0	A
PS Buško Blato	3x3.8/(-10.3)	11.3/(-10.3)	0.81	A
HPP Golubić	2x3.27	6.5	1	P
HPP Jaruga	2x2.8	5.6		P
HPP Ozalj	2x1+1x0.8+2x1.1	5		P
PSP Fužine	4/(-4.2)	4/(-4.2)		A
small HPPs (6)	6/(-1.5)	6/(-1.5)		P
bio minimum HPPs (3)	3.4	3.4		P
<b>Total HPPs</b>		<b>2063.3/(-256)</b>		

HPP–hydro power plants  
A–reservoir  
P–run–of–river

PSP–pumped storage  
RHP–reversible pump turbine  
PS–pumping station

## Data on employees

	Number of employees	
	2001	2002
HEP d.d.	442	457
HEP–Proizvodnja d.o.o. (Generation) (until July 1, 2002 Generation Division)	2 519	2494
HEP–Prijenos d.o.o. (Transmission) (until July 1, 2002 Transmission Division)	1 152	1 144
HEP–Distribucija d.o.o. (Distribution) (until July 1, 2002 Distribution Division)	10 563	10 339
HEP–Toplinarstvo d.o.o. (District Heating) (until July 1, 2002 part of Generation Division)	395	392
HEP–Plin d.o.o. (Gas) (until July 1, 2002 part of Distribution Division)	–	127
<b>HEP Group Total</b>	<b>15 071</b>	<b>14 953</b>

Thermal power plants	available power (MW)		
	generator	net output	fuel
TPP Sisak	2x210	396	LU/PP
NPP Krško (50%) *	354	338	UO <sub>2</sub>
TE–TO Zagreb**	25+120+210	337	LU/PP
TPP Rijeka	320	303	LU
TPP Plomin 2***	210	192	U
TPP Plomin 1	105	98	U
EL–TO Zagreb	12.5+32+2x26	90	LU/PP
CCGT Jertovec	2x42.5	83	PP/ELU
GTPP Osijek	2x25	48	PP/ELU
TE–TO Osijek	45	42	LU/PP
Emergency diesel (4)	29	29	D2
<b>Total TPPs+NPP</b>	<b>2083</b>	<b>1956</b>	
<b>Total HPPs+TPPs+NPP</b>		<b>4019.3</b>	

\* Unavailable from 1998, available again from April 2003.

\*\* New CCGT unit 210 MW in trial run.

\*\*\* TPP Plomin 2 (owned by HEP and RWE Power 50%:50%)

NPP–nuclear power plant

CCGT–combined–cycle gas turbine

TPP–thermal power plants

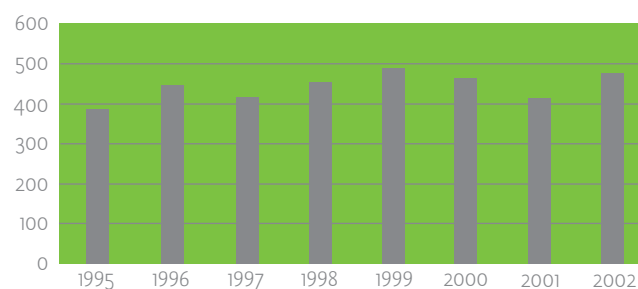
LU–fuel oil, ELU–extra light fuel oils

PP–natural gas, U–coal

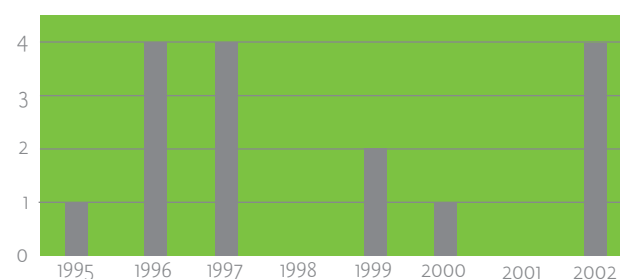
UO<sub>2</sub>–uranium oxide, D2–special fuel oils for operation of emergency TPPs

Note: The table doesn't contain HEP's thermal power plants outside Croatia and not available (total output of 650 MW); TPP Obrenovac (300 MW) in Serbia and Montenegro and TPP Tuzla (220 MW), TPP Kakanj (50 MW) and TPP Gacko (100 MW) in Bosnia and Herzegovina. TPPs in Bosnia and Herzegovina available again from May 2003.

## Safety at work statistics – Injuries



## Safety at work statistics – Fatalities



## Characteristics of operation and atmospheric emissions from HEP's thermal power plants in Croatia in 2000

Thermal power plants	Generation		Fuel				Emissions				
	Power GWh	Heat TJ	Coal 10 <sup>3</sup> t	Sulphur %	Fuel oil 10 <sup>3</sup> t	Sulphur %	Natural gas 10 <sup>6</sup> m <sup>3</sup>	SO <sub>2</sub> (t)	NO <sub>x</sub> (t)	Particulates (t)	CO <sub>2</sub> (kt)
TPP Plomin 1	624		267,0	0,7				3283	1832	93	632
TPP Plomin 2	777		302,3	0,7				372	993	17	715
TPP Rijeka	604				145,1	2,0		5341	851	200	450
TPP Sisak	1024				138,5	2,1	148,9	4852	1669	390	708
TE-TO Zagreb	295	3612			74,1	2,0	102,2	2712	947	86	421
EL-TO Zagreb	325	2396			21,8	2,1	163,9	833	1151	63	372
TE-TO Osijek	155	973			12,5	1,9	66,0	434	228	35	162
GTTP Osijek	61	43			0,9	0,1	25,6	2	234	0,1	50
CCGT Jertovec	20						6,2	0	69	0	12
<b>Total</b>	<b>3886</b>	<b>7025</b>	<b>569,4</b>		<b>393,0</b>		<b>513</b>	<b>17827</b>	<b>7975</b>	<b>885</b>	<b>3522</b>

## Characteristics of operation and atmospheric emissions from HEP's thermal power plants in Croatia in 2001

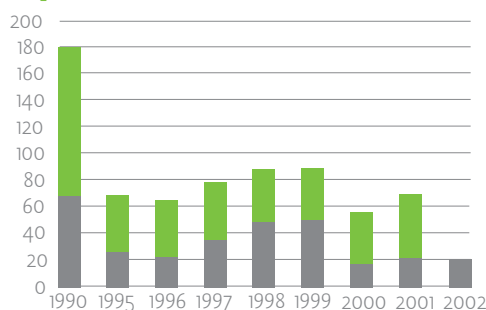
Thermal power plants	Generation		Fuel				Emissions				
	Power GWh	Heat TJ	Coal 10 <sup>3</sup> t	Sulphur %	Fuel oil 10 <sup>3</sup> t	Sulphur %	Natural gas 10 <sup>6</sup> m <sup>3</sup>	SO <sub>2</sub> (t)	NO <sub>x</sub> (t)	Particulates (t)	CO <sub>2</sub> (kt)
TPP Plomin 1	579		276,9	0,6				3106	1368	251	660
TPP Plomin 2	899		350,4	0,6				319	1348	45	829
TPP Rijeka	774				184,7	1,5		5395	997	216	578
TPP Sisak	1264				212,9	2,2	160,4	8282	2164	656	961
TE-TO Zagreb	543	3892			67,8	2,1	179,4	2745	1226	78	543
EL-TO Zagreb	420	3662			35,1	2,4	156,9	1384	1414	105	400
TE-TO Osijek	98	895			12,0	2,0	44,3	436	190	32	120
GTTP Osijek	123	223			0,5		52,5	1	460	0	99
CCGT Jertovec	15						4,6	0	56	0	9
<b>Total</b>	<b>4715</b>	<b>8672</b>	<b>627,3</b>		<b>512,9</b>		<b>598,1</b>	<b>21669</b>	<b>9222</b>	<b>1382</b>	<b>4199</b>

## Characteristics of operation and atmospheric emissions from HEP's thermal power plants in Croatia in 2002

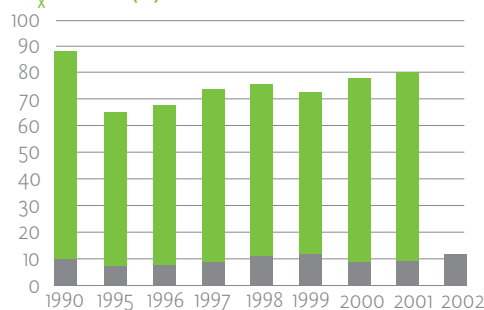
Thermal power plants	Generation		Fuel				Emissions				
	Power GWh	Heat TJ	Coal 10 <sup>3</sup> t	Sulphur %	Fuel oil 10 <sup>3</sup> t	Sulphur %	Natural gas 10 <sup>6</sup> m <sup>3</sup>	SO <sub>2</sub> (t)	NO <sub>x</sub> (t)	Particulates (t)	CO <sub>2</sub> (kt)
TPP Plomin 1	626		289,3	0,8				3232	1423	261	686
TPP Plomin 2	1284		511,0	0,8				469	1979	65	1217
TPP Rijeka	1166				254,8	1,5		8073	1492	324	864
TPP Sisak	1426				75,1	1,9	276,8	3672	2236	304	750
TE-TO Zagreb	645	3642			41,1	2,0	194,1	2323	1216	64	487
EL-TO Zagreb	413	3930			26,6	2,3	164,6	1145	1305	78	388
TE-TO Osijek	98	890			10,6	2,0	45,1	301	180	28	117
GTTP Osijek	118	206			0,0	0,0	52,0	0	447	0	97
CCGT Jertovec	126						42,0	0	538	0	78
<b>Total</b>	<b>5902</b>	<b>8668</b>	<b>800,4</b>		<b>408,1</b>		<b>774,7</b>	<b>19213</b>	<b>10816</b>	<b>1125</b>	<b>4684</b>

## HEP's share in total SO<sub>2</sub>, NO<sub>x</sub> and CO<sub>2</sub> emissions in Croatia

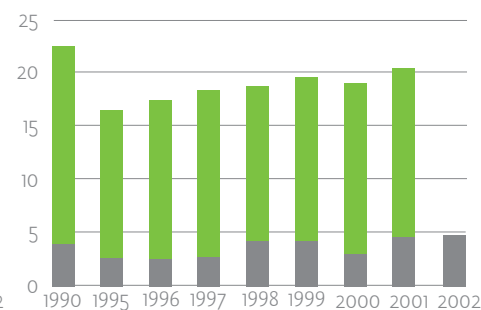
SO<sub>2</sub> emission (kt)



NO<sub>x</sub> emission (kt)

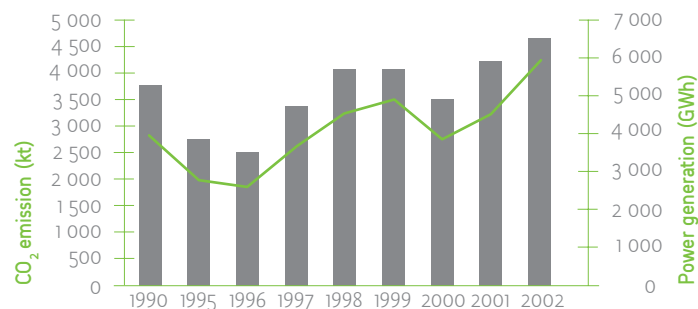
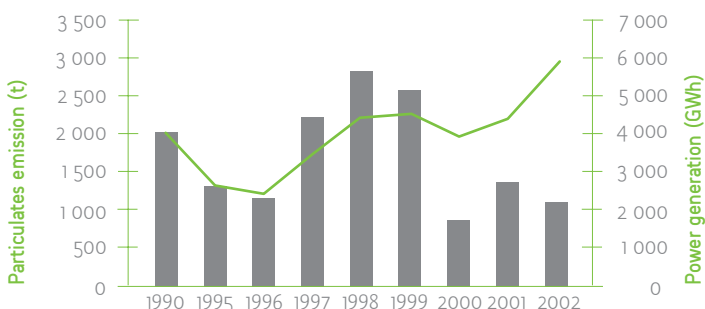
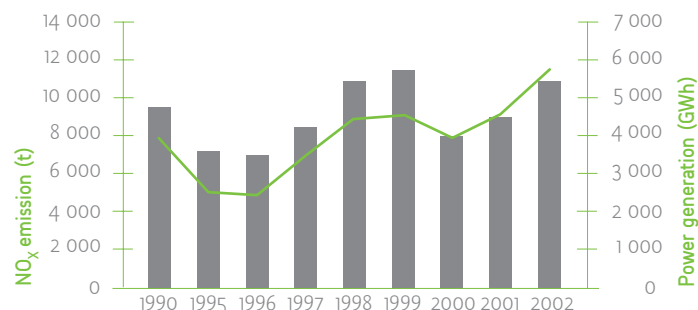
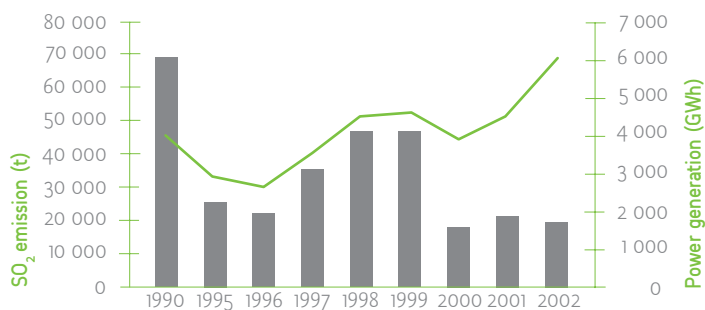


CO<sub>2</sub> emission (Mt)



Note: Emission data 2002 for Croatia in progress.

## Atmospheric emissions and power generation of HEP's TPPs



### 2001

Due to increased electricity generation in thermal power plants, pollutant emissions into the air increased in 2001 compared to 2000. However, these emissions were lower compared to 1999, when electricity generation in thermal power plants approximated the generation in 2001. Average emissions of main pollutants into the air per one kilowatt-hour of electricity delivered to customers were very low compared to the emissions of electricity companies in developed countries, and especially countries in transition. The Republic of Croatia belongs to European countries with the lowest total and average greenhouse gas emissions (CO<sub>2</sub>) and emission of acidic gases (SO<sub>2</sub> and NO<sub>x</sub>), mainly because of small contribution of the electricity sector.

Average SO<sub>2</sub> emissions over the past four years have been almost halved with relation to the values achieved at the end of the eighties and early nineties, while the emission of particulates, NO<sub>x</sub> and CO<sub>2</sub> were kept at approximately the same level. Such trend of SO<sub>2</sub> emission results from the implementation of business decision on the use of low-sulphur fuel in thermal power plants (imported coal with less than one percent of weighted share of sulphur in both units of Plomin TPP, and low sulfur fuel oil in thermal power plants using such fuel) and due to increased use of natural gas as environmentally most acceptable fossil fuel.

### 2002

Electricity generation in HEP's thermal power plants increased by 25 percent in 2002. Average emissions of main air pollutants per kilowatt-hour of electricity delivered to customers were as follows: 1.30 g SO<sub>2</sub>, 0.73 g NO<sub>x</sub>, 0.08 g particulates and 316 g CO<sub>2</sub>. The emission of SO<sub>2</sub> in 2002 fell by 11 percent compared to 2001, and by 72 percent compared to the 1990 emission. NO<sub>x</sub> emission in 2002 increased by 17 percent compared to 2001 emission (in 1990 NO<sub>x</sub> emission was the same as in 2001). The reason for such an increase lays in the fact that electricity generation increased as well. Particulate matter emission fell by approximately 19 percent as compared to the 2001 emission thanks to lower consumption of fuel oil. Particulates emission during the combustion of natural fuel is insignificant, and electrostatic precipitators in TPP Plomin successfully reduce the particulate emission. CO<sub>2</sub> emission is a good indicator of the quantity and type of fuel consumed. In 2002, this emission was by 12 percent higher than the one recorded in 2001, which is significantly lower than the increase in electricity generation from thermal power plants (25 percent) due to larger share of natural gas in place of fuel oil.

### Emissions of SO<sub>2</sub>, NO<sub>x</sub>, CO<sub>2</sub> and particulates from HEP's TPPs reduced to a kWh

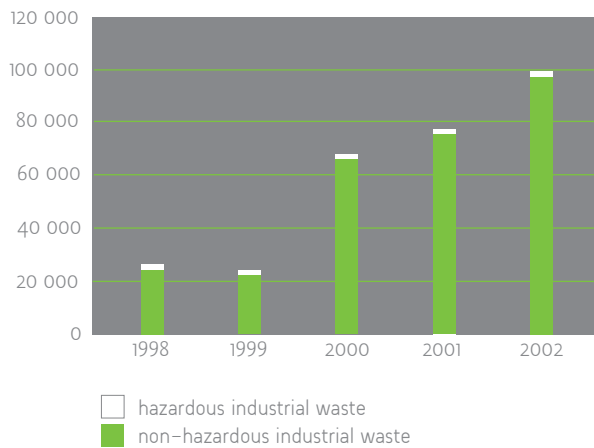
	g/kWh of total electricity available <sup>1</sup>					g/kWh of total electricity generated in TPPs <sup>2</sup>				
	1998	1999	2000	2001	2002	1998	1999	2000	2001	2002
SO <sub>2</sub> emission	3.53	3.44	1.29	1.50	1.30	9.25	9.05	3.96	4.24	2.97
NO <sub>x</sub> emission	0.80	0.84	0.58	0.64	0.73	2.00	2.10	1.68	1.65	1.59
Particulates emission	0.22	0.19	0.06	0.10	0.08	0.58	0.52	0.20	0.28	0.18
CO <sub>2</sub> emission	304	298	255	290	316	751	743	764	785	709

1 – emission of HEP's TPPs reduced to a kWh of total electricity supplied to consumers in Croatia from all sources

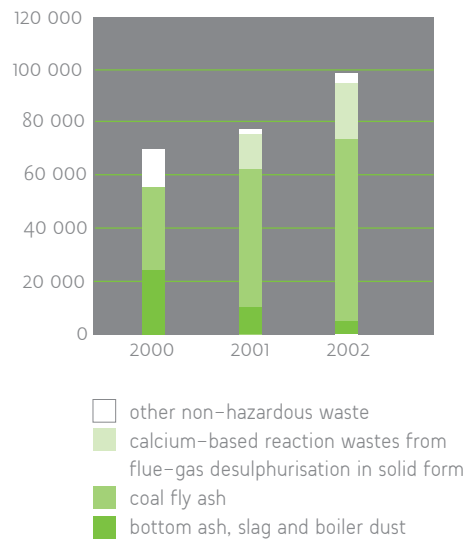
2 – emission of HEP's TPPs (excluding emission due to CHP production) reduced to a kWh of electricity produced in HEP's TPPs

## Production of industrial waste

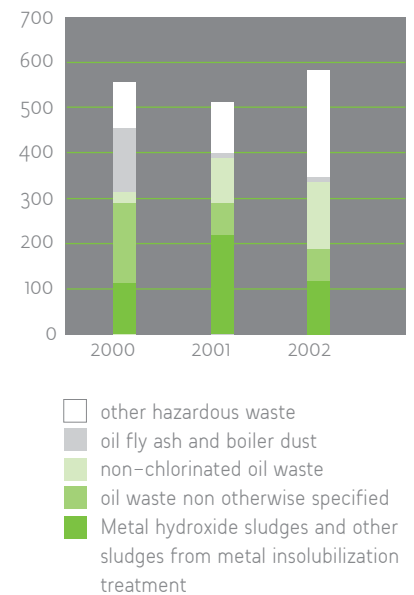
### Total industrial waste (t)



### Non-hazardous industrial waste (t)



### Hazardous industrial waste (t)



The majority of industrial waste generated in energy plants are transformer and insulating oils, old equipment (transformers and condensers) containing PCB/PCT, slag and ash (of Plomin TPP) and waste from boiler furnace cleaning. Below is the presentation of the most frequent waste types with key numbers, consistent with the subject legislation:

### Non-hazardous industrial waste

100101 – Bottom ash, slag and boiler dust

100102 – Coal fly ash

100105 – Calcium-based reaction wastes from flue-gas desulphurisation in solid form

### Hazardous industrial waste

\*190201 – Metal hydroxide sludges and other sludges from metal insolubilization treatment

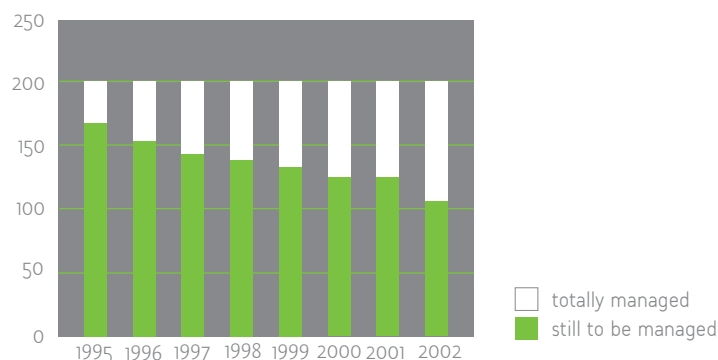
\*130601 – Oil wastes not otherwise specified

\*130303+\*130202 – Non-chlorinated oil waste

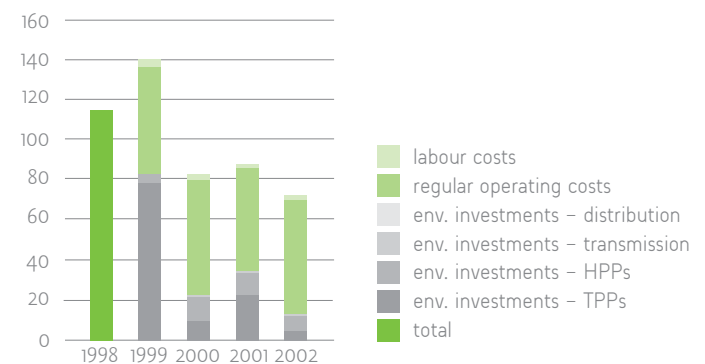
\*100104 – Oil fly ash and boiler dust

Safe and environmentally friendly management of oil waste of class I and II in HEP's thermal power plants was continued in 2001 and 2002. Thermal power plants in Rijeka, Sisak, Osijek and TE-TO Zagreb collect (through authorized agencies) motor oil waste of class I and II, and burn them in addition to their usual liquid fuel. For this activity HEP's thermal power plants have obtained approval in accordance with the By-law on Waste Types (Official Gazette No. 27/96).

### Management of PCB-containing equipment (t)



### Environmental protection costs (mil. HRK)



Published by: Hrvatska Elektroprivreda d.d., Development Department  
Prepared by: EkonerG d.o.o. Zagreb  
Authors: Senka Ritz, Zoran Kisić, mr.sci. Zoran Stanić  
Design: Bruketa & Žinić o.m.  
Photographs: Domagoj Kunić, Maja Bagić, Getty Images, Vjesnik HEP-a  
Pre press: Kaligraf, Zagreb  
Print: IBL d.o.o., Osijek  
Run: 800 copies  
November 2003

Contact person: mr.sci. Zoran Stanić,  
Hrvatska Elektroprivreda, Development Department  
Ulica grada Vukovara 37, 10 000 Zagreb, Croatia  
e-mail: zoran.stanic@hep.hr

Publication "HEP and Environment 2001 – 2002" available at  
[www.hep.hr/okolis/izvjesce](http://www.hep.hr/okolis/izvjesce)

Printed on chlorine-free paper.



Hrvatska Elektroprivreda d.d.  
Ulica grada Vukovara 37  
10 000 Zagreb  
Croatia