HEP AND ENVIRONMENT 2011th

HRVATSKA ELEKTROPRIVREDA d.d.

PUBLISHED BY: Hrvatska Elektroprivreda d.d., Sustainable Development and Quality Management Department

PREPARED BY: Intergrafika TTŽ d.o.o.

PRINT: Intergrafika TTŽ d.o.o.

RUN: 300 copies, September 2012

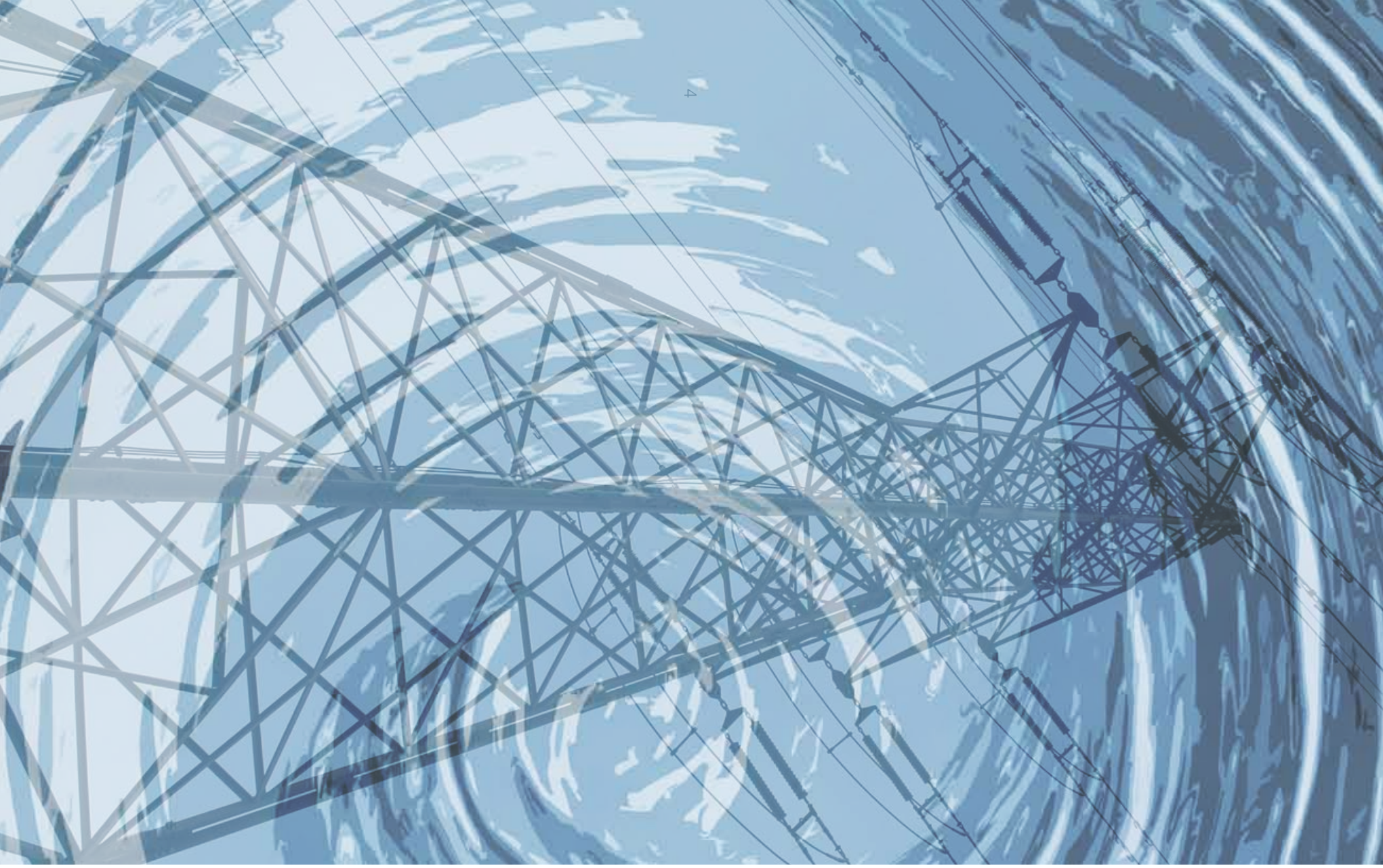
CONTACT PERSON: Tamara Tarnik, M. Sc., Hrvatska Elektroprivreda, Sustainable Development and Quality Management Department
Ulica grada Vukovara 37, 10000 Zagreb, Croatia,
e-mail: tamara.tarnikŽhep.hr

Publication “HEP and the Enviroment 2011” available at www.hep.hr/hep/okolis/izvjesce.

Printed on elemental chlorine free paper.

SUSTAINABLE DEVELOPMENT

CONTENT



FOREWORD BY THE PRESIDENT OF THE MANAGEMENT BOARD

Consistent with past practices, the report Hrvatska Elektroprivreda and the Environment provides an overview of the results achieved and the most significant investments made in environmental and nature protection in the year 2011. In this reporting period, implementation continued of the activities aimed at meeting the European Community directives transposed to Croatian legislation, of which the most important for HEP Group are: the Integrated Pollution Prevention and Control (IPPC) Directive, the Large Combustion Plants Directive (LCP Directive), Directive on the establishment of emissions trading scheme (EU-ETS Directive) and the Habitats Directive and the Birds Directive, based on which the European ecological network Natura 2000 is being proposed and promulgated.

IPPC and LCP Directives and the Industrial Emissions Directive (IED Directive), succeeding the previous two directives, have set a significantly stricter limit values of pollutant emissions into the environment that cannot be fulfilled without large financial investment aimed at applying best available techniques in the existing thermal power plants rated > 50 MWt. Instead of investing in the existing power plants that at the end of their life, a prudent decision is to build new plants in accordance with the best available techniques that will be able to meet environmental protection requirements and ensure electricity and heat supply to customers.

The Republic of Croatia and, consequently, HEP will join the European Emission Trading Scheme for greenhouse gas emissions (EU-ETS) on January 1, 2013, which is six months prior to Croatia's accession to the European Union. HEP's joining the EU-ETS coincides with the start of the third trading period that will last until 2020. Starting from 2013, HEP will have the obligation to buy on the market greenhouse gas emission allowances in an amount equal to its carbon dioxide (CO_2) emissions during fuel combustion for electricity generation. The price of emission allowances on the market, further development of the EU-ETS and the EU policy to combat climate change after the year 2020, will represent significant factors when planning the construction of new generation facilities and the dispatching of the existing ones.

After Croatia's accession to the European Union, most of the national ecological network (CRO-NEN) will become a part of the European network of protected areas, Natura 2000, for which the conservation guidelines will be set by the EC. Due to the size of protected areas in Croatia, most existing HEP's power facilities and all sites of planned generation facilities included in physical plans were entered into the national ecological network (CRO-NEN) and the proposed Natura 2000. In the subsequent period, it is necessary to initiate a strategic assessment of the impact which will have the proclamation of the CRO-NEN and NATURA 2000 on the operation and development of the power system of the Republic of Croatia, and make decisions that will reconcile nature protection requirements and the requirements for a secure supply of electricity and heat, which is the mission of the HEP Group.

HEP Group will continue with its efforts to promote and transpose fundamental values of the EC in the energy sector in accordance with sustainable development principles.

Zlatko Koračević

POLICY AND ORGANIZATION OF NATURE AND ENVIRONMENTAL PROTECTION FUNCTION

HEP continuously monitors and analyzes the impact of its business processes on the environment. The most important indicators of such impacts are emissions of pollutants into the air and quantity of production waste. The company reports on all environmental components timely and objectively to relevant institutions, units of local self-government and the interested public. Employees working in nature and environmental protection function attend seminars and workshops to get informed about duties and activities arising from environmental and nature protection legislation. Technical support to these employees is provided by the Sustainable Development and Quality Improvement Department of HEP d.d. and by the members of HEP's Team for Environmental Protection Coordination and Standardization. The basic task of the Team is to analyze and valuate the environmental activities in HEP Group with an emphasis on the planning, coordination, internal communication and preparation of proposals for improvements in the area of environmental protection.

HARMONIZATION WITH THE EU LEGISLATION

OBTAINING ENVIRONMENTAL PERMITS

In the process of aligning Croatia's environmental legislation with that of the EU, the provisions of Integrated Pollution Prevention and Control (IPPC) Directive 2008/1/EC were transposed into the national Environmental Protection Act and into regulation on the procedure for the determination of integrated environmental requirements. The integrated environmental requirements ("environmental permits") are a condition for continued operation of all existing thermal power plants of HEP of rated thermal capacity above 50 MW and for obtaining a siting permit for new construction or reconstruction of existing plants. Coordinated by HEP's Team for the obtaining of integrated environmental requirements, preparatory activities have been conducted to align all HEP-owned thermal power plants with Best Available Techniques whose application will result in reduced detrimental impact on the environment. During 2011, the analyses of the existing situation and draft compliance studies were prepared for all thermal power plants of rated thermal capacity above 50 MW. The proposed harmonization measures seek to maximize the duration of investment cycles for existing plants and to give priority to construction of new, replacement generating units of higher efficiency and environmental acceptability.

RECONSTRUCTION OF PLOMIN 1 THERMAL POWER PLANT

During 2011, the project to reconstruct Plomin TPP and/or replace the existing Plomin 1 TPP, the aim of which is modernization and capacity increase, was being assessed for impact. The purpose of the project is to build a long-term secure and stable electricity source. The planned replacement unit will have 500 MW of gross capacity instead of the existing gross capacity of 125 MW. After the reconstruction there will be 710 MW of installed capacity on the site instead of today's 335 MW. The replacement unit is planned to go into operation upon Plomin 1 going out of service. The decision on the project environmental acceptability was not made by the end of 2011. The project to build a new 500 MW Unit C at Plomin is in terms of energy and finance HEP's most valuable project and currently one of the largest projects in Croatia.

GREENHOUSE GAS EMISSIONS

By ratifying the Kyoto protocol, Croatia has undertaken to reduce greenhouse gas emissions and by signing the EU accession treaty Croatia has obligates itself to join the emission trading scheme (EU-ETS). HEP owns large combustion plants – thermal power plants –which emit large quantities of greenhouse gases into the atmosphere. From January 1, 2013, these plants will be part of the emission trading scheme for CO_2, meaning that HEP will have to buy all CO_2 emission rights at auctions and include these additional costs in the delivered product – electricity and heat. To prepare HEP for the conditions of greenhouse emission trading, Team for the implementation of Kyoto Protocol provisions has begun to prepare HEP for the new conditions; in 2011 a number of workshops were held to analyze HEP's obligations deriving under emission trading legislation, market and participant structure and market trends, and to identify market risks and examine the impact of emission trading on HEP's business operations.

Also, a market simulator, PLEXOS, was used to model the impact of the amount of CO_2 emitted in electricity generation and to estimate the impact of change of CO_2 unit price on the national electricity system (planning of annual financial resources for the purchase of emission quotas, impact of CO_2 price change on electricity price, planning of fuel type and quantity, planning of operation of individual generating units).

During 2011, a program to reduce CO_2 emissions was developed, for all HEP's stationary sources emitting more than 30 tons of CO_2 a year, which is submitted to relevant national authorities for their information about all HEP's actions to reduce greenhouse gases.

ECOLOGICAL NETWORK

Upon the coming into force of the Regulation Declaring the Ecological Network, some existing and some of planned HEP's plants, mostly listed in the Strategy and Program for Physical Planning of the Republic of Croatia and in relevant county physical plans, became a part of the ecologically significant areas and ecological corridors. After Croatia's entry into the EU, the National Ecological Network will become an integral part of the ecologically significant area of EU – NATURA 2000. Under the provisions of the Environmental Protection Act and the Regulation, protected areas and ecological network areas are subject to guidelines for protection measures applicable to all physical and legal persons using natural resources or performing actions or executing projects under the Act in these areas.

The establishment of the national ecological network within Natura 2000 will cause significant additional requirements for the economy, especially in the energy sector. The requirements will include those related to the construction of the rest of the planned hydro power plants as such projects use large spaces. The ecological network declaration process was carried out without appropriate participation by stakeholders and without a full-scale analysis of the impact on other strategic and developmental interests of Croatia. Also, the legislation does not state clearly whether the areas of National Ecological Network and/or the future network Natura 2000 prevail over physical planning documents or vice versa.

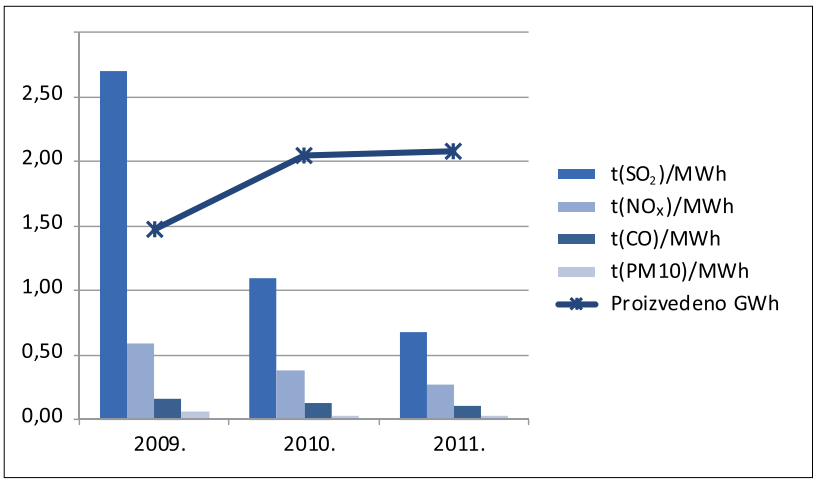
The protection measures laid down in the Act and in the Regulation pose uncertainty on construction of planned or continued operation of existing HEP's generating plants, and thereby on energy production and security of customer supply. The measures also make it harder to meet the obligations to reduce air pollutants, greenhouse gases included, arising from national and EU legislation, and to carry out some of regular plant maintenance work, nature protection and safety at work, and they increase energy production costs.

OPERATING PERMIT FOR UNIT L AT TE-TO ZAGREB

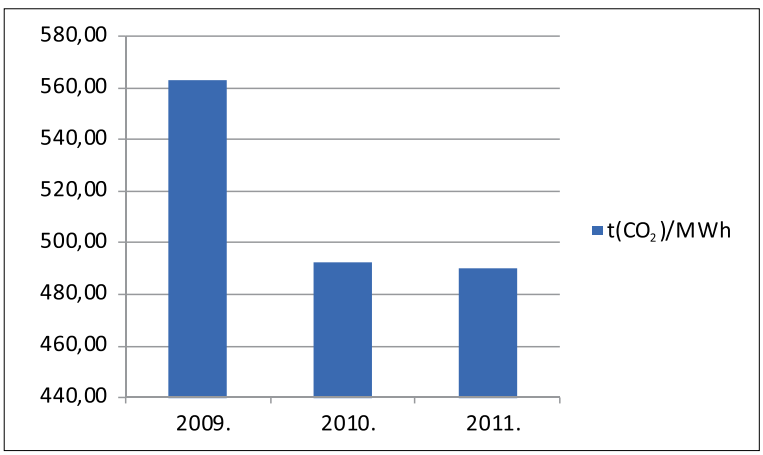
Unit L is a combined-cycles cogenerating unit, built as the replacement for the worn-out cogenerating unit A at TE-TO Zagreb, the purpose being to ensure a stable source of electricity and heat with lower environmental impact. Unit L was put into trial operation in 2009 and the operating permit was obtained in May 2011.

With Unit L and the associated hot water heaters in service, operation of Unit C hot water boilers decreased. Greater quantities of gas that have been ensured will extend the operation of Units K and L for heat supply and prolong the start of operation of Unit C (end of November). Also reduced or eliminated will be the need for firing hot water boilers in early morning hours due to the compensation of so-called hot water rush hour. Switching to natural gas reduces the use of oil and increases the efficiency of fuel conversion.

The result of Unit L construction is a more efficient plant together with reduced consumption of liquid fuel and reduced pollutant emissions.



Specific emissions SO_2, NO_X, CO i PM10 (t/MWh)



Specific emissions CO_2 (t CO_2/MWh)

CONSTRUCTION OF UNIT C AT SISAK TPP

In the location of Sisak TPP, construction of a new unit, C, of a combined-cycle cogenerating plant of 230 MWel/50 MWt, is in progress, planned to go into trial operation in 2013. With the new unit C, in addition to a high level of fuel utilization (combined-cycle) and higher efficiency (cogeneration) and because of reduced dispatch of existing units and use of only natural gas as fuel, air pollutant emissions will be reduced too.

KEEPING UP WITH LEGAL REQUIREMENTS

To educate and inform the employees, the Sustainable Development and Quality Improvement Department continuously follows and systematically, in the form of printed bulletins, prepares overviews of legal requirements in the area of environmental and nature protection of importance for operations and business of all HEP Group companies. Given the large number of new or amended laws and regulations in the last 12 months, the Department has prepared the newest overview and analysis.

Within HEP Group, Register of Waste Generation and Processes and Register of Chemicals Consumption have been implemented in order to fulfill the legal obligations in the area of waste and chemicals management. During 2011, some ten workshops were held to inform HEP employees about legal obligations in the area of waste management and about how to maintain the registers at HEP Group level.

BASIC INDICATORS

During 2010, HEP continued to monitor pollutant emissions into the air – sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon dioxide and particulates as required by air quality legislation, as well as the quantities of hazardous and non-hazardous waste generated within HEP and concentration of hazardous substances in waste water.

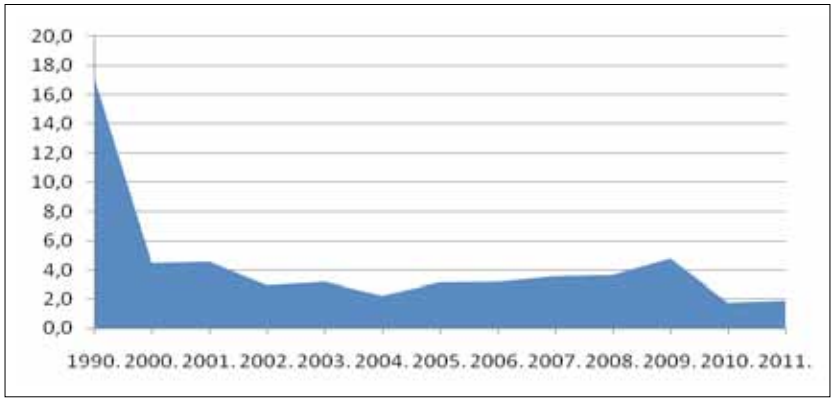
AIR EMISSIONS

Pollutant emissions into the air come predominantly from HEP's large combustion plants – thermal power plants Plomin 1, Plomin 2, TE-TO Zagreb, EL-TO Zagreb, TE-TO Osijek, Sisak, Jertovec and Rijeka.

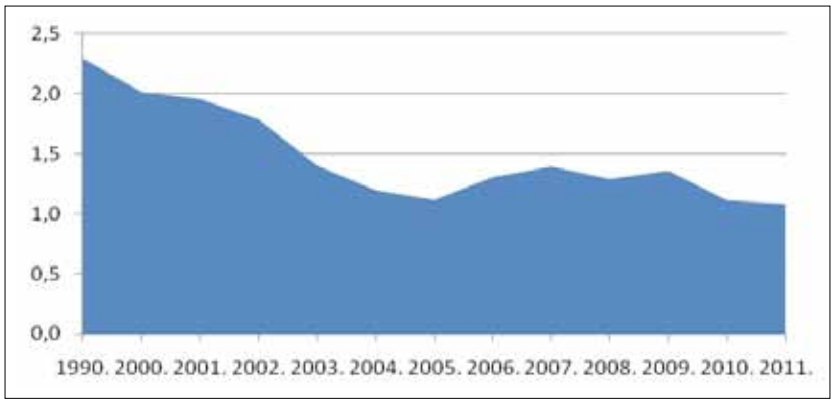
In 2011, total electricity production from HEP's thermal power plants increased in comparison with 2010 by about 7.6 percent. The higher engagement of thermal power plants was the result of requirements for stability and/or safety of the electricity system and unfavorable hydrologic conditions. Due to the increased operation of thermal power plants, fuel consumption increased accordingly – oil by about 25,000 t and coal by about 50,000 t. The specific emission of all pollutants and/or emission of pollutants per kWh was mildly reduced as a result of system optimization and engagement of more efficient generating units.

Year	SO_2 (t)	NO_x (t)	CO_2 (kt)	particulates (t)	Electricity produced (GWh)
1990.	*69.402*	*9.248*	*3.750*	*2.031*	*4.030*
2000.	17.827	7.975	3.654	885	3.958
2001.	21.669	9.222	4.347	1.382	4.713
2002.	17.248	10.544	5.259	1.135	5.899
2003.	21.350	9.391	5.679	1.507	6.703
2004.	13.081	7.051	4.503	767	5.899
2005.	16.890	6.003	4.694	664	5.387
2006.	17.258	7.092	4.544	954	5.436
2007.	24.376	9.532	5.460	756	6.845
2008.	22.165	7.834	4.862	566	6.075
2009.	24.956	7.031	4.043	651	5.178
2010.	8.277	5.318	3.899	313	4.787
2011.	9.621	5.574	4.035	220	5.149
Electricity produced (GWh)	**+16**	**+5**	**+4**	**-32**	**+7,6**

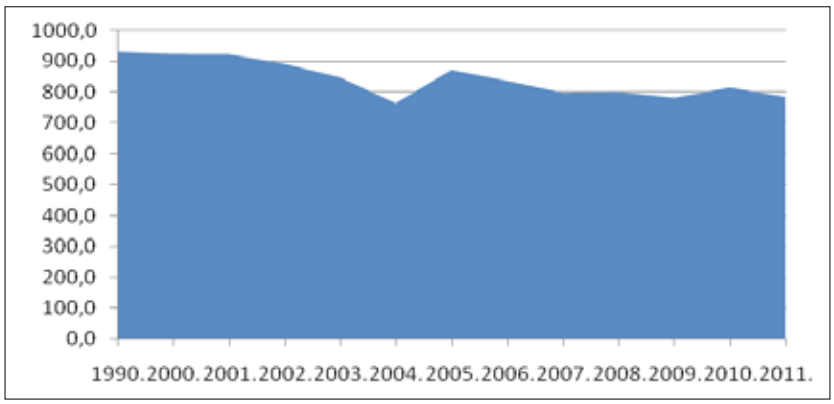
TREND OF SPECIFIC EMISSION OF AIR POLLUTANTS FROM THERMAL POWER PLANTS (1990) 2002-2011



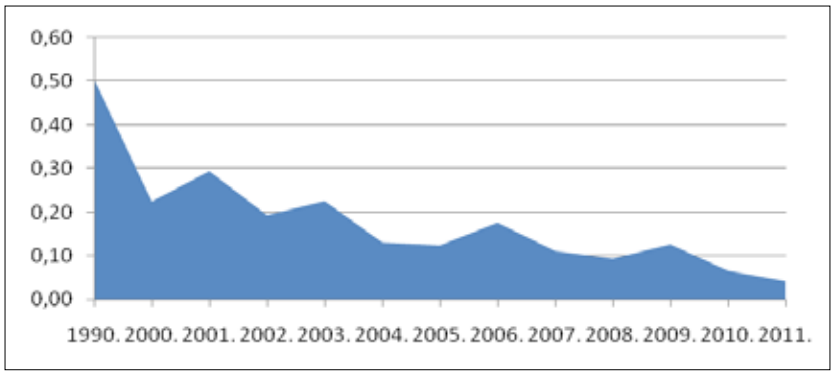
Specific emissions SO_2 (tSO_2/GWh)



Specific emissions NO_x (tNO_x/GWh)



Specific emissions particulates (t particulates/GWh)



Specific emissions CO_2 (tCO_2/GWh)

WASTE

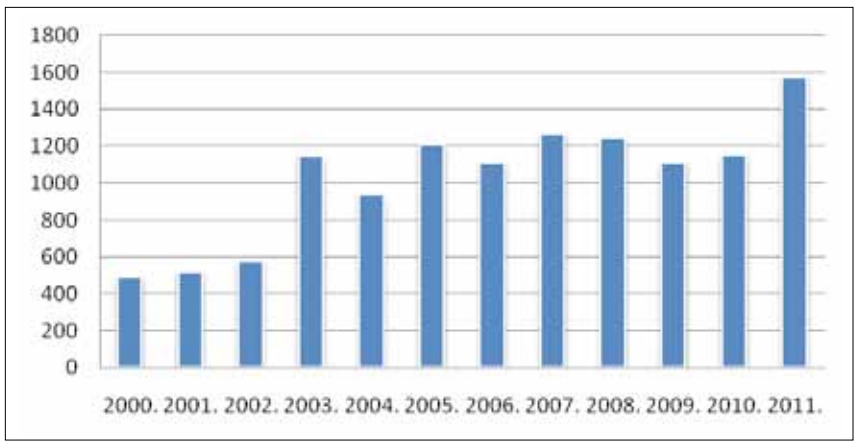
The years-long trend of improving waste management system continued by investing in existing and new temporary waste storages and in employee education to which special attention is paid.

All HEP Group companies and plants continued to build and equip temporary storages for waste and secondary raw materials and furnish them with tanks for separate waste collection. In all plants the managing of waste data electronically using the application "Waste Management" continued.

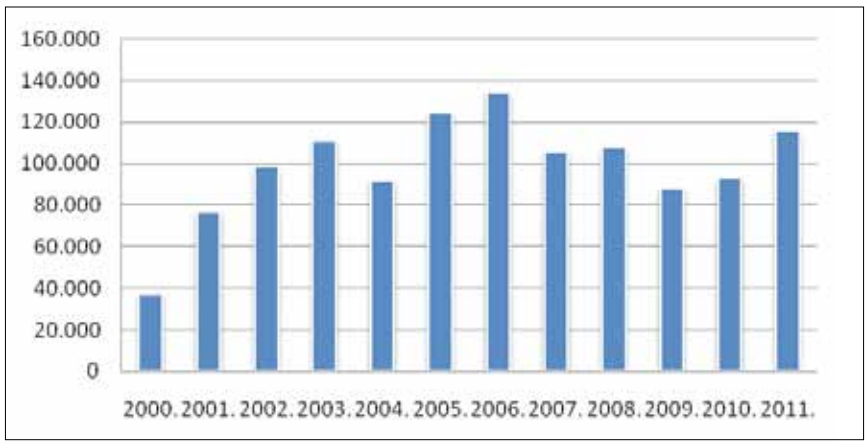
In 2011, a total of 1,574 tons of hazardous waste and 116,236 tons of non-hazardous waste was produced within HEP Group. Larger quantities of generated waste compared to 2010 are a result of increased production by Plomin coal-fired power plants and/or disposal of by-products – ash, slag and gypsum and due to an increased scope of overhauls and reconstruction in other plants. All of the generated waste was handed over to authorized collectors, exporters or processors for further processing and final disposal.

Total quantity of hazardous and non-hazardous waste generated within HEP Group 2002-2011

Year	Hazardous waste (t)	Non-hazardous waste (t)
2000.	490	37.531
2001.	518	76.717
2002.	577	98.492
2003.	1.148	111.292
2004.	940	92.067
2005.	1.209	124.820
2006.	1.112	134.336
2007.	1.269	105.569
2008.	1.243	107.623
2009.	1.110	88.405
2010.	1.152	93.185
2011.	1.574	116.236
Change 2011/ 2010 (%)	**+4**	**+5**



Trend of hazardous waste generation



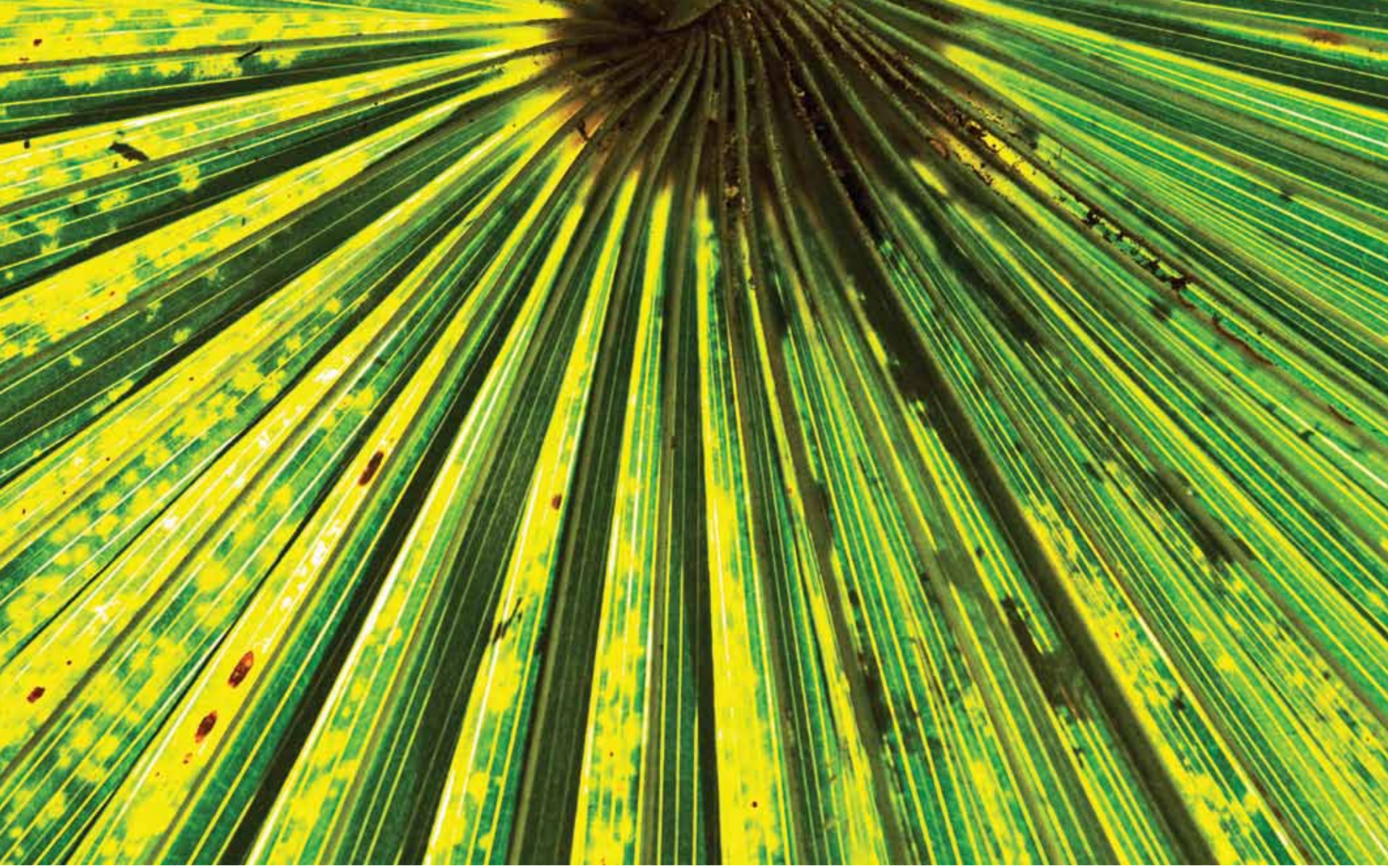
Trend of non-hazardous waste generation

EXPENSES FOR ENVIRONMENTAL AND NATURE PROTECTION

In 2011, total expenses for nature and environmental protection incurred by HEP Group companies amounted to a little more than 111 million kuna. The most significant investments in 2011 were the projects to improve waste management system in HEP's plants and to protect nature and the environment.

Expenses for nature and environmental protection in 2011 according to RETZOK reports

Environmental area	Costs of regular operations (HRK'000)	Investments (HRK'000)
air and climate	3,561	
waste waters	2,796	42
waste	13,200	4,110
protection of soil and groundwater	366	4
noise and vibrations		
protection of nature and landscape	12,471	3,151
radiation protection	65	10
research and development	667	
other (mostly charges)	71,000	180
TOTAL	**104,126**	**7,469**



MAJOR ACHIEVEMENTS IN 2011

WASTE AND WASTE WATER MANAGEMENT

- For TE-TO Zagreb, the basic design was developed and confirmed for the project to build a new water treatment plant and condensate treatment plant. Due to the age of the plant and lack of cost-effectiveness of the reconstruction of the existing plant, a new fully automatic plant of state-of-the-art technology will be installed with microprocessor control technique. As part of the project it is planned to build a condensate treatment plant with return to the demi water feeding the boilers. Also, waste water discharge was connected to Zagreb's public drainage system.
- In HEP ODS distribution area (Elektra Zabok, Elektra Čakovec, Elektra Vinkovci, Elektroistra, Elektroprimorje, Elektra Virovitica and Elektra Križ) and in the Osijek transmission area (HEP OPS d.o.o.), new tanks for separate waste collection were placed with equipment for prevention of leakage of hazardous substances into the environment.
- In HEP ODS distribution area (Elektra Vinkovci, Elektra □ibenik and Elektra Slavonski brod), a new temporary waste storage was built.
- Clean-up and improvement were carried out in the waste water drainage system in TE-TO Osijek, Sisak TPP. EL-TO Zagreb, Velebit HPP, Elektra Zabok, Elektra Koprivnica, Elektroslavonija, Elektra Slavonski Brod, Elektra Virovitica and Rijeka transmission area.
- Cleaning and testing was carried out of the water-tightness of the waste water drainage system in Zakučac HPP, Elektra Varaždin, Elektra Čakovec, Elektra Koprivnica, Elektra Bjelovar, Elektra Križ, Elektra Slavonski Brod, Elektroistra Pula and Elektrolika.
- Operational plans with measures for water pollution emergency were prepared as well as Rules concerning operation and maintenance of waste water drainage for substations in the authority of Elektra Čakovec, Elektra Vinkovci, Elektra Varaždin, Elektroprimorje Rijeka (all HEP ODS) and in all HEP OPS transmission areas.
- Water quality monitoring for the area of Bu□ko Blato was agreed with the Adriatic Sea Water Area Mostar.
- In Đale HPP, a hydraulic crane was installed with equipment for deposit removal.
- In Zakučac HPP, two new boats were procured for the drainage canal of Zakučac HPP and Prančević dam, for the purpose of placing floating dams in case of damage – oil leakage from the power plant.
- In Plomin TPP, a system was built for return of treated waste water and its re-use in the flue gas desulphurization plant, aimed at reducing waste water quantity being released.

AIR QUALITY IMPROVEMENT

- In TE-TO Zagreb, work has begun to replace burners and reconstruct firing plant of K3 boiler (Unit C). It is planned to replace all 8 combined gas-oil burners, 8 ignition gas burners, 8 complete safety and control fittings for gas, oil, purging steam and combustion air, bay measuring equipment, installation of burner management system and its integration into the unit and C boiler control system and reconstruction of boiler furnace and air ducts due to technological requirements for new equipment. The completion of the work which will reduce CO_2 particulate emission is planned before the end of 2012.
- Monitoring plans were prepared for greenhouse gas emissions from all HEP Proizvodnja thermal power plants.
- In EL-TO, trial operation of a new, environmentally acceptable, hot water boiler VK4 was completed. Preparations began to replace burners on the hot water boiler VK3.
- Remediation Program was prepared to reduce the emission of solid particulates from EL-TO Zagreb plant, which was accepted by the City of Zagreb Council.
- Local Boiler Plants Department of HEP Toplinarstvo finished the project to make the 18.5 MW Galženica boiler plant run on gas, which will take over heat production for sanitary hot water preparation and heat for space heating in the transitional period for the most part of the city of Velika Gorica.
- In Ludbreg operation of Elektra Varaždin, new efficient heat recovery boilers were installed replacing old poor-performance boiler plants.

BIOLOGICAL DIVERSITY CONSERVATION PROJECTS

- Based on the Cooperation Agreement made between HEP and the Ministry of Culture (2004) the measures to protect the protected species of the white stork (Ciconia ciconia) continued to be implemented by HEP ODS. Based on an agreement between HEP Operator distribucijskog sustava d.o.o. and the Ministry of Culture, Directorate for Nature Protection, of September 2009, in 2011 distribution areas systematically monitored bird casualties on medium-voltage distribution lines and other plants in order to determine critical parts of the network.
- Based on the previous monitoring of bird casualties, public procurement was conducted for supply of insulation materials to protect the birds from electric shock on medium-voltage facilities of HEP ODS (overhead lines, switches and pole-mounted substations).
- Activities were conducted by Elektroprimorje Rijeka to protect the birds from electric shock in the area of the island of Cres where the griffon vulture lives. The Ministry of Culture, Directorate for Bird Protection, the non-governmental organization Eco-centar Caput Insulae and HEP ODS, Elektroprimorje Rijeka, based on the Action Plan for the protection of the last population of griffon vultures (Gyps fulvus) in Croatia, entered into a contract for

the preparation of the Study on the Protection of Birds and Small Animals from Electrocution on MV 10(20) kV Lines in the Areas of Cres and Lo□inj. As provided in the Action Plan, new technical solutions will be applied for the construction of overhead lines within the existing electricity network, and such solutions will be also used for replacement of worn-out electric pylons and lines in the existing network, so that bird fatalities (collisions, electrocution) are minimized.

- In Elektra Koprivnica and Elektrodalmacija Split, the equipment for insulation of busbars on 35/10 kV transformers was installed to protect and preserve animal species and for operational safety reasons.

OTHER

- Regular internal and external audits of quality management system and environmental management system according to ISO 9001:2008 and ISO 14001:2004 are carried out.
- In hydro power plants re-audits are carried out for re-certification of energy production from renewable sources.
- Extensive activities were carried out on the preparation of seven distribution areas (HEP ODS) for introduction of environmental management system according to HRN EN ISO 14001:2009.
- In Sisak operative area of HEP Toplinarstvo, a number of projects will begin (return of condensate from Caprag area from TS 1, 2 and 3 to the industrial power plant, return of condensate from TS Brzaj to TS 1 in Caprag area, return of condensate from the industrial power plant to Sisak TPP, construction of steam pipeline from the industrial power plant to Sisak TPP), which will result in reduced heat losses and lower pollutant emissions.
- The procedure was initiated for environmental impact assessment for the construction of a 2x220 kV connecting line from Sisak thermal power plant to the 220 kV Mraclin-Prijedor line.