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**AGENCY FOR INTERNATIONAL DEVELOPMENT  
ENERGY EFFICIENCY IN CEE AND THE BALTICS**

**DHR-0030-C-00-5064-00**

**Bosnia Project Definition Mission**

**December 2 - 15, 1995**

**Trip Report**

**Prepared by:**

**Electrotek Concepts, Inc.**

**J. Charles Smith**

**Project Manager**

**January 12, 1995**

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## Summary

During the period of Dec. 3 - 15, I participated as the electricity expert in a joint AID/TDA Project Definition Mission to Bosnia. The mission included:

Pamela Baldwin, USAID

Marshall Ficher, USAID

J. Charles Smith, Electrotek

Geoff Jackson, TDA

Ann Lien, TDA

Richard Coleman, Lan Com

Bennett Reischauer, Stanley Consultants

Vinod Shrivastava, CORE

Andrew Ottolenghi, K&M Engineering & Consulting

The purpose of my participation in the mission was to help identify potential energy infrastructure projects consistent with AID policy and funding guidelines, necessary for the rebuilding of the country. The focus was on the need for developing a long-term energy master plan to guide future investments, and the immediate reconstruction of Transmission and Distribution facilities necessary to restore minimum service to the population. The latter component is also being considered as a component of the municipal rehabilitation plan.

A summary of the meetings and observations made during the trip is contained in the following trip report. Associated reference material is attached. A combined report was ultimately prepared by AID and TDA.

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## Travel Itinerary

<u>Dates</u>	<u>Location</u>	<u>Topic</u>
Dec. 4, 1995	Zagreb, Croatia	Croatian Power System - Overview
Dec. 6 - Dec. 13, 1995	Sarajevo, Bosnia	Bosnian Power System - Status & Need for Assistance

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## Meeting Record

Organization: Croatian National Utility Company

Place: Zagreb, Croatia; Intercontinental Hotel

Date: Monday Dec. 4, 1995

Purpose: Background of Croatian Electric Utility and Relation to Bosnian Energy Situation

Attendees: Mr. Bagelvitich, President, Croatian National Utility Co.  
Charles Smith, Electrotek  
Geoff Jackson, USTDA  
Pamela Baldwin, USAID  
Andrew Ottolenghi, K&M Engineering & Consulting  
Vinod Shrivastava, CORE  
Damjan Bencic, American Embassy, Commercial Specialist

### Highlights

1. Belgrade was the national dispatch center for the former Yugoslavia. Regional dispatch centers were located in Lublijiana, Zagreb, Sarajevo, Titograd, and Skopije.
2. The Perush dam was completely destroyed during the war.
3. Croatia is a winter peaking system, with a large peak to off-peak load ratio. The daily peak may be 2-3 times the nightly minimum.
4. The generation mix is:

47 % hydro

35 % thermal

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17 % nuclear

1 % import

The current system peak is 2,200 MW, with an installed capacity of 4300 MW and an available capacity of 3,500 MW. The daily winter load is about  $40 \times 10^6$  MWH/day, while the summer daily load is  $28 \times 10^6$  MWH/day.

5. Croatia is a member of UCPTTE and observes all operating requirements, including frequency regulation.
6. Major substation communication requirements are met by fiber optic cable.
7. Croatia is about 1,000 MW short of base load capacity. Before the war, Croatia had built about 1,000 MW outside Croatia in Bosnia and Serbia, but this capacity has now been lost to them. They plan to build additional capacity to take its place:

<u>Status</u>	<u>Location</u>	<u>Capacity</u>	<u>Fuel</u>
Finish	Plumen 2	110 MW	coal
Build	Plumen 3	210 MW	coal
	Lesok	400 MW	multi-fuel
	40 km NE of Zagreb	200 MW	?
	Eastern Slavonia	200 MW	?

In addition, there is already a 300 MW pumped storage plant on the Dalmatian coast at Plumen, and 2 oil-fired CHP plants in Zagreb. They would like to retrofit these plants with gas turbines and burn gas. They are also very receptive to alternative ownership arrangements (JV, BOT, BOO) for the construction of new plant, and invite potential partners for discussion.

8. Croatia would ultimately like to export energy to Western Europe. Two major 400 kV lines from the South to the West pass through Croatia, but both are out of service due to the war. Croatia is buying at 2.5c/kwh, the average cost of fuel. The base load energy cost is more like 4.5c/kwh.

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9. Approximately 50 km of 400 kV line along the Dalmatian coast has been destroyed by the war. Rebuilding this line is the subject of a World Bank loan. A critical 400 kV substation in Eastern Slavonia has also been destroyed, but will not be rebuilt until the land is returned to Croatia. The transmission line rights-of-way and substations in the war zone have been extensively mined and are dangerous.

10. On a personal note, Mr. Bagelvitch struck me as a very knowledgeable and personable chief executive. He has an excellent grasp of the facts, understanding of the system and strategic vision of the future. I believe the power system will do well under his leadership.

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## Meeting Record

Organization: Elektroprivreda  
Place: Sarajevo, Bosnia  
Date: Dec. 6 - Dec. 13, 1995  
Purpose: Project Definition Mission for Reconstruction Aid  
Attendees: See Attachment 1

### Highlights

#### Corporate Organization

As with the rest of the country, the electric power system of Bosnia has been divided into three parts, corresponding to the territory held by the Serbs, Croats, and Bosnians. The one former electricity company of Elektroprivreda has been divided into three, consisting of Elektroprivreda Bosnia - Herzegovina (EPBH) in Bosnian territory; Elektroprivreda Herzegovina - Bosnia (EPHB) in Croat territory; and Electroprenos in Serb territory. The respective headquarters are in Sarajevo, Mostar, and the suburb of Ilidza.

#### Kakanj Power Plant and Coal Mine

Power Plant: The Kakanj Power Plant is located in Central Bosnia near Zenica. It has four units of 32 MW each, 2 each placed in service in 1956 and 1960; 2 units of 110 MW each, placed in service in 1969 and 1977; and one unit of 230 MW, placed in service in 1988. Two of the 32 MW units are in operating condition and 2 are being repaired. One of the 110 MW units is operating, and the other is disassembled and in need of technical assistance to complete the overhaul and reassembly. The 230 MW unit was partially mothballed early in the war, but is in need of technical assistance for recommissioning.

The power plant was operating at 12 MW on Sunday, Dec. 10, due to the low level of load. The 110 MW unit was shut down the day before due to its minimum load requirement. One of the 32 MW or 110 MW units must be on-line in order to supply the

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Kakanj district heating requirement of 30 MW of steam. Only the 230 MW unit has any environmental control, and it only has an electrostatic precipitator. The ash content of the fuel is 40 %, and sometimes reaches 50 %. The ash is carried by conveyor belt to an ash pile across the river visually estimated at 100-150 meters high. The ash is of a fine granular structure and was said to present no problem from a long term stability point of view. Apparently, there has been no serious erosion problem yet.

A detailed list of equipment and assistance required by the plant is being prepared in Sarajevo. A similar list is being prepared for the Tuzla power plant. The immediate needs at Kakanj are for assistance in completing the maintenance on 2 of the 32 MW units, reassembling the disassembled 110 MW unit, and recommissioning the 230 MW unit. The ability to restart the 230 MW unit will also depend on the availability of the transmission network. Croatia owns 50 MW of capacity at Kakanj, in addition to 200 MW at Tuzla, and on the Serb side, 100 MW at Gacko, and 23.8 MW and 47.5 MW respectively at hydro plants Trebinje 1 and Dubrovnik. Bosnia must begin to repay the energy it was unable to deliver during the war, as well as continue delivery under long term contract. Slovenia also owns 100 MW of capacity at Uglivek (Serb side thermal), with similar considerations.

Coal Mine: The primary source of coal for the Kakanj power plant is a nearby open pit mine, covering an area of 4 km by 5 km. The pit is being mined at depths of up to 50 m, with an overburden of up to 30 m and a seam of up to 20m. The original equipment is mostly Russian, and is in a very poor state of repair. There are 6 shovels, of which typically only 2 are working at a time. A similar situation exists for the other equipment, i.e. only a very little works at any one time. Much of the equipment, has been cannibalized to keep the remaining equipment operating during the war. The coal washing plant is completely dysfunctional.

The overburden is being dumped in a valley next to the pit. There does not appear to be a serious erosion problem, but the landfill is consuming private property for which the owners are being compensated at a rate established by the state. The roads in the mine are in serious need of repair, an activity which receives little attention given the lack of equipment. The inability to deliver fuel to the power plant is currently the limiting factor in the plant output, followed closely by the ability of the T&D system to deliver the energy to the load, the ability of the plant to produce additional energy, and the rebound of the load itself. The coal mine personnel believe they can quickly increase mine output with some new equipment.

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## Dispatch Centers

There is a national dispatch center located in the headquarters building of Elektroprivreda in Sarajevo. The center used to monitor the status of the thermal plants and provide frequency control signals for the major hydrofacilities in Bosnia. Elektroprivreda was in the process of implementing a limited SCADA system before the war. Right now sporadic communication is maintained with the major generation and transmission facilities throughout Bosnia. Very limited data is available from the field. Elektroprivreda would like to reestablish the dispatch center after emergency service restoration has been completed.

In addition to the republic dispatch center, which has responsibility for the 400 kV and 220 kV network and the power plants, there are 4 transmission regions and 7 distribution regions with smaller control centers. The 4 transmission district control centers are responsible for the 110 kV network and the small hydroplants, while the 7 distribution district control centers are responsible for the system below 100 kV. All of the transmission planning and operations software needs to be replaced. It was old before the war and doesn't reflect the needs of economic operating requirements.

## Long-Term Contracts

Under the former system, Yugoslav republics were able to contribute to the construction of power plants in other republics, and negotiate long-term contracts at favorable rates. For example, investments by Croatia and Slovenia in Bosnia include the following:

### Croatia:

HydroPlant Trebinje 1	23.8 MW
HydroPlant Dubrovnik	47.5 MW
Thermal Plant Tuzla	200 MW
Thermal Plant Kakanj	50 MW
Thermal Plant Gacko	100 MW

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Slovenia:

Thermal Plant Uglivek 100 MW

Bosnia has been unable to fulfill its contracts during the war, and is now renegotiating its obligations to Croatia and Slovenia, who are also said to have unpaid energy bills to Bosnia. In addition, Bosnia had incurred a pre-war obligation of .76 Twh to its UCPTE neighbors, including Croatia, Slovenia, Romania, and Bulgaria. This debt, too, will need to be repaid, but not until power plant output can be increased, and the 400 kV and 220 kV international interconnections can be reestablished. These interconnections will also provide a vehicle for Bosnia to generate some hard currency if it can economically become a net exporter of electricity again.

### System Planning

The Elektroprivreda Transmission and Operations Department has responsibility for planning the annual, monthly, weekly, daily, and hourly output of the system, and negotiating exchanges with neighbors. Before the war, a generation expansion plan had been developed through the 2010-2020 time period. The plan foresaw the addition of up to 2000 MW additional coal-fired capacity, with no other fossil fuels contemplated. EPBH no longer consider these plans realistic, and would like to begin again with a clean slate. The planned plant and mines no longer lie in the same political territory. At the same time, there seems to be a realistic recognition of the fact that there are insufficient resources to duplicate critical electrical facilities and that long-term cooperation among the parties will be essential for the rebuilding effort. Planning programs previously used in Bosnia include WASP and MAED.

### Transmission and Distribution System Rebuilding

EPBH currently owns all electric system assets (Generation, Transmission & Development) in its territory with the exception of street lighting, which is owned by the municipalities. They were beginning to implement construction practices and material standards for T & D construction before the war, but these efforts were

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derailed. They are still not in place, but are badly needed to prevent a proliferation of different design systems throughout the country, which will lead to greater costs and lower reliability in the long-term.

In the cities, the 10 kV cable network consists of a mixture of direct-buried cable and cable in ductwork. Some cable sections have been spliced as many as 10-20 times (1-2 is normal) with inadequate splices made under very difficult conditions. These cables need to be replaced as quickly as possible. Standards are being written for the most important (expensive) equipment first, including cable, switchgear (SF6 and vacuum) and transformers.

In areas which received heavy shelling during the war and which transmission lines cross, a line may have been broken and spliced 10-20 times in the space of 3-4 towers. With improper splices, these lines are also very weak. A small amount of additional weight from snow, for example, can cause these lines to fail again, as happened during the snowstorm of Dec. 12-13, 1995, just before the signing of the peace agreement. A 220 kV line from Jablanica to Tuzla is physically spliced to a 110 kV line into Sarajevo which provides the city with its main power. Sections of both lines were damaged and failed during the storm and took over 24 hours to put back into service. Extensive reconductoring of such lines will be required. The entire line is in operation at 110 kV due to the extensive damage to the 220 kV facilities. Power from the hydroplant Visegrad in the Serb territory can also be fed into Serb suburbs of Sarajevo, but the means to deliver it to other sections of the city is imperfect at the moment.

The most serious damage to the T&D system generally took place in the area of the front lines. We passed through the area of Travnik, to the west of Zenica, viewing the damage to the T&D system. We saw front lines of both Croat-Bosniak and Serb-Bosniak fighting. In some areas, the devastation of the homes of the Muslims, identified by their four-sided roofs, next to the still inhabited homes of the Croats or Serbs, was most stark. In other areas, all homes were completely destroyed. We inspected one 110/10 kv substation, several 10/.4 kv substations, and many sections of 220, 110, 10, and .4 kv line. Much of the 220 kv and 110 kv line is in minefields and cannot yet be repaired. Numerous steel towers are damaged or destroyed and long lengths of steel conductor are missing. Many 110/10 kv substations have been cannibalized to get others back into operation. Transformer radiators have been shot and all the oil has leaked out; insulators and bushings have been shot and damaged; instrument transformers and circuit breakers are destroyed; bus work is often a twisted mess. The 10 and .4 kv lines

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vary from minimal damage to completely gone, with many of the wooden poles having been cut down and used for firewood.

While the field personnel have been very resourceful in restoring a minimum level of service under extreme hardship conditions, the system is being operated in a dangerous and unsafe fashion. Energized equipment is being operated with unsafe clearances, equipment is being operated above rating, and lines are being operated with inadequate relay protection and in some cases, without adequate circuit breaker protection. Emergency assistance is required to rectify this situation.

#### Training and Assistance

I explored the areas of technical training and assistance with EPBH, including the UPP, through Mrs. Nikolic, the Director of R&D. She says that after 4 years of war and isolation, EPBH is in very poor condition, from both a technical and manpower point of view. They would be grateful for any programs of technical cooperation and assistance which they can receive. They liked the idea of the UPP, and look forward to the possibility of working with a sister utility. On the technical side, they requested specific assistance in the areas of system frequency control, control center design, system planning and operations, and distribution system loss reduction. I told them I would discuss these requests in Washington and discuss them again on my next visit.

Part of the assistance should consist of technical assistance in developing new standards for load forecasting, distribution planning, system design, construction standards, and equipment standards. I have been told that new construction standards are being developed, but I have not been able to see any. If this effort is not undertaken immediately, there will be a higher cost in the long term to maintain and repair the hodgepodge of systems which will develop. This may also offer an opportunity to support the development of some private, regionally based engineering/construction companies to perform distribution system design and maintenance.

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## Impressions from Trip through Mostar to Split

On Thursday, Dec. 14, I rode from Sarajevo through Mostar to Metkovic and on to Split in Croatia. Until Jablanica, the road was through a mountainous region and only partially cleared of snow. Beyond Jablanica, the road was clear and passable. Many segments of the T&D system were visible from the road, as well as the major dams on the Neretva River. As in the trip to Zenica, many damaged towers and missing sections of conductor were observed. The damage in the Serb territory around Sarajevo seemed light in comparison to that observed throughout other sections of Bosnia. There were some areas where we passed through several kilometers of completely destroyed villages at a time in central and southern Bosnia, and other areas of more localized damage or no damage.

One of the most striking features of the landscape is the extreme steepness and ruggedness of the hills and mountains, and the fact that this did not deter the construction of numerous T&D facilities throughout the region. The transmission line design calculations will be more complex here due to the difficult terrain and resulting loads. The most rugged terrain was observed south of Jablanica and north of Mostar. The devastation on the east bank of the Neretva (Muslim side) compared to the relative lack of damage on the west bank (Croat side) is quite obvious in Mostar.

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**Attachment 1**

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## List of Primary Contacts for the Energy Sector

December 6-13, 1995 Sarajevo, Bosnia and Herzegovina

IMG	Jacques Perreaux, Electricity Coordinator
	Paul Monnory, General Manager
	Rob Stockdale, Head of Field Office
	Daria , Interpreter
Ministry of Foreign Affairs	Prof. Dr. Fahrudin Sebic, Minister
Ministry of Energy & Industry	Mr. Smailbegovic, Minister
UMCOR	Dirk Van Gorp, Head of Mission
Sarajevo University	Prof. Salih Carsimamovic
Elektroprivreda	Mr. Edham Bicakcic, General Manager
	Mr. Acif Hadrovic, Head, Consulting Team
	Mrs. Dubravka Nikolic, Director of R&D
	Mr. Franjo Bozuta, Director of Transmission & Operation
	Mr. Enver Dresco, Director of Generation
	Mr. Markovic Ognjen, Technical Director
	Mrs. Sabaheta Sadikovic, Head of Generation Planning
	Mr. Mustafa Ceco, Director, Elektrodistribucija Doboje
Kabanj TPP	Mr. Enver Sabanovic, Chief Engineer
Central Bosnia Coal Company	Mr. Brescic Fuad, General Director
	Mr. Fazlic Ibrahim, Financial Director

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**Attachment 2**

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**Schedule of Major Meetings**  
**Bosnia and Croatia, Dec. 4 - 16, 1995**

Monday, Dec. 4, 1995 am

Zagreb, Croatia

IMP - Logistics Briefing

Paul J. Monnory, General Manager

Pierre Verstraelen, Water & Sanitation

Monday, Dec. 4, 1995 pm

Zagreb, Croatia

Croatian Electric Power Co. - Corporate Overview

Mr. Bagelvitich, President

Tuesday, Dec. 5, 1995 pm

Sarajevo, Bosnia & Herzegovina

Ministry of Foreign Affairs - Orientation

Prof. Dr. Fahrudin Sebic, Minister of Foreign Relations

Mr. Mamekovic, Water & Sanitation

Mr. Zlatkovic, Ministry of Coordination of Foreign Affairs

Jacques Perreaux, IMG

Frieerich Morlock, IMG

Frank Gillespie, USAID

Craig Buck, USAID, Mission Director

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Wed., Dec. 6, 1995 am

Sarajevo, Bosnia & Herzegovina

IMG - Current System Status

Jacques Perreaux, IMG

Wed. Dec. 6, 1995 am

Sarajevo, Bosnia & Herzegovina

Ministry for Cooperation with the UN - Overview

Mr. Muratovic, Ministry for Cooperation

Mr. Smailbegovic, Ministry of Energy & Industry

Mr. Samir Musovic, Ministry of Trade

Mr. Innomovic, Ministry of Physical Planning & Natural Resources

Mr. Koludur, Ministry of Transport

Mr. Kreso, Agency for International Cooperation in Reconstruction & Development

Mr. Sebic, Ministry of Foreign Affairs

Mr. Mucovic, Ministry of Economics

Wed., Dec. 6, 1995 pm

Sarajevo, Bosnia & Herzegovina

Elektroprivreda - Discussion Topics & Schedule

Mrs. Dubravka Nikolic, Director of R&D

Thurs. Dec. 7, 1995 am

Sarajevo, Bosnia & Herzegovina

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Elektroprivreda - Introduction & Overview

Mr. Edhem Bicakcic, General Manager

Mr. Acif Hadrovic, Head, Consulting Team

Mrs. Sabaheta Sadikovic, Head, Generation Planning

Prof. Salih Carsimamovic, Dept. of Energy Efficiency, Sarajevo University

Mr. Markovic Ognjen, Technical Director

Mr. Enver Kreso, Director of Generation

Friday, Dec. 8, 1995

Sarajevo, Bosnia & Herzegovina

Elektroprivreda - Economics, Finance & Planning

Mrs. Sabaheta Sadikovic, Head, Generation Planning

Mr. Markovic Ognjen, Technical Director

Friday, Dec. 8, 1995

Sarajevo, Bosnia & Herzegovina

Elektroprivreda - Transmission & Distribution

Mrs. Dubravka Nikolic, Director of R&D

Mr. Franjo Bozuta, Director of Transmission & Operation

Saturday, Dec. 9, 1995

Zenica, Bosnia & Herzegovina

Rudnici Uglja - Srednja Bosna (Central Bosnian Coal Mine)

Mr. Brescic Fuad, General Director

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Mr. Fazlic Ibrahim, Finance Director

Mr. Sabanovic Enver, Chief Engineer, Kakanj TPP

Mr. Rob Stockdale, IMG

Sunday, Dec. 10, 1995

Kakanj, Bosnia & Herzegovina

Kakanj Power Plant & Coal Mine

Mr. Fazlic Ibrahim, Finance Director, Coal Mine

Mr. Sabanovic Enver, Chief Engineer, Kakanj TPP

Sunday, Dec. 10, 1995

Trebnik, Bosnia & Herzegovina

Elektroprivreda - Transmission and Distribution System Status

Mr. Mustafa Ceko, Director, Elektrodistribucija Doboj

Tuesday, Dec. 12, 1995

Sarajevo, Bosnia & Herzegovina

Elektroprivreda - Transmission and Distribution System Planning &  
Reconstruction

Mrs. Dubravka Nikolic, Director of R&D

Mr. Franjo Bozuta, Director Transmission & Operation

Director Distribution.

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**Attachment 3**

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## Agenda Topics

### Utility Company Overview

Structure and Relation to Government

Generation, Transmission, Distribution, Planning

Operation of the System (then and now)

Voltage Control

Frequency Control

### Status of the System Now

Generation

Transmission (Protection, Communications, Control)

Distribution

Customer Load

Population

Annual Consumption

Daily Profiles

Manpower Availability and Training

Dispatch Center and Control Hierarchy

Exports/Imports and Interconnections

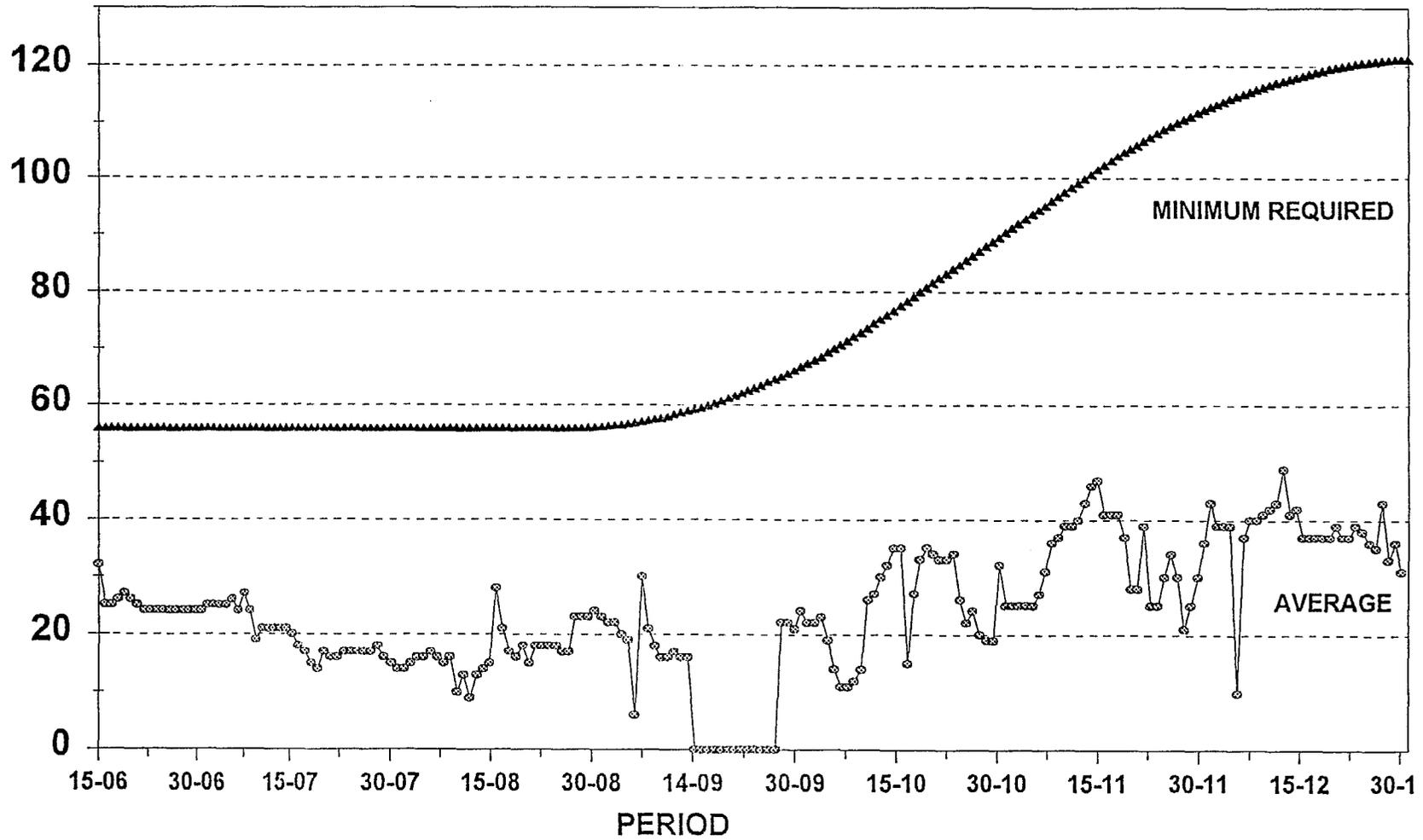
Impact of Electrical Heating

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**Attachment 4**

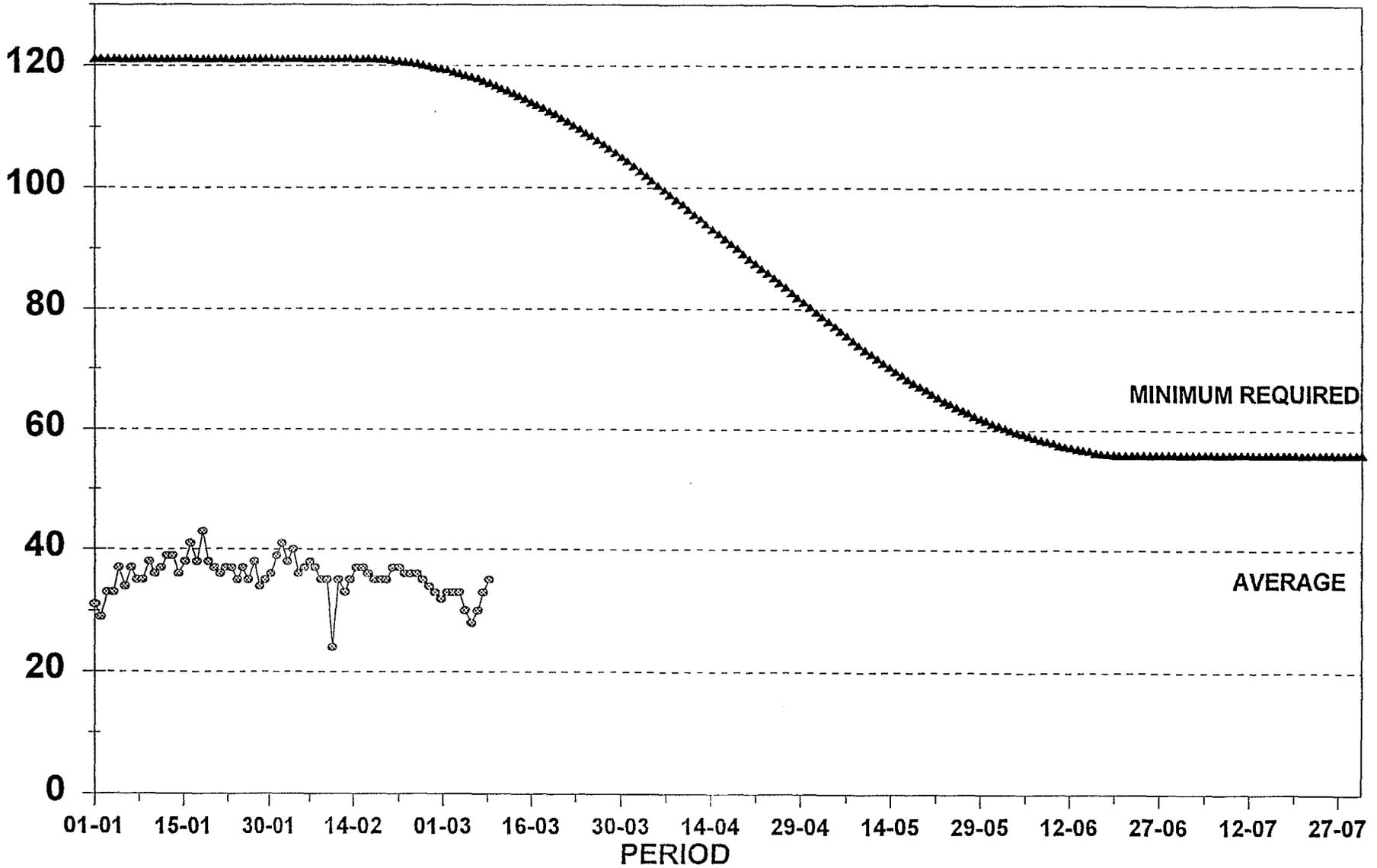
# ELECTRICITY SUPPLY - SARAJEVO 1994

in MW

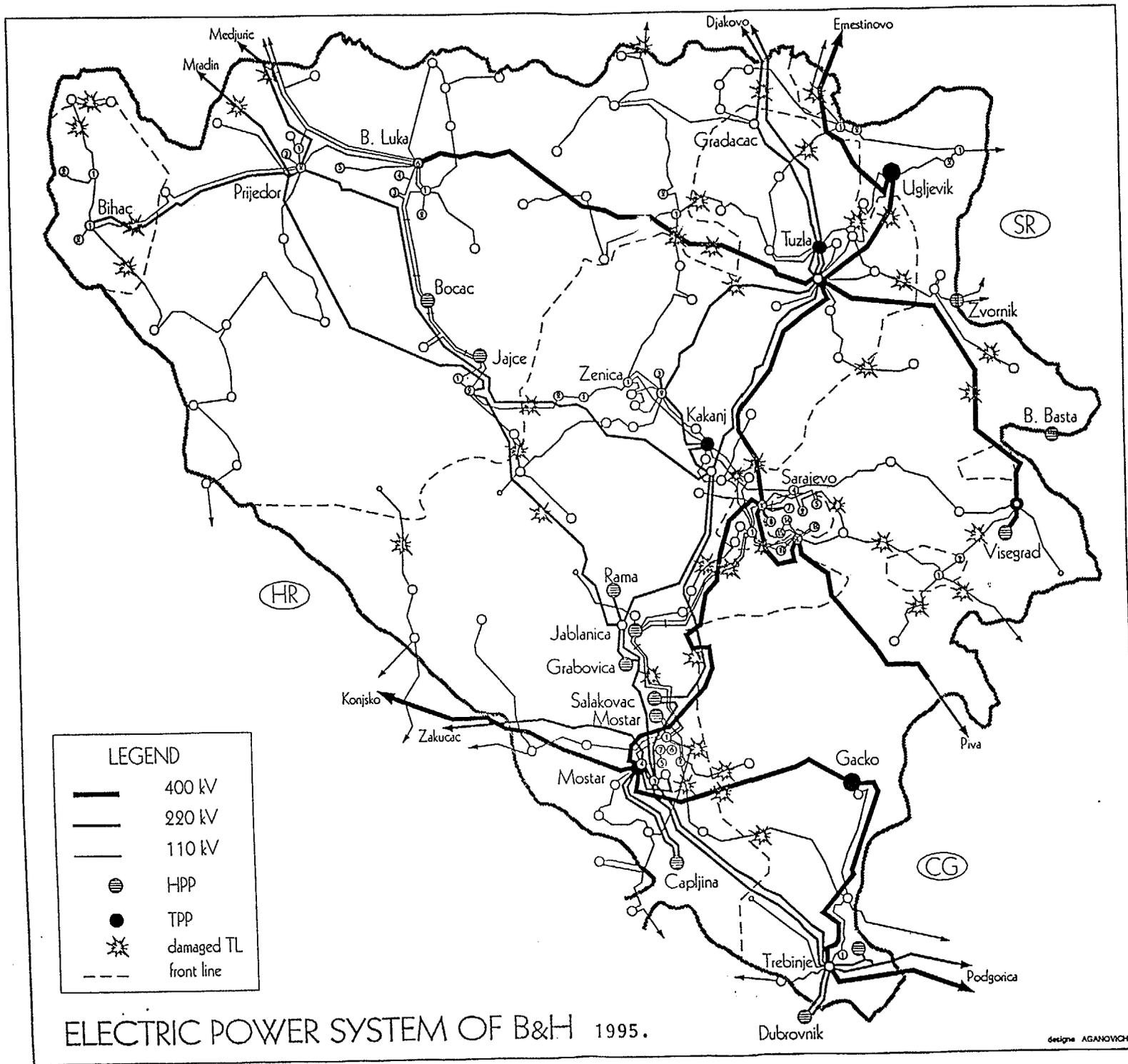


# ELECTRICITY SUPPLY - SARAJEVO 1995

in MW



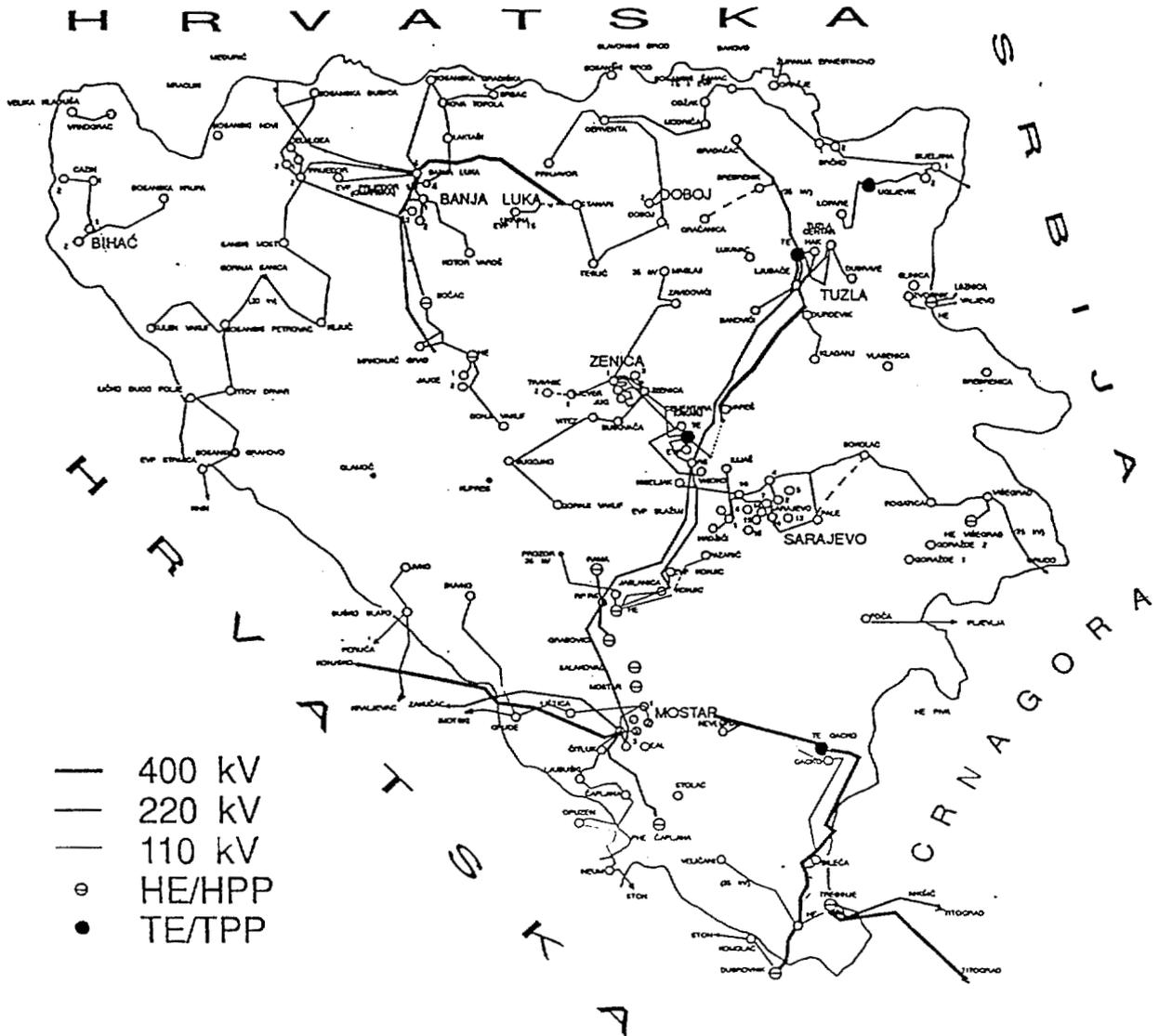
22



ELECTRIC POWER SYSTEM OF B&H 1995.

designer AGANOVICH

28

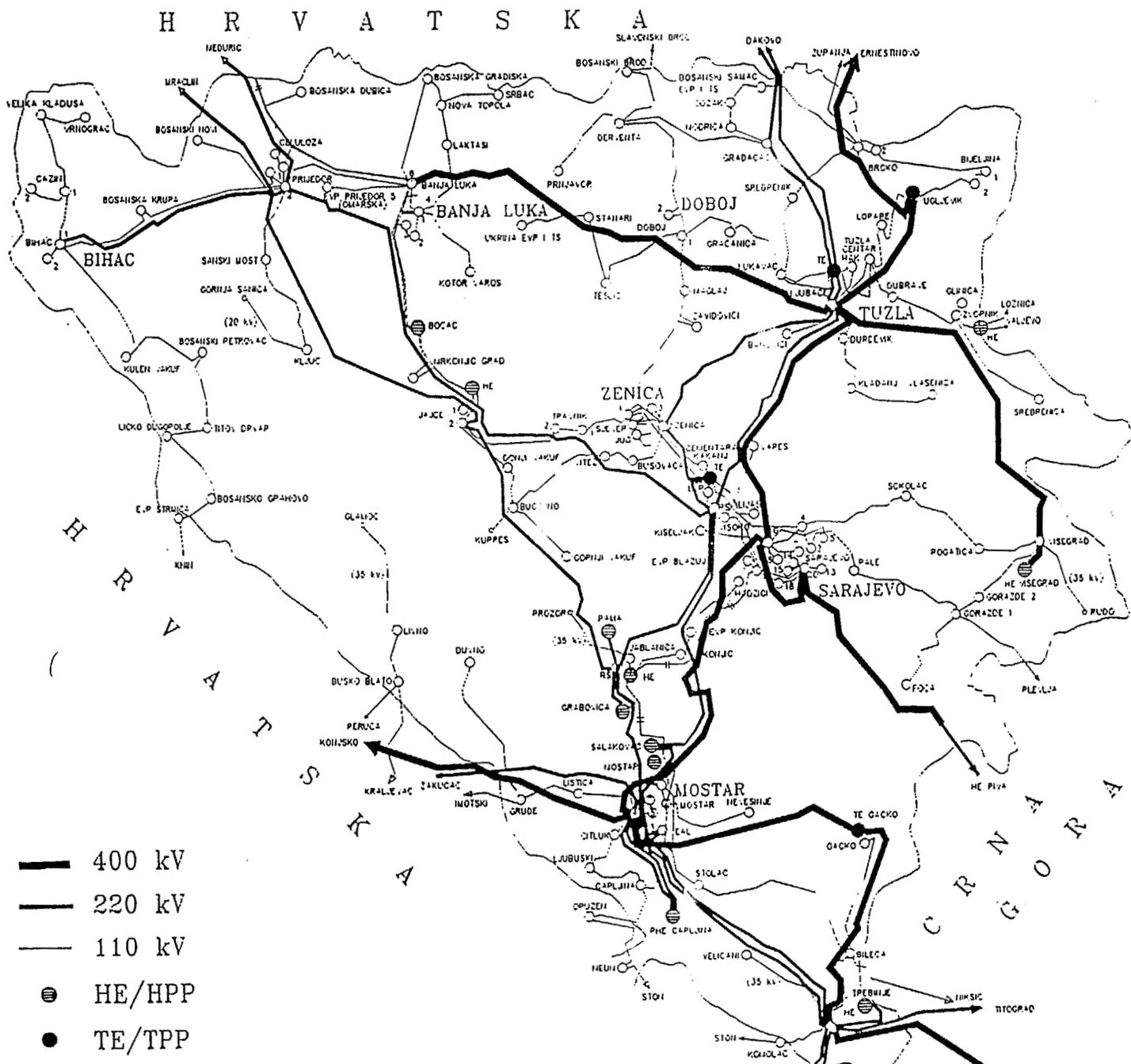


ELEKTROENERGETSKI SISTEM B&H KRAJEM 1994.G.

Sredstva za podizanje prenosne mreže (dalekovodi i trafostanice) naponskih nivoa 400, 220 i 110 kV

1. 400 kV mreža .....	30 miliona DEM
2. 220 kV mreža .....	17 miliona DEM
3. 110 kV mreža .....	40 miliona DEM

# ELEKTROENERGETSKI SISTEM BiH 1991.



S  
R  
B  
I  
J  
A

-  400 kV
-  220 kV
-  110 kV
-  HE/HPP
-  TE/TPP

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**Attachment 5**

A1 01

PUBLIC ENTERPRISE  
ELEKTROPRIVREDA BOSNE I HERCEGOVINE  
S A R A J E V O

I

1/93

**ACTIVITY PROGRAM AT THE SANATION  
OF THE ELECTRIC ENERGY FACILITIES  
FOR THE ELECTRIC POWER SYSTEM OPERATION**

1-2/1/93

Sanation and revitalization of the electric energy  
facilities at the narrow region of the town Sarajevo

*+ additf = list of required vehicles*

Sarajevo, August 1993.

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PUBLIC ENTERPRISE  
ELEKTROPRIVREDA BOSNE I HERCEGOVINE  
S A R A J E V O

PROJECT: ACTIVITY PROGRAM AT THE  
SANATION OF THE ELECTRIC  
ENERGY FACILITIES FOR THE  
ELECTRIC POWER SYSTEM  
OPERATION

C O D E: 1/93

STUDY: Sanation and revitalization of the  
electric energy facilities at the  
narrow region of the town Sa-  
rajevo

C O D E: 1-2/1/93

PROJECT COORDINATOR: Scientific-research department

STUDY REALIZATOR: "Elektroprenos" Sarajevo  
mr Ognjen Marković, dipl.el.eng.  
Savo Nikolić, dipl.el.eng.  
Avdo Užičanin, dipl.el.eng.  
Kenan Arnautović, dipl.el.eng.  
Jefto Delić, el.eng.

TRANSLATOR: Mirsada - Mika Zgonjanin

Sarajevo, August 1993.

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## 1. INTRODUCTION

This study is done within the activity for providing the electric power in the town Sarajevo before the winter 1993.

The subject of this study are all damaged and destroyed units of the transmission network at the Sarajevo region needing the inevitable sanitation necessary for the regular supply and transformation of the electric power.

The choice of the units ready for the sanitation and revitalization follows the established priority and the damage degree (based on the energy explanation) leading to the soon solution of the unfavourable electric energy situation at the close Sarajevo region.

The aggression on the Republic Bosnia and Herzegovina in March 1992. and the war activities still going on, have provoked serious damages at the electric energy units of the transmission network. In spite of our constant efforts trying to have these units repaired, during the whole period, the necessary scope and quality of the repair proved to be impossible. The main reasons of the ineffectivity is the lack of the safe, and very often, no approach to the damaged units and the aggressor's constant keeping us from the repair of these units.

A particular problem of the sanitation and revitalization is the shortage (and also our impossibility to procure) the spare parts, equipment and materials.

For the real recognition of the scope and possibility of the sanitation and revitalization of these units, the special attention is paid to:

- the general characteristics of the units needing the sanitation and revitalization;
- material component (equipment, spare parts and materials);
- necessary financial investments for the realization of the sanitation and revitalization program of the transmission network units at the Sarajevo region.

## 2. ELECTRIC POWER SUPPLY OF THE SARAJEVO REGION BEFORE THE WAR

Before the war in Bosnia and Herzegovina, the region of the town Sarajevo was supplied with the electric power over twelve (12) transformer stations 110/x connected to the electric energy system of B&H through two TS 400/110 kV and eight (8) 110 kV transmission lines directed to the electricity resources (HP Jablanica, TP Kakanj and HP Višegrad). The direct connection with a great number of the generating capacities (TP Kakanj, TP Tuzla, HP Jablanica, HP Višegrad, HP Piva) and the solidly constructed network of the 110 kV transmission lines made it possible for the town Sarajevo to have the stable and high-quality supply.

The total installed capacity of all twelve (12) transformer stations 110/x with twenty two (22) assembled transformers was 687,0 MVA. The realized peak load in the town Sarajevo was 281 MW in 1991. and over these transformers and distribution network, the consumers were supplied with 1.459,45 GWh. The table 1. shows the consumption list with the realized peak load in 1991., stated for each month separately.

1991. Table 1.

MONTH	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
$P_{max}$ (MW)	269,0	281,0	224,0	220,0	214,5	167,0	176,2	165,2	174,5	244,6	224,2	229,5
$W$ (GWh)	160,6	151,0	129,7	122,93	110,68	90,4	85,07	85,6	95,48	119,12	134,24	174,63

The transformer stations 110/x kV, transmitting the electric power to the town Sarajevo are: TS Sarajevo 1, Sarajevo 2, Sarajevo 4, Sarajevo 5, Sarajevo 7, Sarajevo 8, Sarajevo 13, Sarajevo 14, Sarajevo 15, Sarajevo 18, Pale and Hadžići.

### 3. ELECTRIC POWER SUPPLY OF THE CLOSE SARAJEVO REGION IN WAR

#### 3.1. Supply in 1992.

From the very beginning of the war, namely April 1992., the electric energy facilities have been the target of bombing, and the electric power has become the means for the war aim realization.

After the transmission lines, connecting the transformer stations in the town with the electric power system, were destroyed, the majority of these stations are left permanently without any voltage, while the great number of them were seriously damaged and out of order for their function.

The following stations stayed definitely without 110 kV voltage:

1. TS 110/10 kV Sarajevo 13 (May 4.1992.)
2. TS 110/10 kV Sarajevo 14 (May 14.1992.)
3. TS 110/10 kV Sarajevo 15 (May 14.1992.)
4. TS 110/10/35 kV Sarajevo 18 (April 29.1992.)
5. TS 110/10 kV Sarajevo 5 (July 7.1992.)
6. TS 110/10 kV Sarajevo 8 (August 12.1992.)
7. TS 110/10/35 kV Pale (July 7.1992.)
8. TS 110/10/35 kV Hadžići (August 5.1992.)

The connection with the electric energy system was reduced to only one transmission line transmitting over TS Sarajevo 10, periodically to the other stations: TS Sarajevo 2 or TS Sarajevo 7, supplying the close Sarajevo region, namely TS Sarajevo 1 and TS Sarajevo 4 that used to supply Ilidža, Blažuj, Vogošća and Ilijaš.

From December 7.1992. TS 110/35 kV Sarajevo 2 definitely stayed without the 110 kV voltage. Since then the close town region has been, periodically and in limited quantities of the power, supplied over TS 110/10 kV Sarajevo 7 with its two assembled transformers 110/10 kV, capacity 2x31,5 MVA; and through one transmission line 110 kV Sarajevo 10-Sarajevo 7-II.

The data, we have, show that in 1992. the close town region was supplied over six (6) TS 110/x: TS Sarajevo 2, TS Sarajevo 5, TS Sarajevo 7, TS Sarajevo 13, TS Sarajevo 14 and TS Sarajevo 15 with only 409,78 GWh of the electricity out of which in January, February, March and April there were 300,364 GWh and the rest of 109,416 GWh was delivered in all eight (8) months.

The town was without any voltage during some longer periods as from September 21.1992. to October 15.1992. (25 days); then from December 7.1992. to January 15.1993. (40 days). In these period the town was also without any water supply and any telephone connections.

### 3.2. Supply in 1993.

As it has already been said, that the close region of the town Sarajevo, from the beginning of 1993., namely from January 15.1993. when the town after all 40 days got the voltage, was supplied over only one TS 110/10 kV Sarajevo 7 where from January 19.1993. two transformers 2x31,5 MVA were in operation. Over the TS 110/35/10 kV Sarajevo 1, the regions of Blažuj, Ilidža, Vogošća and Ilijaš were supplied too.

Due to the weak connections of this region to the electric power system, and often damages at the conductors caused by the war activities, during the first eight (8) months, the town was in 44% of this time totally without any voltage.

Due to the limited quantities of the electric power coming to the town, it was distributed mainly to the high priority consumers. In May 1993. the damages at the network were the reason that all connections with HP on the river Neretva stayed cut, and the system includes TP Kakanj and TP Tuzla with their minimum production (The shortage of the coal and fuel) provoking the limited consumption of 7-8 MW in Sarajevo, and periodically only 1-2 MW.

At this time there were some, longer periods when the town supply was broken. The longest period without any electric power was from June 21.1993. to August 13.1993. (53 days) when TS Sarajevo 7 was out of operation due to the damages at the network.

By the end of August 1993., after the connection with HP on the river Neretva was reestablished, the state is somehow improved and the close town region is delivered max. 25-30 MW that is over TS Sarajevo 7 directed mainly to the high priority consumers and to some households consumers. The table 2. shows the consumption with the ration between the maximum and average capacity stated for each month of 1993. during this period.

		1993.								Table 2.
Month		I	II	III	IV	V	VI	VII	VIII	Total I-VIII
TS SA 7	P <sub>max</sub> / P <sub>ave</sub> (MW)	55/39	51/35	49/37	58/40	52/19	22/8	0/0	38/15	
	W (GWh)	13,715	13,372	19,454	26,949	12,486	2,772		5,189	93,937
TS SA 1	P <sub>max</sub> / P <sub>ave</sub> (MW)	19/15	19/16	20/15	20/15	17/9	8/4	4/3	15/7	
	W (GWh)	5,27	6,143	7,817	9,876	5,952	1,601	1,045	3,949	41,653
TOTAL	W (GWh)	18,985	19,515	27,271	36,825	18,438	4,373	1,045	9,138	135,59

#### 4. ELECTRICITY NEEDS OF THE CLOSE REGION OF THE TOWN SARAJEVO UP TO THE END OF 1993. AND THE SUGGESTIONS FOR THEIR REALIZATION

Any precise recognition of the electricity needs of the close region of the town Sarajevo up to the end of 1993. can be hardly done without taking into consideration the availability of other energents (gas, oil, solid fuels).

Still, according to the available data, it has been done the consumption forecast for the close town region up to the end for 1993. and enclosed at the table 3.

Table 3.

	IX/93.	X/93.	XI/93.	XII/93.
P <sub>max</sub> (MW)	72,8	90,1	109,7	117,5
W (GWh)	41,05	55,10	60,84	68,65

The realization of this forecast asks the operative state of the certain transformer stations 110/x kV, transmission lines 400 kV and 110 kV, and some distribution transformer stations, medium and low voltage network.

The inevitable precondition for the above realization is the necessary providing of the generating capacities at HP<sup>g</sup> and TP<sup>g</sup>

The transmission of the necessary quantities of the electric power to the close town region up to the end of 1993. asks the operation of the transformer stations 110/x kV and the transmission lines 400 kV and 110 kV.

##### Necessary transformer stations:

- TS 110/35 kV Sarajevo 2 (Velešići) 63 + 31,5 MVA
- TS 110/10 kV Sarajevo 5 (Koševo) 2 x 31,5 MVA
- TS 110/10 kV Sarajevo 7 (B. Potok) 2 x 31,5 MVA
- TS 110/10 kV Sarajevo 14 (Otoka) 2 x 31,5 MVA

Necessary transmission lines:

- TL 400 kV Sarajevo 10-Tuzla
- TL 110 kV Sarajevo 10-Sarajevo 4
- TL 110 kV Sarajevo 4 - Sarajevo 2
- TL 110 kV Sarajevo 2-Sarajevo 5
- TL 110 kV Sarajevo 1-HP Jablanica II and III
- TL 110 kV Sarajevo 1-Sarajevo 18-Sarajevo 20
- TL 110 kV Sarajevo 20-Sarajevo 14-Sarajevo 15
- TL 110 kV Sarajevo 10-Sarajevo 2
- TL 110 kV TP Kakanj-Sarajevo 4
- TL 110 kV Sarajevo 1-Jablanica I
- TL 110 kV Sarajevo 4-Sokolac
- TL 110 kV Sarajevo 10-Sarajevo 7-1

The repair of all above mentioned lines 400 and 110 kV connects into the electric energy system the stated transformer stations and also gives the possibility of linking TS Sarajevo 1, TS Sarajevo 4, TS Hadžići, TS Sokolac and TS Pale to the system.

The repair of the above transmission lines 400 and 110 kV and uniting the above transformer stations into the electric power system enables the electricity to be provided for the close region of the town Sarajevo.

The quality and stability of the power supply of the close town region is conditioned by placing all four transformer stations (each of them with two energy transformers) into operation.

The repair of the transmission lines and placing the transformer stations into the full operation ask the necessary equipment, materials, tool and other items listed at the specifications.

The specifications of the equipment, materials and other items necessary for the sanation and revitalization state both the type of the product and the producer enabling an easy exchange of the destroyed and damaged equipment without restricting the same producer.

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**5. SPECIFICATION OF THE EQUIPMENT, MATERIALS,  
DEVICES, INSTRUMENTS AND TOOL FOR THE  
SANATION AND REVITALIZATION OF THE  
TRANSFORMER STATIONS**

5.1. Transformer station 110/35/10 kV Sarajevo 2

1. Specification of equipment and materials

Number	Equipment	Units Quant.		Unit price	Total price (DEM)
0	1	2	3	4	5
<i>Ref</i>	1. Outdoor three-pole interrupter (consisting of three single-pole interrupters) with following characteristics: -Max.operating voltage 123 kV -Nominal current: 1250 A -Cut-off short circuit current: 31,5 kA -medium for arch extinguish-oil -Elec.motor drive 220V DC -Auxilliary drive voltage 220 V DC -Signal on-off switch with 16 current paths type HPGE 11/15 product of "Energoinvest"	pcs.	3	40.000	120.000
	2. Outdoor three-pole in-line disconnector with poles in parallel, with following characteristics: -max.operating voltage 123 kV -rated current 1250 A -thermal current $I_t=31,5$ kA/sec. -elec.motor drive 220 V DC -auxiliary drive voltage 220 V DC -signal on-off switch with 16 current paths -hand phase-to.earth with signal on-off switch with 8 current paths type RSM-11 or VRV-11 product of "Energoinvest"	pcs.	2	25.000	50.000
	3. Outdoor current instrument transformer with following characteristics: -max.operating voltage 123 kV -transformer ratio: I core 2x200/5A, cl.0,5 capacity 15 VA, FS=5 II core 2x200/5A cl.10 P10,30 VA -thermal current $I_{th}=40$ kA				

Ref-

0	1	2	3	4	5
	-dynamic current $I_{dyn}=100$ kA type TPE 11 c product of "Energoinvest"	pcs.	3	7.390	22.170
4.	Capacity voltage divider for outdoor installation with following characteristics: -max.operating voltage 123 kV -transformer ratio: 110/ $\sqrt{3}$ /0,1/ $\sqrt{3}$ kV -power 150 VA;cl.0,5 -capacity 8000-1000pF type MBH 123 product of "Energoinvest"	pcs.	5	6.120	30.600
5.	Zincoxide overvoltage arrester with following characteristics: - $U_n \geq 89$ kV- $I_n = 10$ kA product of "Energoinvest"	pcs.	3	5.000	15.000
6.	HF damp with following characteristics: -nominal current 630 A -max.operating voltage:123 kV -inductivity 0,2 mH product of "Energoinvest"	pcs.	2	8.000	16.000
7.	Conductive insulator for power transformer with following characteristics: -max.voltage: 123 kV -nominal current 400-550A -type CTf-123 550-400 A or an equivalent product of "Mikafil"	pcs.	2	3.450	6.900
8.	Outdoor mobile-drawable block for max.operating voltage 38 kV, 50 Hz with following assembled equipment: -outdoor three-pole minimum oil circuit breaker with following characteristics: nominal current: 630 A, max. voltage: 38 kV, cut-off short circuit current: 12 kA elec.motor drive: 220 V DC signal on-off switch with 12 current paths type HPGE 7-9.... piece 1				

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0	1	2	3	4	5
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-Current instrument transformer for outdoor installation with following characteristics:  
 max. voltage 38 kV,  
 transformer ratio:2x150/5/5A  
 first core:cl.0,5;F<sub>S</sub>=5;30 VA  
 second core:cl.10 P 10;30 VA  
 type TE 7-8.... pieces 3

The mobile-drawable block is designed for the montage on the steel rails assembled at the concrete basement

product of "Energoinvest" pcs. 3 35.000 105.000

9. Mobile-drawable block for outdoor installation for max. operating voltage 38 kV, 50 Hz with following characteristics:  
 -Outdoor three-pole minimum oil circuit breaker with following characteristics:  
 nominal current: 630 A,  
 max.voltage: 38 kV,  
 cut-off short circuit current: 12 kA  
 elec.motor drive: 220 V DC  
 signal on-off switch with 12 current paths  
 type HOGE 7-9 .... piece 1

-Outdoor power instrument transformer, with following characteristics:  
 max.voltage: 38 kV,  
 transf.ratio: 2x400/5/5A,  
 I core: cl.0,5;F<sub>S</sub>=5;30 VA,  
 II core:cl.10 P10; 30 VA  
 type TE 7-8 .... pieces 3  
 The mobile-drawable block is designed for the montage on the steel rails assembled at the concrete basement  
 product of "Energoinvest" pcs. 1 35.000 35.000

10. Zinc oxide overvoltage arrester with following characteristics:  
 U<sub>n</sub>= 39 kV; I<sub>n</sub> = 10 kA  
 product of "Energoinvest" pcs. 3 520 1.560

11. Interposing current transformer with transformer ratio 1/5A type STEM-10  
 product of "Energoinvest" pcs. 6 50 3.000

50  
500?

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	0	1	2	3	4	5
12	12.	Transformer oil Shell or Dial C or any other compatible oils	t.	20	4.000	80.000
13	13.	Silicate gel	kg.	15	120	1.800
T O T A L:						487.030

2.	Expenses of the sanation and revitalization of TS 110/35/10 kV Sarajevo 2					(DEM)
2.1.	Equipment 1-13 .....					487.030
2.2.	Electromontage works .....					97.406
2.3.	Transport and assurance .....					24.351
2.4.	Adjustment project realization .....					10.000
2.5.	Functional testing .....					1.200
2.6.	T O T A L .....					619.987

5.2. Transformer station 110/10 kV Sarajevo 5

1. Specification of equipment and materials

RF

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Number	Equipment	Units	Quant.	Unit price (DEM)	Total price (DEM)
0	1	2	3	4	5
	1. Transformer oil Sheel or Dial C or any other compatible oils	t.	2	4.000	8.000
	2. Gas SF6 for filling the metal enclosed substation	kg	150	30	4.500
<b>T O T A L:</b>					<b>12.500</b>

2. Expenses of the sanation and revitalization of TS 110/10 kV Sarajevo 5					(DEM)
2.1.	Equipment 1-2 .....				12.500
2.2.	Electromontage works .....				1.000
2.3.	Transport and assurance .....				625
2.4.	Functional testing .....				300
2.5.	<b>T O T A L</b> .....				<b>14.425</b>

1/48

5.3. Transformer station 110/10 kV Sarajevo 7

1. Specification of equipment and materials

Number	Equipment	Units	Quant.	Unit price (DEM)	Total price (DEM)
0	1	2	3	4	5
4	1. Zincoxide overvoltage arrester with following characteristics: $U_n \geq 89$ kV; $I_n = 10$ kA product of "Energoinvest"	pcs.	6	5.000	30.000
5	2. Supporting rod insulator for outdoor instalation with following characteristics: -max.operating voltage:123 kV -breaking force: 400 daN product of "Energoinvest"	pcs.	2	1.000	2.000
15	3. Transformer oil Shell or Dial C or any other compatible oils	t.	2	4.000	8.000
2	T O T A L:				40.000

2.	Expenses of the sanation and revitalization of TS 110/10 kV Sarajevo 5				(DEM)
2.1.	Equipment 1-3 .....				40.000
2.2.	Electromontage works .....				3.200
2.3.	Transport and assurance .....				2.000
2.4.	Functional testing .....				300
2.5.	T O T A L .....				45.000

5.4. Transformer station 110/10 kV Sarajevo 14

1. Specification of equipment and materials

*Rdf*

*12*

Number	Equipment	Units	Quant.	Unit price (DEM)	Total price (DEM)
0	1	2	3	4	5
	1. Transformer oil Shell or Diala C or any other compatible oils	t.	33	4.000	132.000
T O T A L:					132.000

2. Expenses of the sanation and revitalization of TS 110/10 kV Sarajevo 5				(DEM)
2.1.	Equipment	.....		132.000
2.2.	Electromontage works	.....		10.560
2.3.	Transport and assurance	.....		6.600
2.4.	Functional testing	.....		200
2.5.	T O T A L	.....		149.360

5.5. Specification of device, instruments and tool

Number	Materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
0	1	2	3	4	5
1.	Device for filtering and vacuuming of transformer oil (6-10 t/h)	set	1	60.000	60.000
2.	Grease spray drier for insulated transformers at the field	set	1	50.000	50.000
3.	Device for SF6 manipulation and substation vacuuming (metal enclosed substations)	set	1	50.000	50.000
4.	Detector of SF6 gas presence (portable)	pcs.	4	2.000	8.000
5.	Detector (portable) of nitrogen presence (leaking from the metal enclosed substation)	pcs.	2	10.000	20.000
6.	Mobile (portable) device for compressed air with filtering, for pneumatic operations, with operating pressure up to 16 bars	pcs.	1	15.000	15.000
7.	Instrument device for dielectric hardness of transformer oil (portable) for high voltage transformers (up to 400 kV/cm)	pcs.	2	5.000	10.000
8.	Elec. motor pump with flow registrator, for pouring the transformer oil, capacity 2-3 t/h	pcs.	2	1.000	2.000
9.	Elec. motor pump with flow registrator, for pouring the transformer oil, capacity up to 20 t/h	pcs.	1	5.000	5.000
10.	Inductor insulation tester 2,5 and 5 kV (hand drive)	pcs.	2	3.000	6.000
11.	Inductor insulation tester 5 kV (motor drive)	pcs.	1	8.000	8.000
12.	Instrument set for testing magnetizing currents and transformer ratio of voltage transformers	set	1	20.000	20.000

0	1	2	3	4	5
13.	Complete sets of mechanic tool for montagers	set	10	6.000	60.000
14.	Set of the hydraulic cranes from 50 to 100 t, with command board, motor pump and equipment, for lifting voltage transformers	set	1	20.000	20.000
T O T A L:					334.000

5.6. Expenses for sanation and revitalization of transformer stations

Transformer station	Recapitulation of revitalization expenses						Total (DEM)
	Equip	El.montage works	Transport & assurance	Project realization	Functional testing		
JELEŠIĆI TS 110/10/35 kV Sarajevo 2	487.030	97.406	24.351	10.000	1.200	619.987	
KOSEVO TS 110/10 kV Sarajevo 5	12.500	1.000	625	-	300	14.425	
UČA POTOK TS 110/10 kV Sarajevo 7	40.000	3.200	2.000	-	300	45.500	
STOKA TS 110/10 kV Sarajevo 14	132.000	10.560	6.600	-	200	149.360	
Device, instruments, tool						334.000	
<b>T O T A L:</b>	<i>671.530</i>	<i>112.166</i>	<i>335.76</i>	<i>10.000</i>	<i>2.000</i>	1.163.272	

*124.166*

*+ 1 kanga 110/10 kV - 555.000*  
*+ 3 kanga 35/10 kV - 450.000*  


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*1.015.000*

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**6. SPECIFICATION OF EQUIPMENT, DEVICES, INSTRUMENTS  
AND TOOL NECESSARY FOR THE SANATION AND REVITA-  
LIZATION OF TRANSMISSION LINES**

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## 6.1. TL 400 kV Sarajevo 10-Tuzla

## 1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
0	1	2	3	4	5
1.	Conductor Al-Fe 490/65 mm <sup>2</sup>	kg	14.400	8	115.200
2.	Conductor EAl-Mg 120/70 mm <sup>2</sup>	kg	2.300	10	23.000
3.	DT - string 400 kV	pcs.	18	2.700	48.600
4.	DC - string 400 kV	pcs.	36	2.600	93.600
5.	SC - string 400 kV	pcs.	12	1.100	13.200
6.	DC-V string 400 kV	pcs.	12	2.600	31.200
7.	Carrying suspension of earth conductor	pcs.	4	60	240
8.	Tensioning suspension of earth conductor	pcs.	2	120	240
9.	Proceeding compression connector for conductor 490/65 mm <sup>2</sup>	pcs.	18	60	1.080
10.	Tensioning compression connector for conductor 490/65 mm <sup>2</sup>	pcs.	12	100	1.200
11.	Compression connector for conductor 490/65 mm <sup>2</sup> repair	pcs.	50	40	2.000
12.	Prolonging compression conductor for EAl-Mg 120/70 mm <sup>2</sup>	pcs.	15	80	1.200
13.	Compression connector for conductor EAL-Mg 120/70 mm <sup>2</sup> repair	pcs.	30	90	2.700
14.	Glass insulator U160BS	pcs.	2.300	45	103.500
15.	Zinc armature for earth electrode	kg	200	3	600
16.	Clamp for earth electrode	pcs.	10	15	150
17.	Elastic distancer 400 mm	pcs.	40	20	800
18.	Zinc adapted construction	kg	24.500	2,5	61.250
T O T A L: (1-18)					499.760

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0	1	2	3	4	5
2.	Construction and electromon- tage works, technical docu- mentation, regulation of property relations, preliminary works, transport assurance of equipment and materials				160.000
3.	Recapitulation (1+2)				659.760

6.2. TL 110 kV Sarajevo 10-Sarajevo 4

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	18.000	8	144.000
2.	Conductor EAl-Mg 95/55 mm <sup>2</sup>	kg	2.500	10	25.000
3.	DT-string 110 kV	pcs.	24	960	23.040
4.	DC-string 110 kV	pcs.	36	930	33.480
5.	SC-string 110 kV	pcs.	-	-	-
6.	Carrying suspension of earth conductor	pcs.	6	20	120
7.	Tensioning suspension of earth conductor	pcs.	4	40	160
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	60	37	2.220
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	80	16	1.280
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	10	54	540
11.	Glass insulators U120BS	pcs.	1.000	32	32.000
12.	Zinc armature for earth electrode	kg	-	-	-
13.	Clamp for earth electrode	pcs.	-	-	-
14.	Zinc adapted tower construction (various profiles)	kg	6.000	2,5	15.000
<b>T O T A L: 1-14</b>					<b>276.840</b>
2.	Construction and electro-montage works, technical documentation, regulation of property relations, preliminary works, transport and assurance of equipment and materials				160.000
3.	Recapitulation (1+2)				356.840

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6.3. TL 110 kV Sarajevo 2-Sarajevo 4

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	10.000	8	80.000
2.	Conductor Fe III 50 mm <sup>2</sup>	kg	800	5	4.000
3.	DT-string 110 kV	pcs.	18	960	17.280
4.	DC-string 110 kV	pcs.	12	930	11.160
5.	SC-string 110 kV	pcs.	6	450	2.700
6.	Carrying suspension of earth conductor	pcs.	6	20	120
7.	Tensioning suspension of earth conductor	pcs.	4	40	160
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	50	37	1.850
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	40	16	640
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	6	54	324
11.	Glass insulators U120BS	pcs.	1.500	32	48.000
12.	Zinc armature for earth electrode	kg	70	3	210
13.	Clamp for earth electrode	pcs.	2	5	10
14.	Zincd adapted tower construction (various profiles)	kg	16.000	2,5	40.000
<b>T O T A L: 1-14</b>					<b>206.454</b>

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|----|--|---------|
| 2. | Construction and electro-montage works, technical documentation, regulation of property relations, preliminary works, transport and assurance of equipment and materials | 90.000  |
| 3. | Recapitulation (1+2)   | 296.454 |

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6.4. TL 110 kV Sarajevo 2-Sarajevo 5

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	9.000	8	72.000
2.	Conductor Fe III 50 mm <sup>2</sup>	kg	1.600	5	8.000
3.	DT-string 110 kV	pcs.	8	960	7.860
4.	DC-string 110 kV	pcs.	12	930	11.160
5.	SC-string 110 kV	pcs.	6	450	2.700
6.	Carrying suspension of earth conductor	pcs.	4	20	80
7.	Tensioning suspension of earth conductor	pcs.	2	40	80
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	50	37	1.850
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	60	16	960
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	4	54	216
11.	Glass insulators U120BS	pcs.	1.600	32	51.200
12.	Zinc armature for earth electrode	kg	-	-	-
13.	Clamp for earth electrode	pcs.	-	-	-
14.	Zinc adapted tower construction (various profiles)	kg	7.500	2,5	18.750
<b>T O T A L: 1-14</b>					<b>174.676</b>

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| 2. | Construction and electro-montage works, technical documentation, regulation of property relations, preliminary works, transport and assurance of equipment and materials | 80.000  |
| 3. | Recapitulation (1+2)   | 254.676 |

6.5. TL 110 kV Sarajevo 1-Jablanica II and III

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	30.000	8	240.000
2.	Conductor Fe III 50 mm <sup>2</sup>	kg	3.000	5	15.000
3.	DT-string 110 kV	pcs.	36	960	34.560
4.	DC-string 110 kV	pcs.	36	930	33.480
5.	SC-string 110 kV	pcs.	18	450	8.100
6.	Carrying suspension of earth conductor	pcs.	18	20	360
7.	Tensioning suspension of earth conductor	pcs.	12	40	480
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	40	37	1.480
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	80	16	1.280
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	6	54	324
11.	Glass insulators U120BS	pcs.	3.500	32	112.000
12.	Zinc armature for earth electrode	kg	200	3	600
13.	Clamp for earth electrode	pcs.	6	5	30
14.	Zinc adapted tower construction (various profiles)	kg	16.000	2,5	40.000
T O T A L: 1-14					487.694

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| 2. | Construction and electro-montage works, technical documentation, regulation of property relations, preliminary works, transport and assurance of equipment and materials | 207.000 |
| 3. | Recapitulation (1+2)   | 694.694 |

6.6. TL 110 kV Sarajevo 1-Sarajevo 18-Sarajevo 20

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	36.000	8	288.000
2.	Conductor Fe III 50 mm <sup>2</sup>	kg	1.200	5	6.000
3.	DT-string 110 kV	pcs.	18	960	17.280
4.	DC-string 110 kV	pcs.	24	930	22.320
5.	SC-string 110 kV	pcs.	12	450	5.400
6.	Carrying suspension of earth conductor	pcs.	6	20	120
7.	Tensioning suspension of earth conductor	pcs.	4	40	160
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	18	37	666
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	80	16	1.280
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	8	54	432
11.	Glass insulators U120BS	pcs.	3.000	32	96.000
12.	Zinc armature for earth electrode	kg	-	-	-
13.	Clamp for earth electrode	pcs.	-	-	-
14.	Zinc adapted tower construction (various profiles)	kg	38.000	2,5	95.000
15.	Conductor Al-Fe 150/25 mm	kg	1.500	8	12.000
T O T A L: 1-15					544.658

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| 2. | Construction and electro-<br>montage works, technical docu-<br>mentation, regulation of pro-<br>perty relations, preliminary<br>works, transport and assurance<br>of equipment and materials | 280.000 |
| 3. | Recapitulation (1+2)   | 824.658 |

6

6.7. TL 110 kV Sarajevo 20-Sarajevo 14-Sarajevo 15

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	30.000	8	240.000
2.	Conductor Fe III 50 mm <sup>2</sup>	kg	2.000	5	10.000
3.	DT-string 110 kV	pcs.	24	960	23.040
4.	DC-string 110 kV	pcs.	24	930	22.320
5.	SC-string 110 kV	pcs.	-	-	-
6.	Carrying suspension of earth conductor	pcs.	6	20	120
7.	Tensioning suspension of earth conductor	pcs.	2	40	80
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	20	37	740
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	40	16	640
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	4	54	216
11.	Glass insulators U120BS	pcs.	1.100	32	35.200
12.	Zinc armature for earth electrode	kg	350	3	1.050
13.	Clamp for earth electrode	pcs.	10	5	50
14.	Zinc adapted tower construction (various profiles)	kg	38.000	2,5	95.000
<b>T O T A L: 1-14</b>					<b>428.456</b>

2. Construction and electro-montage works, technical documentation, regulation of property relations, preliminary works, transport and assurance of equipment and materials

215.000

3. Recapitulation (1+2)

643.456

6.8. TL 110 kV Sarajevo 10-Sarajevo 2

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	9.000	8	72.000
2.	Conductor Fe III 50 mm <sup>2</sup>	kg	1.200	5	6.000
3.	DT-string 110 kV	pcs.	12	960	11.520
4.	DC-string 110 kV	pcs.	21	930	19.530
5.	SC-string 110 kV	pcs.	6	450	2.700
6.	Carrying suspension of earth conductor	pcs.	4	20	80
7.	Tensioning suspension of earth conductor	pcs.	3	40	120
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	50	37	1.850
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	50	16	800
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	6	54	324
11.	Glass insulators U120BS	pcs.	1.000	32	32.000
12.	Zinc armature for earth electrode	kg	75	3	225
13.	Clamp for earth electrode	pcs.	2	5	10
14.	Zinc adapted tower construction (various profiles)	kg	6.000	2,5	15.000
<b>T O T A L: 1-14</b>					<b>162.159</b>
2.	Construction and electro-montage works, technical documentation, regulation of property relations, preliminary works, transport and assurance of equipment and materials				69.000
3.	Recapitulation (1+2)				231.159

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6.9. TL 110 kV Kakanj-Sarajevo 4

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	17.000	8	136.000
2.	Conductor Fe III 50 mm <sup>2</sup>	kg	1.600	5	8.000
3.	DT-string 110 kV	pcs.	18	960	17.280
4.	DC-string 110 kV	pcs.	24	930	22.320
5.	SC-string 110 kV	pcs.	6	450	2.700
6.	Carrying suspension of earth conductor	pcs.	10	20	200
7.	Tensioning suspension of earth conductor	pcs.	6	40	240
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	50	37	1.850
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	50	16	800
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	6	54	324
11.	Glass insulators U120BS	pcs.	1.600	32	51.200
12.	Zinc armature for earth electrode	kg	-	-	-
13.	Clamp for earth electrode	pcs.	-	-	-
14.	Zinc adapted tower construction (various profiles)	kg	5.000	2,5	12.500
<b>T O T A L: 1-14</b>					<b>253.414</b>

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| 2. | Construction and electro-montage works, technical documentation, regulation of property relations, preliminary works, transport and assurance of equipment and materials | 105.000 |
| 3. | Recapitulation (1+2)   | 358.414 |

64

6.10. TL 110 kV Sarajevo 1-Jablanica I

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	12.000	8	96.000
2.	Conductor Fe III 50 mm <sup>2</sup>	kg	1.500	5	7.500
3.	DT-string 110 kV	pcs.	24	960	23.040
4.	DC-string 110 kV	pcs.	18	930	16.740
5.	SC-string 110 kV	pcs.	12	450	5.400
6.	Carrying suspension of earth conductor	pcs.	12	20	240
7.	Tensioning suspension of earth conductor	pcs.	6	40	240
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	50	37	1.850
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	50	16	960
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	6	54	324
11.	Glass insulators U120BS	pcs.	1.500	32	48.000
12.	Zinc armature for earth electrode	kg	70	3	210
13.	Clamp for earth electrode	pcs.	5	5	25
14.	Zinc adapted tower construction (various profiles)	kg	5.000	2,5	13.750
T O T A L: 1-14					214.279

2. Construction and electro-  
montage works, technical docu-  
mentation, regulation of pro-  
perty relations, preliminary  
works, transport and assurance  
of equipment and materials

32000

3. Recapitulation (1+2)

306279

65

6.11. TL 110 kV Sarajevo 4-Sokolac

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	1.500	8	12.000
2.	Conductor Fe III 50 mm <sup>2</sup>	kg	200	5	1.000
3.	DT-string 110 kV	pcs.	-	-	-
4.	DC-string 110 kV	pcs.	4	930	3.720
5.	SC-string 110 kV	pcs.	-	-	-
6.	Carrying suspension of earth conductor	pcs.	-	-	-
7.	Tensioning suspension of earth conductor	pcs.	-	-	-
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	12	37	444
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	30	16	480
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	4	54	216
11.	Glass insulators U120BS	pcs.	500	32	16.000
12.	Zinc armature for earth electrode	kg	-	-	-
13.	Clamp for earth electrode	pcs.	-	-	-
14.	Zinc adapted tower construction (various profiles)	kg	1.000	2,5	2.500
<b>T O T A L: 1-14</b>					<b>36.360</b>

2.	Construction and electro-montage works, technical documentation, regulation of property relations, preliminary works, transport and assurance of equipment and materials				7.000
3.	Recapitulation (1+2)				43.360

6.12. TL 110 kV Sarajevo 10-Sarajevo 7-1

1. Specification of equipment and materials

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	26.000	8	208.000
2.	Conductor SLK cable	kg	4.300	18	77.400
3.	DT-string 110 kV	pcs.	12	960	11.520
4.	DC-string 110 kV	pcs.	36	930	33.480
5.	SC-string 110 kV	pcs.	-	-	-
6.	Carrying suspension of earth conductor	pcs.	8	25	200
7.	Tensioning suspension of earth conductor	pcs.	12	30	360
8.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	50	37	1.850
9.	Compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	40	16	640
10.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	8	30	240
11.	Glass insulators U120BS	pcs.	1.700	32	54.400
12.	Zinc armature for earth electrode	kg	-	-	-
13.	Clamp for earth electrode	pcs.	-	-	-
14.	Zinc adapted tower construction (various profiles)	kg	3.000	2,5	7.500

T O T A L: 1-14

395.590

2.	Construction and electro-montage works, technical documentation, regulation of property relations, preliminary works, transport and assurance of equipment and materials				160.000
3.	Recapitulation (1+2)				555.590

6.13. List of equipment and materials for TL 110 kV

Number	Equipment and materials	Units	Quant.	Unit price (DEM)	Total (DEM)
1	2	3	4	5	6
1.	Conductor Al-Fe 240/40 mm <sup>2</sup>	kg	198.500	8	1.588.000
2.	Conducotor EAl Mg 150/25 mm <sup>2</sup>	kg	1.500	8	12.000
3.	Conductor EAl Mg 95/55 mm <sup>2</sup>	kg	2.500	10	25.000
4.	Conductor Fe III 50 mm <sup>2</sup>	kg	13.100	5	65.500
5.	Conductor- SLK cable	m	4.300	18	77.400
6.	DT- string 110 kV	pcs.	194	960	186.240
7.	DC- string 110 kV	pcs.	247	930	229.710
8.	SC- string 110 kV	pcs.	66	450	29.700
9.	Carrying suspension of earth conductor	pcs.	72	20	1.440
10.	Tensioning suspension of earth conductor	pcs.	43	40	1.720
11.	Carrying suspension for SLK cable	pcs.	8	25	200
12.	Tensioning suspension for SLK cable	pcs.	12	30	360
13.	Proceeding compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	450	37	16.650
14.	Compression connector conductor 240/40 mm <sup>2</sup> reparis	pcs.	600	16	9.600
15.	Tensioning compression connector for conductor 240/40 mm <sup>2</sup>	pcs.	68	54	3.672
16.	Glass insulators U 120 BS	pcs.	18.000	32	576.000
17.	Zinced armature for earth electrode	kg	765	3	2.295
18.	Clamp for earth electrode	pcs.	25	5	125
19.	Zinced adapted tower construction (various profiles)	kg	141.500	2,5	353.750
<b>T O T A L: (1-19)</b>					<b>2.179.362</b>

Note:

DT - double tensioning

DC - double carrying

SC - single carrying

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6.14. Specification of devices, tool and service vehicles

Number	Materials	Units	Quant.	Unit price (DEM)	Total price (DEM)
0	1	2	3	4	5
<b>1. TOOLS</b>					
1001	1.1. Pulling (slide) ladder for strings, length 2,9 m	pcs.	4	260	1.040
1002	1.2. Pulling (slide) ladder for strings 220 kV, length 7,4 m	pcs.	4	410	1.640
1003	1.3. Pulling ladder for strings 110 kV length 2,5 m	pcs.	8	220	1.760
1004	1.4. Wire ladder for carrying strings 220 kV length 3 and 4,5 m	pcs.	8	110	880
1005	1.5. Ladder for repairs at tensioning pole, length 7,5 m. Made of light material, attested for this work. For easier transport and carrying, ladder is two-piece model	pcs.	4	170	680
1006	1.6. Ladder for repairs at carrying pole 400 kV, length 5 m, possibly in two pieces made	pcs.	4	130	520
1007	1.7. Traveller for steel rope-for lifting, spreading and tensioning	pcs.	10	250	2.500
1008	Catal. no. 49.10.20	pcs.	10	250	2.500
1009	Catal. no. 49.20.10	pcs.	10	250	2.500
1010	Catal. no. 49.30.20	pcs.	10	250	2.500
1011	1.8. Traveller for montage of protective ropes	pcs.	20	500	10.000
1012	Type 1. Catal.no. 49.25.50	pcs.	20	500	10.000
1013	Type 1. Catal.no. 49.35.50	pcs.	20	500	10.000
1014	Type 2. Catal.no. 49.35.90	pcs.	20	500	10.000
1014	1.9. Cutter-pliers type II and III for conductor linking 150-240 mm <sup>2</sup>	pcs.	8	300	2.400
1015	1.10. Hydraulic motor press for linking Fe and Al-Fe conductors with borer set "Fisterer" or any similar	pcs.	4	5.900	23.600

	0	1	2	3	4	5
1016	1.11.	Traveller for montage of conductors.cross section 5-11,7 mm Catal. no. 49.25.10	pcs.	20	750	15.000
1017	1.12.	Traveller for montage of conductors, cross section 18,1-22,4 mm Catal. no. 49.45.10.	pcs.	20	750	15.000
1018	1.13.	Traveller for montage conductors of cross section 12-18 mm Catal. no. 49.35.10	pcs.	20	750	15.000
1019	1.14.	Traveller for montage of conductors type Uboldi Italia 60/217	pcs.	20	750	15.000
1020	1.15.	Traveller for montage of conductors of 22,5-27,2 mm Catal.no. 49.65.10	pcs.	20	750	15.000
1021	1.16.	Traveller for tensioning the conductors for force up 5 t. Type 60/202 B.Uboldi-Italia	pcs.	10	700	7.000
1022	1.17.	Line car for repairs of conductors Type 60/204 Uboldi-Italia	pcs.	4	400	1.600
1023	1.18.	Clamp for conductor tensioning Type S 150 for conductor cross section 16-18 mm Catal. no. 48.07.150	pcs.	8	240	1.920
1024	1.19.	Clamp for conductor tensioning Type S-240, conductor cross section 18-22 mm Catal. no. 48.02.240	pcs.	8	250	2.000
1025	1.20.	Clamp for conductor tensioning Type S-360, conductor cross section 22-27 mm Catal. no. 48.02.360	pcs.	8	260	2.080
1026	1.21.	Clamp for conductor tensioning Type S-490 for conductor cross section 27-32 mm Catal. no. 48.02.490	pcs.	8	270	2.160
1027	1.22.	Clamp for conductor tensioning Type S-50 conductor cross section S-10,5 mm	pcs.	8	240	1.920

	0	1	2	3	4	5
1028 1.23. Clamp for conductor tensioning Type S-95 for conductor cross section 10,5-13 mm			pcs.	8	240	1.920
1029 1.24. Terminal sock for conductor spreading.cross section 10-13 mm Catal. no. 47.01.13			pcs.	5	110	550
1030 1.25. Terminal sock for conductor spreading.cross section 13-16 mm Catal. no. 47.01.16			pcs.	5	110	550
1031 1.26. Terminal sock for conductor spreading.cross section 19-23 mm Catal. no. 47.01.23			pcs.	5	110	550
1032 1.27. Terminal sock for conductor spreading.cross section 23-29 mm Catal. no. 47.01.29			pcs.	5	110	550
1033 1.28. Terminal sock for conductor spreading.cross section 29-38 mm Catal. no. 47.01.30			pcs.	5	110	550
1034 1.29. Universal devices for lifting and pulling,"Tirfor" Type T-13 pulling force of rope, 5,10,25,50 and 100 m			pcs	8	1.800	14.400
1035 1.30. Universal devices for lifting and pulling,"Tirfor" Type T-35, with pulling force, length 5,10,25 50 and 100 m			pcs.	8	2.500	20.000
1036 1.31. Tensioner Type A 60/141 for force up 3000 kg			pcs.	3	85	255
1037 1.32. Self-mobile device for conductor dragging with double winch,Model kW-7, pulling force 2x5 tons			pcs	1	45.000	45.000
1038 1.33. Flexible steel rope,cross cest.12 mm, 25,50 and 100 m			pcs.	5	350	1.750
1039 1.34. Flexible steel rope,cross sect.16 mm,25,50 and 100 m			pcs.	5	380	1.900
1040 1.35. Synthetic or hemp rope, 12 mm length 100 m			pcs.	8	600	4.800

	0	1	2	3	4	5
1041	1.36.	Synthetic or hemp rope, 16 mm length 100 m	pcs.	20	800	16.000
1042	1.37.	Monter tool (complet)	pcs.	10	100	1.000
1043	1.38.	Motor saw for tree cutting "STHIL" small model	pcs.	3	1.000	3.000
1044	1.39.	Motor saw for tree cutting "STHIL" bigger model	pcs.	3	1.400	4.200
1045	1.40.	Diesel power load set up 3 kW	pcs.	3	2.800	8.400
1046	1.41.	Portable hydraulic hand high-pressure press for conductor linking, with hose 10 m	set	4	2.250	9.000
1047	1.42.	Insert+Hydraulic hand press for conductors Al-Fe 490/65, 360/57,240/40,150/25 and Fe 50 mm <sup>2</sup>	set	3	1.500	4.500
1048	1.43.	Hydraulic motor press for conductors 490/65,360/57, 240/40,150/25 Al-Fe and Fe 50 mm <sup>2</sup>	set	3	4.400	13.200
1049	1.44.	Insert-Hydraulic motor press for conductors Al-Fe 490/65, 360/57,240/40,150/25 and Fe 50 mm <sup>2</sup>	set	3	1.500	4.500
1050	1.45.	Pliers for cutting Al-Fe conductor 490/65 mm <sup>2</sup>	set	2	950	1.900
1051	1.46.	Belts with safety rope	set	20	250	5.000
1052	1.47.	Hand borer up 16 mm	set	4	750	3.000
1053	1.48.	Device for spreading and tensioning of conductor at TL 380 kV (conduvtor in bundle). min.pulling force 10 t.Device is selfmobile with possible automatic regulation of pulling force (similar device is Japanese product mod.NokW7 TWIN CAPSTANS SELF-DRIVING PULLER)	pcs.	1	135.000	135.000
1054	1.49.	Brake for device for conduc- tor pulling,with possible au- tomatic regulation of braking force Brake is adapted for drive over bad terrains, equipped with driveshaft for connection to motor vehicles	pcs.	1	135.000	135.000

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	0	1	2	3	4	5
1055 1.50. Flexible metal connector(rope) "PILOT SAJLA" cros.sect.6 mm, min.breaking force 1.600 kg Rope is to be 1.000 m coiled at iron spools.Rope terminals are adjusted for easy proceed- ing with suitable turning swivel				4	1.500	6.000
1056 1.51. Flexible metal conductor (rope) for pulling,cross sect. 12-13, min.breaking force 7.500 kg.Rope is deli- vered in 800 m lengths coiled at metal spools.Rope terminals are adjusted for an eesy pro- ceeding with suitable turning swivel				5	4.000	20.000
1052 1.52. Flexible metal rope for con- ductor tensioning, cr.sec. 18 mm, min breaking force 18.000 kg. Rope is delivered in 3.000 m lengths coiled at metal spols. Rope ends are adjusted for an easy proceed- ing or connected to pull devices				2	11.500	23.000
1058 1.53. Device for conductor encolling from spools. Device is equipped with own hand lifter and hand brake. Made of light material adjusted for uncoiling connec- tor from spools, cross sec. up 2,0 m.capacity 4.000 kg Note: Similar product from "UBOLDI" Italia				4	1.000	4.000
1053 1.54. Device for conductor coiling with hand chain drive. Other data same as Item 1.53.				4	1.000	4.000
1060 1.55. Hand lifter (device) for unloading the insulator strings by replacement insulator units at carrying insulator poles with max.string or rope length up 6 m for min.force 5.000 kg. Device is to be light(less than 20 kg)and adjusted for repairs at tensioning and carrying po- les(horizontal and vertical posi- tion of works)				4	1.000	4.000

	0	1	2	3	4	5
<p>1061</p> <p>1.56. Traveller for spreading conductors in bundle (2 conductor bundle at horizontal position of 400 mm space) Equipped with auxiliary travellers for passing the spread connector Max.vertical load of traveller 12.000 kg. Made of light and solid material. Gutter 70 mm coated with plastic mass. Note: Above traveller is similar to TESMEC Type 651</p>				pcs. 30	2.000	60.000
<p>1062</p> <p>1.57. Balance traveller (for force equaling) for spreading connectors in bundle, (two connector bundle, 400 mm spaces) Min.loading force 12.000 kg) Adjusted for connector spreading through the travellers described in Item 1.56 Note: Similar traveller is produced by TESMEC mod.641</p>				pcs. 4	650	2.600
<p>1063</p> <p>1.58. System of complex of trans. ferrable travellers for conductor tensioning with two complex traveller systems with iron drive cord for 12.000 kg rope Note: Similar traveller system is produced by TESMEC mod. 301</p>				pcs. 4	600	2.400
<p>1064</p> <p>1.59. Single traveller for conductor spreading.cross sec. 600 mm, gutter 70 mm for vertical force 6.000 kg, Gutter is coated with plastic mass.</p>				pcs. 30	700	21.000
<p>1065</p> <p>1.60. Line car for distant ring montage at conductors in bundle(of two conductor) with 400 mm space. Line car is with chain foot drive equipped with brake and distance counter Note: Similar car is produced by TESMEC mod. 661</p>				pcs. 4	700	2.800

	0	1	2	3	4	5
1066 1.61. Line car for slight repairs and works at conductors (one conductor) similar to UBOLDI T/1050(ex 60/240) Made of light material			pcs.	4	350	1.400
1067 1.62. Prolonging sock for proceeding conductors at spreading Cross sect. 18-30 mm			pcs.	10	100	1.000
1068 1.63. Prolonging sock for proceeding conductors at spreading Cross sect. 11-14,5 mm			pcs.	10	100	1.000
1069 1.64. Interconnector for steel rope prolonging for conductor spreading with 5.000 kg. force.			pcs.	10	20	200
1070 1.65. Turning swivel for 12.000 force.			pcs.	20	50	1.000
1071 1.66. Portable dynamometer for force matching at conductors Adjusted to force matching of conductors at tensioning condition			pcs.	4	600	2.400
1072 1.67. Service vehicle with winch (8 seats)			pcs.	2	30.000	60.000
1073 1.68. Set of earthing tool for 110 kV voltage			pcs.	8	1.000	8.000
1074 1.69. Set of earthing tool for 220 kV voltage			pcs.	4	1.500	6.000
1075 1.70. Set of earthing tool for 400 kV voltage			pcs.	2	2.000	4.000
<b>T O T A L:</b>						<b>837.475</b>

NOTE:

Catalog numbers mentioned at the above specification are taken from the technical documentation of "DALEKOVOD" Zagreb

6.15. Expenses of sanation and revitalization of TL 400 and 110 kV

TRANSMISSION LINE	Equipment & material (DEM)	Works (DEM)	Total (DEM)
1. TL 400 kV Sarajevo 10-Tuzla	499.760	160.000	659.760
2. TL 110 kV Sarajevo 10-Sarajevo 4	276.840	80.000	356.840
3. TL 110 kV Sarajevo 2-Sarajevo 4	206.454	90.000	296.454
4. TL 110 kV Sarajevo 2-Sarajevo 5	174.676	80.000	254.676
5. TL 110 kV Sarajevo 1-Jablanica II and III	487.694	207.000	694.694
6. TL 110 kV Sarajevo 1-Sarajevo 18-Sarajevo 20	544.658	280.000	824.658
7. TL 110 kV Sarajevo 20-Sarajevo 14-Sarajevo 15	428.456	215.000	643.456
8. TL 110 kV Sarajevo 10-Sarajevo 2	162.159	69.000	231.158
9. TL 110 kV Kakanj-Sarajevo 4	253.414	105.000	358.414
10. TL 110 kV Sarajevo 1-Jablanica I	214.278	92.000	306.278
11. TL 110 kV Sarajevo 4-Sokolac	36.360	7.000	43.360
12. TL 110 kV Sarajevo 10-Sarajevo 7-I	395.590	160.000	555.590
<b>T O T A L: (1-12)</b>	<b>3.680.339</b>	<b>1.545.000</b>	<b>5.225.339</b>

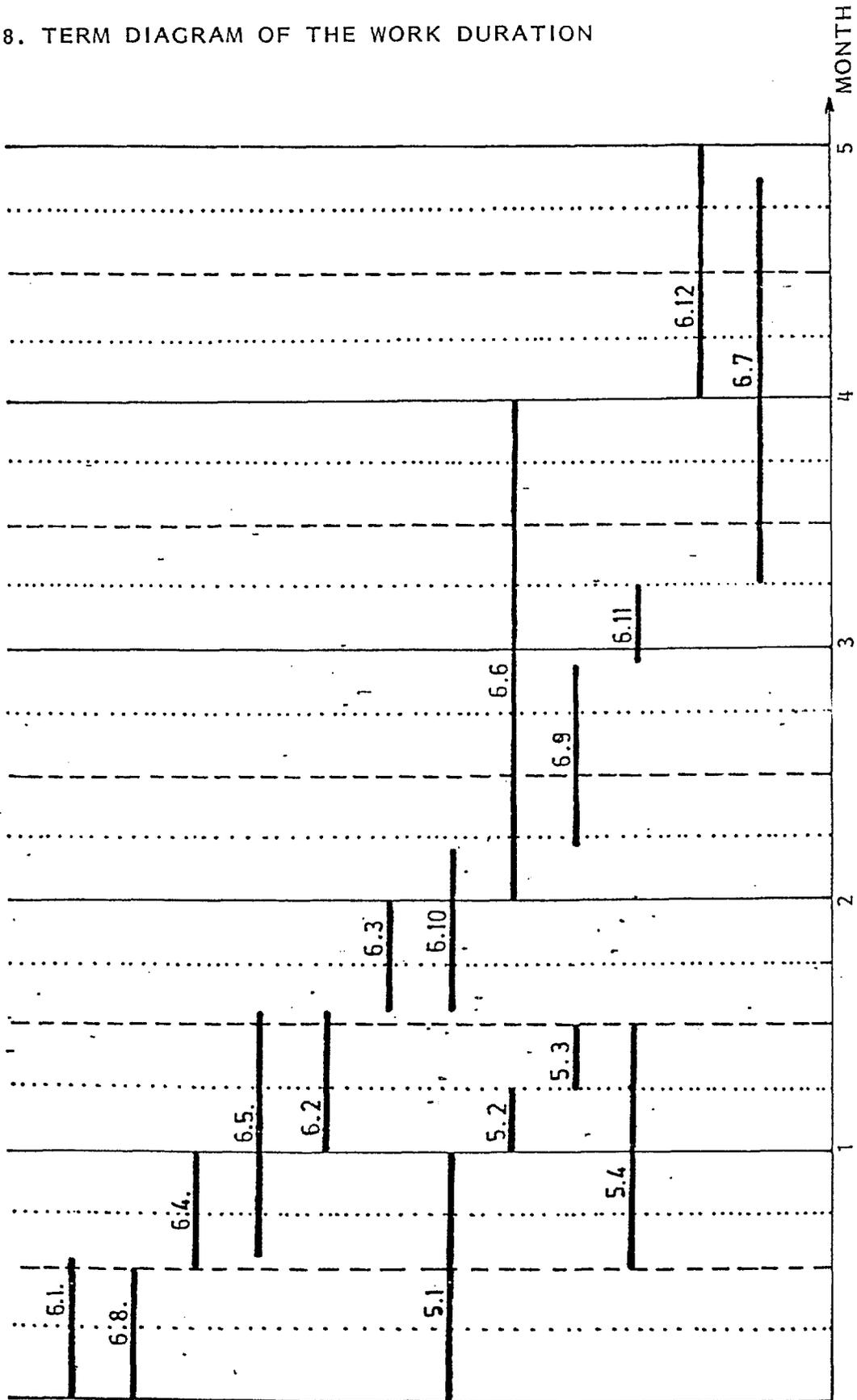
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**7. RECAPITULATION OF THE EXPENSES FOR SANATION  
AND REVITALIZATION OF TRANSFORMER STATIONS  
AND TRANSMISSION LINES**

Electric energy facility	Equipment (DEM)	Works, other expenses (DEM)	Devices, instrumen. and tool (DEM)	Total (DEM)
Transmission lines 400 and 110 kV	3.680.339	1.545.000	837.475	6.062.814
Transformer stations 110/x kV	671.530	157.742	334.000	1.163.272
<b>T O T A L:</b>				<b>7.226.086</b>

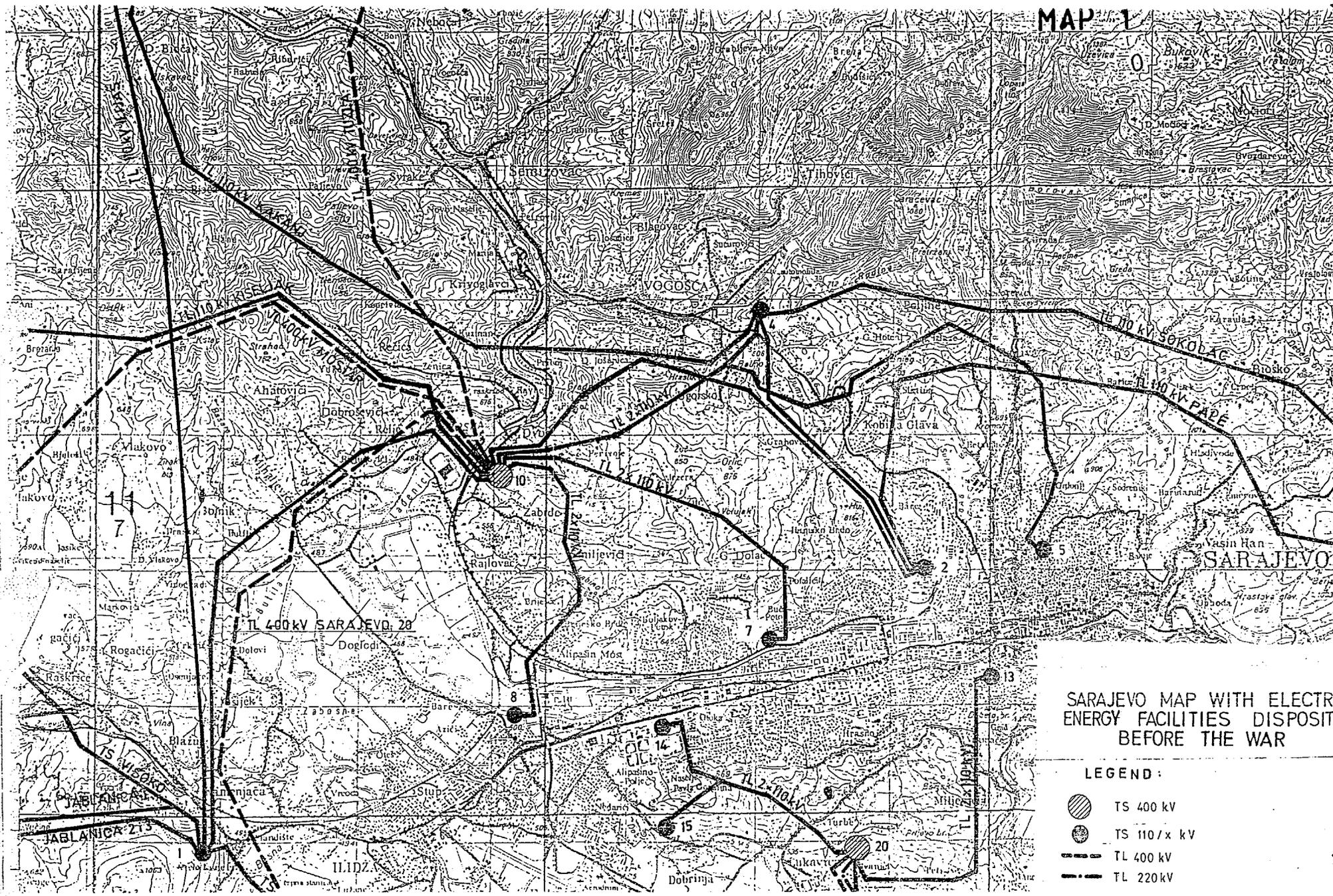
1. Transformation 110/10KV 31,5 MVA 5 000  
 2. Transformation 35/10KV 8 MVA 4 000  
 ↳ station VIJEČNICA 5  
 SAZ VELISICA 1  
 1 015 000

### 8. TERM DIAGRAM OF THE WORK DURATION



LEGEND: 5.1.-5.4.: transformer stations from Item 5. proposed for sanitation and revitalization  
6.1.-6.12.: transmission lines from Item 6. proposed for sanitation and revitalization

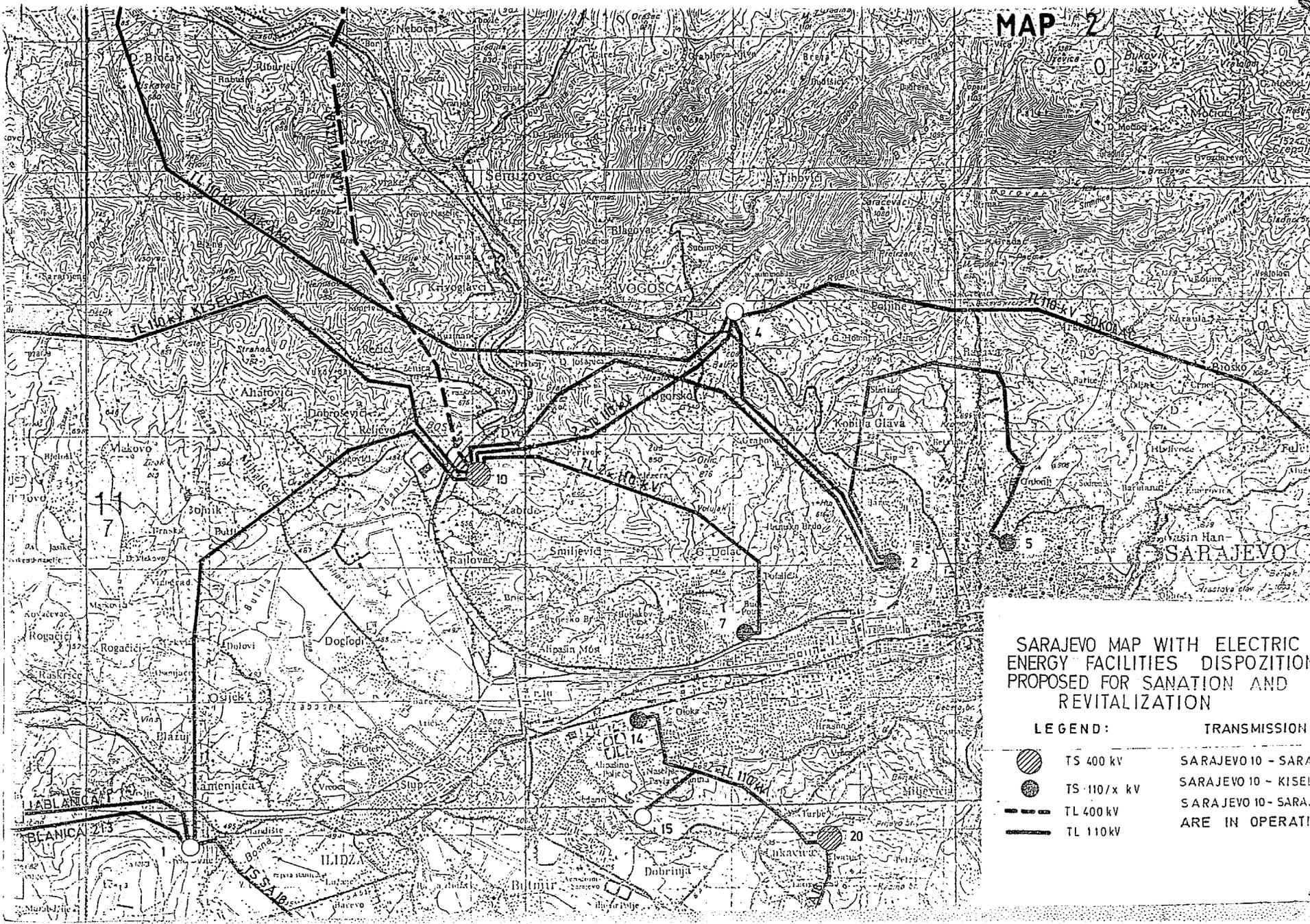
Note: Term foreseen for works supposes all equipment, materials, tool, machines, vehicles and others are provided and weather conditions do not delay the works.



SARAJEVO MAP WITH ELECTRICAL ENERGY FACILITIES DISPOSITION BEFORE THE WAR

LEGEND :

-  TS 400 kV
-  TS 110/70 kV
-  TL 400 kV
-  TL 220 kV



SARAJEVO MAP WITH ELECTRIC ENERGY FACILITIES DISPOSITION PROPOSED FOR SANATION AND REVITALIZATION

LEGEND:		TRANSMISSION
	TS 400 kV	SARAJEVO 10 - SARA
	TS 110/x kV	SARAJEVO 10 - KISEL
	TL 400 kV	SARAJEVO 10 - SARA
	TL 110 kV	ARE IN OPERATI

SPECIFICATION OF THE BASIC EQUIPMENT FOR THE REHABILITATION OF THE ELECTRICAL DISTRIBUTION NETWORK IN SARAJEVO					
No	Equipment/Materials	Unit	Quantity	Unit price in DM	Total price in DM
1	Oil immersed power transformer Y,Y0,d5 VM 110/10 kV, 31,5 MVA, "Rade Koncar"	pcs	2	555.000,00	1.100.000,00
2	Oil immersed power transformer Yd5 VM 35/10 kV, 8 MVA "Rade Koncar"	pcs	6	160.000,00	960.000,00
3	Oil immersed power transformer Yy5 VM (20)/0,4 kVA, 100 kVA "Rade Koncar"	pcs	10	3.380,00	33.800,00
4	Oil immersed power transformer Yz5 VM 10(20) /o,4 kVA 250 kVA "Rade Koncar "	pcs	20	5.300,00	106.000,00
5	Oil immersed power transformer Dy5 UM 10(20)/0,4 kVA, 400 kVA " Rade Koncar "	pcs	8	7.080,00	56.640,00
6	Oil immersed power transformer Dy5 UM 10(20)/0,4 kVA, 630 kVA	pcs	66	9.570,00	631.620,00
7	Oil immersed power transformer Dy5 UM 10(20)'0,4 kVA, 1000 kVA	pcs	5	15.800,00	79.000,00
8	Transformer oil	kg	200000	4,00	800.000,00
9	Outdoor installation with 2 transmission fields, 2 transformer fields, 1 instrument field and iron construction with joints	set	1	620.000,00	620.000,00
10	Automatic pneumatic switch - disconnecter RN-4, RDN-4 10 kV, 200 A, "Energoinvest" ( or CSIR 12/630 "TSN")	pcs	60	1.900,00	114.000,00
11	Automatic pneumatic switch - disconnecter with fuses and disconnecting coil RFN-4, 10 kV 200 A "Energoinvest" ( or CSIR 12/100 "TSN")	pcs	30	2.700,00	81.000,00
12	Compression disconnecter CS1H 12/630 DD "TSN" ( see Notes)	pcs	20	1.900,00	38.000,00

13	Compression disconnecter CS1H 12/100 DD SK LT "TSN" ( see Notes ) Notes for items 12 and 13 : For 700 mm wide cubicles, the alternative would be the vacuum interrupter V12-25-16-(20) "R.Koncar"	pcs	15	2.700,00	40.500,00
14	Minimum-oil interrupter HG 4a/8c, 12 kV, 630 A 500 MVA 25 kA "Energoinvest" or : vacuum interrupter V 12-25-16 "Koncar"	pcs	10	5.110,00	51.100,00
15	Mini block with 3 cubicles, 24 kV 630 A 500 MVA "Energoinvest", "TSN", "Rade Koncar" or similar	pcs	15	11.000,00	165.000,00
16	Pin-type insulator SAR 30 "R.Koncar"	pcs	24	80,00	1.920,00
17	Pin-type insulator SAR 10 "R.Koncar"	pcs	250	30,00	7.500,00
18	Conducting insulator SB 38/62 for UM "TSN"	pcs	15	120,00	1.800,00
19	HV fuse cartridge 10 kV 50 A ,FTR "Energoinvest"	pcs	50	90,00	4.500,00
20	HV fuse cartridge 10 kV 125 A ,FTR "Energoinvest"	pcs	120	80,00	9.600,00
21	HV fuse cartridge 10 kV 125 A, VVC "Energoinvest"	pcs	24	90,00	2.160,00
22	HV fuse cartridge 10 kV 75 A, VVC "Energoinvest"	pcs	150	80,00	12.000,00
23	LV switch DU 1250, 500 V, 50 Hz with manual front drive "Energoinvest"	pcs	5	1.600,00	8.000,00
24	LV switch DU 1250, 500 V, 50 Hz with electric motor drive "Energoinvest"	pcs	3	1.900,00	5.700,00
25	LV switch F 1000 with front drive "Energoinvest"	pcs	10	1.300,00	13.000,00
26	Cable NYBY 3 x 35 mm, 10 kV "ELKA"	m	300	40,00	12.000,00
27	Cable PPOO 1 x 500 mm, 1 kV "ELKA"	m	60	30,00	1.800,00
28	Cable PPOO 1 x 300 mm, 1 kV "ELKA"	m	20	25,00	500,00
29	LV fuse box for pole mounted TS "Energoinvest"	pcs	6	2.000,00	12.000,00
30	LV switchgear assembly with 8 cable terminals "Energoinvest"	pcs	6	10.000,00	60.000,00
31	Voltmeter type FQ3 0 - 500 V, 50 Hz "Iskra"	pcs	350	200,00	70.000,00

32	Ammeter type FQ3 0-1000 A with the pointer for max. 15 minutes load "ISKRA"	pcs	40	250,00	10.000,00
33	Three-core HV cable, copper wire, paper insulated, lead sheathed, single wire armoured, protected by bitumen-impregnated jute tape . Rated voltage 35 kV, test voltage 54 kV ; type IPZO-13, copper wire 3 x 120 mm2 (JUS N.C5.020)	m	4200	75,00	315.000,00
34	Single-core HV cable, Al wire, XLPE insulated, PVC sheathed overall. Rated voltage 35 kV, test voltage 54 kV, type XHP-48 A with Al wire 1 x 150/25 mm2 (JUS N.C5.230)	m	7300	35,00	255.500,00
35	Three-core HV cable, Al wire, paper insulated, lead sheathed, steel wire armoured, protected by bitumen-impregnated jute tape. Rated voltage 10 kV, test voltage 18 kV, type IPO 13 A , Al wire 3 x 150 mm2 (JUS.N.C5.020)	m	25000	128,00	3.200.000,00
36	Three-core HV cable, Al wire, PVC insulated, steel wire armoured, PVC sheathed overall. Rated voltage 10 kV, test voltage 18 kV, type PHP 81 A , Al wire 3 x 150/6 mm2 (JUS N.C5.220)	m	17500	67,00	1.172.500,00
37	Cable joints, type KS 1600/HE for connections of 35 kV three-core lead sheathed cables (listed as No.33), produced by "TEP" Zagreb	pcs	12	831,00	9.972,00
38	Cable joints, type XPKS 35/3 for connections of 35 kV XLPE insulated cables (listed as No.34), produced by "TEP" Zagreb	pcs	24	506,00	12.144,00
39	Cable joints, type KS-64 for connections of 10 kV paper-insulated cables (listed as No.35), produced by "TEP" Zagreb	pcs	270	430,00	116.100,00

40	Cable joints, type PPKS 6 P 10 kV for connections of 10 kV PVC insulated cables- no electric protection (cables which are already part of the network ), produced by "TEP" Zagreb	pcs	160	370,00	59.200,00
41	Cable joints,type 92-AN 730-3 with protection joints 93-AF 94 for connections of 10 kV three-core,PVC insulated cable (listed as No.36),produced by "3M(EAST) AG" Switzerland	pcs	60	540,00	32.400,00
42	Cable midspan joints,type 92-A175-3D for connections of 10 kV three-core, paper insulated and PVC insulated cables (already part of the network), produced by "3M (EAST) AG" Switzerland	pcs	6	1.350,00	8.100,00
43	Cable head, type GK 35 for 35 kV three-core,single wire armoured, lead sheathed cables( listed as No.33 ), produced by "TEP" Zagreb	set	12	3.502,00	42.024,00
44	Cable head, type XPKG 35/2-S, for 35 kV single-core, XLPE insulated cables (listed as No.34),produced by "TEP" Zagreb	pcs	12	350,00	4.200,00
45	Cable head for indoor installation,type KGU-12 for 10 kV paper insulated cables(listed as No.35 ),produced by "TEP" Zagreb	pcs	120	270,00	32.400,00
46	Cable head for outdoor installation,type KG 12 for 10 kV paper insulated cables(listed as No.35) ,produced by "TEP" Zagreb	pcs	12	450,00	5.400,00
47	Cable head,type 93-DN/2-3 with accessory set type 93-PN 72 for 10 kV ,PVC insulated cables (listed as No. 36), produced by "3N(East) AG" Switzerland	set	30	620,00	18.600,00
48	Copper ferrule for compression, type XG7 T-70, produced by "SIMEL"	pcs	400	14,00	5.600,00
49	Copper ferrule for compression, type XG 7 T-95, produced by "SIMEL"	pcs	200	15,00	3.000,00

50	Copper ferrule for compression, type XG 7 T-120, produced by "SIMEL"	pcs	60	16,00	960,00
51	Aluminium ferrule for compression, type XG8C150, produced by "SIMEL"	pcs	1500	21,00	31.500,00
52	Bimetallic Al-Copper ferrule for compression, type XN8C-150 B 70, produced by "SIMEL"	pcs	300	24,00	7.200,00
53	Bimetallic Al-Copper ferrule for compression, type XN8C-150 B 95, produced by "SIMEL"	pcs	300	28,00	8.400,00
54	Bimetallic Al-Copper lug for compression, type XCX 150, produced by "SIMEL"	pcs	300	30,00	9.000,00
55	Aluminium compression lug, type XC8 150, produced by "SIMEL"	pcs	300	25,00	7.500,00
56	PVC cable protection, dimensions 150 x 150 x 1000 mm, produced by "Vinidurit" Zadar	pcs	16000	4,00	64.000,00
57	Copper compression lug, type XCT 70-115-12, produced by "SIMEL"	pcs	100	20,00	2.000,00
58	Copper compression lug, type XCT 95-130-16, produced by "SIMEL"	pcs	200	25,00	5.000,00
59	Copper compression lug, type XCT 120-150-16, produced by "SIMEL"	pcs	100	28,00	2.800,00
60	Impregnated wooden pole, JUS D.T4 021/69 and D.B2.020:				
	length 8 m	pcs	966	150,00	144.900,00
	length 9 m	pcs	976	160,00	156.160,00
	length 10 m	pcs	1296	180,00	233.280,00
	length 11 m	pcs	541	200,00	108.200,00
	length 12 m	pcs	75	230,00	17.250,00
61	Pole made of polyester resins reinforced with glass fibres, types:				
	10/250 (10 m long, permissible stress on top 250 daN)	pcs	100	374,00	37.400,00
	11/250 (11 m long, permissible stress on top 250 daN)	pcs	133	414,00	55.062,00
	12/250 (12 m long, permissible stress on top 250 daN)	pcs	135	476,00	64.260,00
	These poles are produced by "Restel" Italy				

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62	Reinforced concrete towers of following types: N-10( 10 m long, permissible stress on top 250 daN) N-12( 12 m long, permissible stress on top 250 daN) K-10-40( 10 m long, permissible stress on top 950 daN) K-12-40( 12 m long, permissible stress on top 950 daN) N-9 ( 9 m long, permissible stress on top 250 daN) K-9-60 ( 9 m long, permissible stress on top 1392 daN) Produced by "Neretva" Capljina	pcs	96	301,00	28.896,00
		pcs	376	364,00	136.864,00
		pcs	43	590,00	25.370,00
		pcs	206	622,00	128.132,00
		pcs	270	171,00	46.170,00
		pcs	90	750,00	67.500,00
63	Steel-lattice ,hot-dip galvanised tower ( with bolts ), types: C1 12,30 m ( 5 pcs ) C2 13,50 m ( 4 pcs ) E7 12,78 m ( 2 pcs ) E2 14,02 m ( 1 pcs ) Produced by "Energoinvest" Sarajevo	t	6900	1.800,00	12.420,00
		t	3056	1.800,00	5.501,00
		t	3768	1.800,00	6.783,00
		t	1154	1.800,00	2.078,00
64	Reinforced-concrete support for mounting on wooden pole. Permissible breaking moment 2000/1000 daNm. Produced by "Sava" ,Krsko,Slovenia	pcs	2118	81,00	171.558,00
65	Steel, hot-dip galvanised clamping ring for jointing of pole and support. Produced by "Sava" Krsko, Slovenia but also by "Energoinvest" Sarajevo	pair	2268	24,00	54.432,00
66	Reinforced concrete stabilising plate, 50x40x9 cm, produced by "Sava" Krsko	pcs	1560	21,00	32.760,00
67	Concrete tube, internal diameter 500 mm, 1 m long	pcs	920	33,00	30.360,00
68	Portland cement PC 350	kg	15000	2,00	30.000,00
69	Steel, hot-dip galvanised bracket, type NGH-1( designed by "Elektrodistribucija")	pcs	142	216,00	30.672,00
70	Steel, hot-dip galvanised bracket, type NGH-2( designed by "Elektrodistribucija")	pcs	30	252,00	7.560,00
71	Steel, hot-dip galvanised bracket, type UZH-40( designed by "Elektrodistribucija")	pcs	29	244,00	7.076,00

72	Steel,galvanised bracket, type ZPK-1/1 ( designed by "Elektrodistribucija" )	pcs	250	234,00	58.500,00
73	Steel, galvanised bracket, type OK-40 ( designed by "Elektrodistribucija")	pcs	30	150,00	4.500,00
74	Steel,galvanised bracket, type KK-1 ( designed by "Elektrodistribucija" )	pcs	193	22,00	4.246,00
75	Steel,galvanised bracket, type KK-2 ( designed by "Elektrodistribucija" )	pcs	145	26,00	3.770,00
76	Steel, galvanised bracket, type ZK ( designed by "Elektrodistribucija" )	set	31	100,00	3.100,00
77	Steel, galvanised bracket, type KRK ( designed by "Elektrodistribucija" )	set	12	110,00	1.320,00
78	Steel bolts with nuts M 20, lengths:				
	200 mm	pcs	140	8,15	1.141,00
	250 mm	pcs	200	9,14	1.828,00
	300 mm	pcs	150	10,00	1.500,00
	350 mm	pcs	150	12,00	1.800,00
	500 mm	pcs	80	13,50	1.080,00
	750 mm	pcs	160	18,00	2.880,00
	1300 mm	pcs	60	20,00	1.200,00
	1400 mm	pcs	20	23,00	460,00
79	Steel, galvanised bracket, type ZPK-1 ( designed by "Elektrodistribucija")	pcs	10	340,00	3.400,00
80	Steel, galvanised bracket, type ZPK-3 ( designed by "Elektrodistribucija")	pcs	10	410,00	4.100,00
81	Steel, galvanised tower swivel clevis Z-46 ( designed by "Elektrodistribucija" )	pcs	174	34,00	5.916,00
82	Insulator support, curved,type NSV-25 E ( JUS N.F1 502/62)	pcs	460	21,00	9.660,00
83	Insulator support,curved, type NSV-25 F ( JUS N.F1.502/62)	pcs	60	28,00	1.680,00
84	Straight insulator support NPV-25 A (JUS N.F1 501.62)	pcs	283	18,00	5.094,00
85	Straight insulator support NPV-25 B (JUS N.F1 501/62)	pcs	100	28,00	2.800,00
86	Aluminium conductor, steel reinforced (ACSR) 25/4,JUS N.C1.351	kg	28600	3,60	102.960,00
87	Aluminium conductor, steel reinforced (ACSR) 35/6,JUS N.C1.351	kg	36250	5,00	181.250,00

88	Aluminium conductor, steel reinforced (ACSR) 50/8, JUS N.C1.351	kg	58150	7,00	407.050,00
89	Pin-type porcelain insulator D-135 ( JUS N.F1.105)	pcs	800	39,00	31.200,00
90	Pin-type porcelain insulator PS-17,5 R( not standardized by JUS)	pcs	200	47,00	9.400,00
91	Pin-type porcelain insulator D-260 ( JUS N.F1.105 )	pcs	30	84,00	2.520,00
92	Glass insulator set U120 BS (I.E.C. 305) or glass insulator set F-120/146 "Sediver"	pcs	300	63,00	18.900,00
93	Silicon long rod insulator N-TT 070-016, produced by "Rebosio", Milan, Italy	pcs	260	150,00	39.000,00
94	Silicon long rod insulator D-TT 080-033, produced by "Rebosio" Milan, Italy	pcs	30	195,00	5.850,00
95	Pin-type silicon insulator P-CF 045-011 with suspension clamp for Al rope 6-10 mm, pin and U bolts M 20x170 mm(CF-1), produced by "Rebosio", Milan ,Italy	pcs	189	180,00	34.020,00
96	Link with a pin ball (IEC 16), cat.no.21.13.10, produced by "Dalekovod" Zagreb	pcs	200	14,00	2.800,00
97	Ball-socket (IEC 16A) cat.no.24.03.10, produced by "Dalekovod" Zagreb	pcs	200	13,00	2.600,00
98	Shackle, cat.no.27.08.20, produced by "Dalekovod" Zagreb	pcs	30	18,00	540,00
99	Clevis ,cat.no.22.32.10, produced by "Dalekovod" Zagreb	pcs	30	11,00	330,00
100	Dropper, cat.no.26.26.30, produced by "Dalekovod" Zagreb	pcs	60	23,00	1.380,00
101	Suspension clamp for AlFe cable, cat.no.10.12.10., produced by "Dalekovod" Zagreb	pcs	45	57,00	2.565,00
102	Suspension clamp for Cu cable, cat.no.10.15.60., produced by "Dalekovod" Zagreb	pcs	10	49,00	490,00
103	Tension clamp, cat.no.16.12.10, produced by "Dalekovod" Zagreb	pcs	170	31,00	5.270,00

104	Tension clamp, cat.no.16.10.20, produced by "Dalekovod" Zagreb	pcs	15	30,00	450,00
105	Al-Cu current clamp, cat.no. 77.06.09., produced by "Dalekovod" Zagreb	pcs	300	6,30	1.890,00
106	Al-Cu current clamp, cat.no. 77.06.11., produced by "Dalekovod" Zagreb	pcs	60	8,25	495,00
107	Aluminium current clamp, cat.no.77.07.11., produced by "Dalekovod" Zagreb	pcs	300	4,70	1.410,00
108	Chain terminal for steel rope, cat.no.77.01.05, produced by "Dalekovod" Zagreb	pcs	100	2,50	250,00
109	Hemp	kg	210	18,00	3.780,00
110	Three-pole, outdoor line disconnecter, type RNO-12/630- 400, for mounting on wooden pole, produced by "EMO" Ohrid	set	34	2.400,00	81.600,00
111	Three-pole outdoor switch ,type F1a 15/60, 12 kV, 400 A, cat.no. 67.81.13., for mounting on wooden pole A, produced by "Rade Koncar" Zagreb	set	10	3.250,00	32.500,00
112	Aluminium notched clamp, cat.no. 413501 ( for Al-Fe wire 25/4 ) 413502 ( for Al-Fe wire 35/6 ) 413503 ( for Al-Fe wire 50/8 ) Produced by "Mehanika" Trbovlje	pcs pcs pcs	70 150 50	5,00 6,00 7,00	350,00 900,00 350,00
113	Aluminium tension clamp, cat.no. 411701 411702 Produced by "Mehanika" Trbovlje	pcs pcs	270 240	7,00 9,30	1.890,00 2.232,00
114	Al-Cu straight jumper terminal, type C4.10.25, produced by "Dalekovod" Zagreb	pcs	60	8,30	498,00
115	Surge arrester, type 1 B10 N, rated voltage 12 kV, cat.no .212507 with a holder, produced by "Mehanika" Trbovlje (Other option: arrester type PVR cat.no. 281610, 10 kA with a holder cat.no. 7212, produced by "OHIO BRASS", Ohio, USA	pcs	60	350,00	21.000,00
116	Concrete MB 20	m3	1150	150,00	172.500,00

117	Reinforced concrete stabilising plate, 90x50x10 cm (type S-90), produced by "Neretva" Capljina	pcs	180	3,50	630,00
118	Reinforced concrete base plate, 60x60x10 cm ( type P-60 ), produced by "Neretva" Capljina	pcs	30	4,65	139,50
119	Same as above, 40x40x10 cm ( type A-40 )	pcs	20	2,71	54,20
120	Reinforced concrete base plate, 40x30x10 cm ,produced by "Neretva" Capljina	pcs	1600	4,50	7.200,00
121	Reinforced concrete stabilising plate, 60x20x10 cm, produced by "Neretva" Capljina	pcs	7700	4,50	34.650,00
122	Reinforced concrete base plate ( type P-60A ) for tower foundation, produced by "Neretva" Capljina	pcs	120	3,25	390,00
123	Round cleats for self-supporting cable bundle with 4 hooks (diameter 170 mm) for mounting on concrete towers, cat.no. 19.03.40., produced by "Dalekovod" Zagreb	pcs	30	7,50	225,00
124	Round cleats for self-supporting cable bundle with 2 hooks ( 62 mm diameter ) for mounting on roof support, cat.no.19.03.15, produced by "Dalekovod" Zagreb	pcs	80	6,82	545,60
125	Tension support with self-supporting cable bundle, hot-dip galvanised, cat.no.19.03.05.20, produced by "Dalekovod" Zagreb	pcs	1700	10,15	17.255,00
126	Suspension clamp with a link for self-supporting cable bundle, made of Aluminium alloy, cat.no.13.06.15, produced by "Dalekovod" Zagreb	pcs	1200	6,54	7.848,00
127	Tension clamp for self-supporting cable bundle, cat.no. 17.06.15, produced by "Dalekovod" Zagreb	pcs	1200	12,50	15.000,00
128	Hot-dip galvanised bolts for self-supporting cable bundle, cat.no.19.03.06, produced by "Dalekovod" Zagreb	pcs	1700	3,54	6.018,00

129	PVC insulated belt for self-supporting cable bundle, cat.no. 19.02.20, produced by "Dalekovod" Zagreb	pcs	8700	1,66	14.442,00
130	Tension clamp for self-supporting cable bundle, for mounting on roof girder (house installation), cat.no.17.07.08. produced by "Dalekovod" Zagreb	pcs	2700	9,17	24.759,00
131	Round cleat with 2 hooks (170 mm diameter), for anchor mounting on concrete tower, cat.no.19.03.40., produced by "Dalekovod" Zagreb	pcs	150	8,00	1.200,00
132	Straight LV insulator support, type NPN 19x85 A, JUS N.F1. 601/62	pcs	2500	2,50	6.250,00
133	Straight LV insulator support, type NPN 19x85 B, JUS N.F1. 601/62	pcs	1700	4,00	6.800,00
134	Strap/bolt for tension Z-80 LV insulator, type SP-105, JUS N.F1. 606/62	pcs	1800	7,59	13.662,00
135	Strap/bolt for tension Z-115 LV insulator, type SP-115, JUS N.F1. 606/62	pcs	1500	18,00	27.000,00
136	Cylindrical tension LV insulator DIN 48156, type C-30, permissible stress 50 daN, for roof girder anchor	pcs	1300	13,00	16.900,00
137	Cylindrical tension LV insulator DIN 48156 type D-100, permissible stress 2000 daN, for tower anchor	pcs	330	20,00	6.600,00
138	Pin-type LV insulator, type N.95, JUS N.F1. 301/59 or DIN 48150	pcs	3300	35,10	115.830,00
139	Tension LV insulator, type Z-80, JUS N.F1. 306/59 or DIN 48154	pcs	2000	15,00	30.000,00
140	Tension LV insulator, type Z-115, JUS N.F1. 306/59 or DIN 48154	pcs	2000	36,00	72.000,00
141	LV fuse type Fz-25, produced by "Elektroelement" Izlake	pcs	3000	3,00	9.000,00
142	Insulated surge arrester, type IPO 2,5/0,5, cat.no. 200802, produced by "Mehanika" Trbovlje	pcs	500	25,00	12.500,00

143	Insulated single-core conductor, type P/NYA/ ,size 10 mm <sup>2</sup> , voltage level up to 1 kV, JUS N.C3.200	m	12000	1,25	15.000,00
144	Low-voltage cable 0,6/1 kV, type PPOO, size 2x10 mm <sup>2</sup> , JUS N.C5.220/75	m	2000	5,00	10.000,00
145	Same as above, size 4x10 mm <sup>2</sup>	m	4000	6,00	24.000,00
146	Self-supporting cable bundle, type X00/0, size 2x16 mm <sup>2</sup> , Al conductors,XLPE insulated, JUS N.C1.302 or DIN 48201, produced bu "ELKA" Zagreb	m	29000	2,30	66.700,00
147	Same as above, size 4x16 mm <sup>2</sup>	m	35000	4,30	150.500,00
148	Self-supporting cable bundle, type X00/0, size 3x35+71,5 mm <sup>2</sup> , Al conductors and Al-alloy neutral conductor, breaking force of 1740 daN, JUS N.C1.302 or DIN 48201, produced by "ELKA" Zagreb	m	45000	9,50	427.500,00
149	Same as above, size 3x70+71,5 mm <sup>2</sup>	m	130000	15,00	1.950.000,00
150	Same as above, size 3x70+71,5+2x16 mm <sup>2</sup>	m	35000	22,10	773.500,00
151	Steel galvanised FeZn grounding wire, 25x4 mm, JUS NC.B3.550	kg	13000	1,29	16.770,00
152	Grounding cross joints (60x60x3 mm) with 4 bolts or band-to-band joints, JUS N.B4.936	pcs	800	1,61	1.288,00
153	Curved LV insulator support, type NSN 19E, JUS N.F1.602/62	pcs	3500	3,00	10.500,00
154	Chain terminal up to 25 mm <sup>2</sup> , cat.no.77.01.07., produced by "Dalekovod" Zagreb	pcs	800	1,20	960,00
155	Compression Al clamp, size 70/16 mm <sup>2</sup> , cat.no.77.74.16, produced by "Dalekovod" Zagreb	pcs	1600	6,50	10.400,00
156	Compression Al clamp, size 70/35 mm <sup>2</sup> , cat.no.77.74.35., produced by "Dalekovod" Zagreb	pcs	1800	5,20	9.360,00
157	Threaded Al joint, size 35 mm <sup>2</sup> , cat.no.41.35.02, produced by "Mehanika" Trbovlje	pcs	2000	7,00	14.000,00

158	Compression Al-Cu clamp, size 70/10 mm <sup>2</sup> , cat.no.77.84.16, produced by "Dalekovod" Zagreb	pcs	2400	5,00	12.000,00
159	Compression Al-Cu clamp, size 16/10 mm <sup>2</sup> , cat.no.77.70.10, produced by "Dalekovod" Zagreb	pcs	1300	5,50	7.150,00
160	Compression midspan Al joint, size 70/70 mm <sup>2</sup> , cat.no. 55.25.13, produced by "Dalekovod" Zagreb	pcs	1700	6,00	10.200,00
161	Compression Al-Cu clamp, size 35/10 mm <sup>2</sup> , cat.no.77.82.10, produced by "Dalekovod" Zagreb	pcs	1100	6,20	6.820,00
162	Aluminium end terminal, size 25-35 mm <sup>2</sup> , cat.no. 411701, produced by "Mehanika" Trbovlje	pcs	20000	3,50	70.000,00
163	Current clamp, Al-Cu, size 6-35 mm <sup>2</sup> , cat.no.41.08.00, produced by "Mehanika" Trbovlje	pcs	30000	2,75	82.500,00
164	UNIMAX disconnecting Al clamp with 2 bolts, size 6-50 mm <sup>2</sup> , cat.no.41.05.03, produced by "Mehanika" Trbovlje	pcs	35000	3,85	134.750,00
165	Al compression clamp, size 25/16 mm <sup>2</sup> , cat.no.77.71.16., produced by "Dalekovod" Zagreb	pcs	1100	4,50	4.950,00
166	Compression clamp, cat.no. 77.70.10. produced by "Dalekovod" Zagreb	pcs	1200	4,50	5.400,00
167	Low voltage crossarms for mounting on concrete poles, type NZK-135, produced by "Elektrokovina" Maribor, Slovenia	pcs	30	55,00	1.650,00
168	Same, type NZK-210	pcs	15	55,00	825,00
169	Same, type NNK-135	pcs	30	50,00	1.500,00
170	Same, type NNK-151	pcs	35	50,00	1.750,00
171	Same, type NNK-210	pcs	40	50,00	2.000,00
172	Same, type NNK-245	pcs	30	52,00	1.560,00
173	Same, type NPK-2N1 (2N2, 2N3)	pcs	40	35,00	1.400,00
174	Same, type NPK-2S1( 2S2, 2S3)	pcs	20	35,00	700,00
175	Same, type NPK-4S1 ( 4S2, 4S3 )	pcs	20	40,00	800,00

176	Same, type NPK-4NS1 ( 4NS2, 4NS3 )	pcs	30	45,00	1.350,00
177	Cable head 0,6/1 kV,made of heat-shrinking material, type KE-3F/4, produced by "3M (East) AG" Switzerland	pcs	150	319,00	47.850,00
178	Outdoor cable head 0,6/1 kV , type 92-S63, produced by "3M (East) AG" Switzerland	pcs	200	439,00	87.800,00
179	Cable joint made of heat-shrinking material 0,6/1 kV, type 91-A24, produced by "3M (East) AG" Switzerland	pcs	250	500,00	125.000,00
180	Indoor fuse box , type KPO-63, produced by "TEP" Zagreb	pcs	15	45,00	675,00
181	Indoor fuse box , type KPO-25, produced by "Nikola Tesla" Tuzla	pcs	75	190,00	14.250,00
182	Silumin outdoor fuse box , type KPOV-S2, produced by "Nikola Tesla" Tuzla	pcs	50	276,00	13.800,00
183	Silumin outdoor fuse box , type KPOV-S1, produced by "Nikola Tesla" Tuzla	pcs	30	164,00	4.920,00
184	Distribution box, type RRP 01/1/50-4/ produced by "TEP" Zagreb	pcs	20	585,00	11.700,00
185	Distribution box, type RRP 02/1/RO-6/ produced by "TEP" Zagreb	pcs	10	700,00	7.000,00
186	Distribution box, type RRP 03/1/RO-8/ produced by "TEP" Zagreb	pcs	5	950,00	4.750,00
187	Cable 0,6/1 kV, type PP41 , JUS N.C5.220/75, size 4x50 mm2	m	500	45,00	22.500,00
188	Same, size 4x70 mm2	m	500	50,00	25.000,00
189	Same, size 4x95 mm2	m	3000	60,00	180.000,00
190	Cable 0,6/1 kV , type PP41-A, JUS N.C5.220/75, size 4x150 mm2	m	3000	55,00	165.000,00
191	Same, size 4x120 mm2	m	1000	47,00	47.000,00
192	Copper compression ferrule for LV conductors, type XG7 T-95, "SIMEL" France	pcs	1500	15,00	22.500,00
193	Same as no.192., but type XG7 T-70	pcs	1000	14,00	14.000,00
194	Same as no.192. ,but type XG7 T-50	pcs	600	12,00	7.200,00

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195	Al-Copper compression ferrule for LV conductors, type XGX 150 B 50, produced by "SIMEL" France	pcs	1000	22,00	22.000,00
196	Same as no.195, type XGX 150 B 70	pcs	1500	24,00	36.000,00
197	Same as no.195., type XGX 150 B 95	pcs	2000	28,00	56.000,00
198	Al compression ferrule for Al LV cables, type XG8 50 "SIMEL" France	pcs	500	12,00	6.000,00
199	Same as 198, type XG8 70	pcs	500	14,00	7.000,00
200	Same as 198, type XG8 95	pcs	500	15,00	7.500,00
201	Same as 198, type XG8 120	pcs	500	16,00	8.000,00
202	Same as 198, type XG8 150	pcs	2000	20,00	40.000,00
203	Copper compression lug for Cu conductors, type XCT 50-96-12, "SIMEL" France	pcs	500	15,00	7.500,00
204	Same as no.203, type XCT 70-115-12	pcs	700	20,00	14.000,00
205	Same as no.203, type XCT 95-130-16	pcs	1000	25,00	25.000,00
206	Bimetallic AlCu compression lugs, type XCX, produced by "SIMEL" France	pcs	600	18,00	10.800,00
207	Same as 206, type XCX 70	pcs	500	20,00	10.000,00
208	Same as 206, type XCX 95	pcs	500	25,00	12.500,00
209	Same as 206, type XCX 120	pcs	500	28,00	14.000,00
210	Same as 206, type XCX 150	pcs	1500	30,00	45.000,00
211	Bolted connection 35 mm <sup>2</sup> , produced by "Mehanika" Trbovlje	pcs	2000	2,00	4.000,00
212	Same, 50 mm <sup>2</sup>	pcs	2000	2,00	4.000,00
213	Same, 70 mm <sup>2</sup>	pcs	2000	2,00	4.000,00
214	Same, 95 mm <sup>2</sup>	pcs	1500	2,00	3.000,00
215	Stand PK 250 A, produced by "Elektroelement" Izlake	pcs	1500	25,00	37.500,00
216	Stand PK 400 A, produced by "Elektroelement" Izlake	pcs	1500	35,00	52.500,00
217	Fuse cartridge, type NV 250-63, "Elektroelement" Izlake	pcs	200	12,00	2.400,00
218	Same as 217, type NV 250-80A	pcs	1000	12,00	12.000,00
219	Same as 217, type NV 250-100A	pcs	700	12,00	8.400,00
220	Same as 217, type NV 250-125 A	pcs	600	14,00	8.400,00
221	Same as 217, type NV 250-160 A	pcs	1000	14,00	14.000,00
222	Same as 217, type NV 400-200 A	pcs	2500	18,00	45.000,00

223	Same as 217, type NV 400-250 A	pcs	4300	18,00	77.400,00
224	Same as 217, type NV 400 - 315 A	pcs	6000	20,00	120.000,00
225	Lamp for mounting on support, 60 mm, CD 116-1250 K, produced by "Elektrovina" Maribor	pcs	150	370,00	55.500,00
226	Lamp for mounting on support, 60 mm, CD 116-1400 K, produced by "Elektrovina" Maribor	pcs	80	370,00	29.600,00
227	Lamp for mounting on support, 60 mm, CD 116-1250 K, produced by "Elektrovina" Maribor	pcs	20	420,00	8.400,00
228	Lamp for mounting on tower, CD 516-1250 K, produced by "Elektrovina" Maribor	pcs	200	370,00	74.000,00
229	Lamp for mounting on tower, CD 516-1400 K, produced by "Elektrovina" Maribor	pcs	80	370,00	29.600,00
230	Lamp for mounting on rope, CD 306-1250, produced by "Elektrovina" Maribor	pcs	200	300,00	60.000,00
231	Lamp for mounting on rope, CD 316-1400 K, produced by "Elektrovina" Maribor	pcs	50	300,00	15.000,00
232	Lamp for mounting on tower, CM 216-2400 K, produced by "Elektrovina" Maribor	pcs	250	540,00	135.000,00
233	Lamp for mounting on tower, CM 216-2250 Na, produced by "Elektrovina" Maribor	pcs	100	600,00	60.000,00
234	Lamp for mounting on tower, UL 575-1125 , produced by "Elektrovina" Maribor	pcs	600	200,00	120.000,00
235	Lamp for mounting on tower, Z3H 1400 produced by "Schreder" Belgium	pcs	25	400,00	10.000,00
236	Lamp for mounting on tower, Z3H 1250, produced by "Schreder" Belgium	pcs	150	400,00	60.000,00
237	Lamp for mounting on tower, Z3N 1250, produced by "Schreder" Belgium	pcs	50	450,00	22.500,00
238	Lamp with supports for mounting on wooden pole Z1 125, produced by "Schreder" Belgium	pcs	1200	250,00	300.000,00

239	Lamp for mounting on tower, Z1H 125 , produced by "Schreder" Belgium	pcs	100	250,00	25.000,00
240	Lamp for mounting on tower , RXHB 2400, produced by "Schreder" Belgium	pcs	40	650,00	26.000,00
241	Lamp for mounting on tower, RXNB 2250 , produced by "Schreder" Belgium	pcs	30	750,00	22.500,00
242	Lamp for mounting on tower, RXHBT 4400, produced by "Schreder" Belgium	pcs	30	1.300,00	39.000,00
243	Lamp for mounting on tower SATURN 125 W , produced by "Schreder" Belgium	pcs	120	270,00	32.400,00
244	Lamp with shade 500 mm - OPAL and fittings DZ 077 for mounting on tower, produced by "DEKOR" Zabok	pcs	150	300,00	45.000,00
245	Lamp with shade 500 mm - LEDO and fittings DZ 077 for mounting on tower , produced by "DEKOR" Zabok	pcs	100	300,00	30.000,00
246	Lamp with shade 400 mm - OPAL and fittings DZ 077 for mounting on tower, produced by "DEKOR" Zabok	pcs	30	300,00	9.000,00
247	Lamp for mounting on tower 76 mm KN 163-1125, produced by "TEP" Zagreb	pcs	550	300,00	165.000,00
248	Lamp for mounting on tower, KN 133-1125 , produced by "TEP" Zagreb	pcs	150	300,00	45.000,00
249	Lamp for mounting on lamp post UE 1186-2125, produced by "Elektrovovina" Maribor	pcs	200	350,00	70.000,00
250	Lamp - wall fitting , "Fenjer-Bascarsija", produced by "Sjaj" Hrasnik	pcs	100	200,00	20.000,00
251	Lamp - ceiling fitting "Fenjer - Bascarsija", produced by "Sjaj" Hrasnik	pcs	50	200,00	10.000,00
252	Galvanised octagonal steel lamp post with base plate for mounting on concrete foundation, with possibility to install the fuse box KORS 1B320, produced by "Dalekovod" Zagreb	pcs	80	20,00	1.600,00
253	Same as no. 252, type KORS 1 B 400	pcs	60	250,00	15.000,00

254	Same as no. 252, type KORS 1 B 500	pcs	50	300,00	15.000,00
255	Same as no. 252, type KORS 2 B 800	pcs	10	600,00	6.000,00
256	Same as no. 252, type KORS 2 B 870	pcs	50	650,00	32.500,00
257	Same as no. 252, type KORS 2 B 1000	pcs	20	750,00	15.000,00
258	Same as no. 252, type KORS 2 B 1100	pcs	15	900,00	13.500,00
259	Same as no. 252, type KORS 2 B 1200	pcs	10	1.000,00	10.000,00
260	Galvanised round steel lamp post with base plate for mounting on concrete foundation, with possibility to install the fuse box CRS 1 B 400, produced by "Dalekovod" Zagreb	pcs	300	250,00	75.000,00
261	Same as no. 260, type CRS 500	pcs	50	300,00	15.000,00
262	Same as no. 260, type CRS 2 B 800	pcs	10	600,00	6.000,00
263	Same as no. 260, type CRS 2 B 870	pcs	100	650,00	65.000,00
264	Same as no. 260, type CRS 2B 1000	pcs	10	750,00	7.500,00
265	Same as no. 260, type CRS 2B 1100	pcs	70	900,00	63.000,00
266	Same as no. 260, type CRS 2B 1200	pcs	50	1.000,00	50.000,00
267	Lamp post BEL 5 K , produced by "Metalka" Buje	pcs	6	2.500,00	15.000,00
268	Lamp post suitable for fuse box mounting, 3 m high, produced by "DEKOR" Zabok	pcs	30	500,00	15.000,00
269	Galvanised steel support for lamp post L1 150 I , produced by "Dalekovod" Zagreb	pcs	30	80,00	2.400,00
270	Same as no.269, type L2 150 2	pcs	20	160,00	3.200,00
271	Double support U 208, produced by "Dekor" Zabok	pcs	30	100,00	3.000,00
272	Triple support U 308, produced by "Dekor" Zabok	pcs	30	150,00	4.500,00
273	Polyester locker for lamp post, equiped in accordance with "Elektroprivreda" request ,type KRO-JR with two output terminals, produced by "TEP" Zagreb	pcs	30	2.500,00	75.000,00

274	Same as no. 273 ,but with 4 output terminals	pcs	20	3.300,00	66.000,00
275	Service box R 60 18/2, produced by "TEP" Zagreb	pcs	720	87,00	62.640,00
276	Service box PR 917, produced by "TEP" Zagreb	pcs	350	85,00	29.750,00
277	Service box OA 314-1400, produced by "Elektrovina" Maribor	pcs	50	200,00	10.000,00
278	Same as no.277, but type OA 214-1250	pcs	200	200,00	40.000,00
279	Fuse box KPO-25, produced by "Nikola Tesla" Tuzla	pcs	60	190,00	11.400,00
280	Quicksilver lightbulb, high pressure, VTFe 125 W	pcs	7000	30,00	210.000,00
281	" 250 W	pcs	3000	35,00	105.000,00
282	" 400 W	pcs	2000	45,00	90.000,00
283	Sodium lightbulbs, high pressure, VTNa 250 W	pcs	1000	85,00	85.000,00
284	Fluorescent tube FC-40 W	pcs	800	5,00	4.000,00
285	Incandescent lamp, wolfram 100 W	pcs	500	2,00	1.000,00
286	Choke for VTFe 125 W	pcs	1500	50,00	75.000,00
287	" VTFe 250 W	pcs	800	80,00	64.000,00
288	" VTFe 400 W	pcs	600	100,00	60.000,00
289	" VTNa 250 W	pcs	200	130,00	26.000,00
290	" FC 40 W	pcs	200	20,00	4.000,00
291	Ignition ENS 151 for VTNa 250 , produced by "Elektrovina" Maribor	pcs	350	20,00	7.000,00
292	Light bulb base E 27	pcs	2000	5,00	10.000,00
293	Light bulb base E 40	pcs	1500	10,00	15.000,00
294	Low voltage fuse D0 1 16 A, produced by "Elektroelement" Izlake	pcs	1200	1,00	1.200,00
295	Low voltage fuse D 11 16 A., produced by "Elektroelement" Izlake	pcs	1800	1,00	1.800,00
296	Cable PP 41 4x25 1 kV, JUS N.C5. 220/75	m	1000	17,00	17.000,00
297	Cable PP 41 4x35 1 kV, JUS N.C5. 220/75	m	1000	20,00	20.000,00
298	Self-supporting cable PP00/0, 4x10 1 kV	m	2000	6,00	12.000,00
299	Cable PP00 3x1,5 1 kV	m	2500	1,50	3.750,00
300	Thermoplastic cable joint for cables PP 41 4x35, type 91-122, produced by "3M (East) AG" Switzerland	m	150	100,00	15.000,00

301	Plastic tube 63x57 mm, produced by "Viniplastika" Zadar, JUS G.C6.501	m	390	5,00	1.950,00
<b>TOTAL IN DM</b>					<b>22.345.195,00</b>

**NOTES ON THE LIST OF BASIC EQUIPMENT FOR THE  
REHABILITATION OF ELECTRIC DISTRIBUTION NETWORK IN SARAJEVO**

1. List of basic equipment was made in accordance with the assessment of damages to the equipment in the distribution network of the city.

2. Costs of mounting, transport and other relating costs are not included in the prices of equipment and materials.

The listed prices are given on the basis of the assessment and other available information.

3. It is possible to replace the listed equipment by another type of equipment of equal or superior technical characteristics and with prior consent of "Elektrodistribucija" Sarajevo.

(For example, it is possible to replace the oil-immersed power transformer with a power transformer without oil, or to replace mini apparatus with another of equal or superior technical characteristics.)

4. The list of basic equipment that can be disassembled comprises only the large items..

5. The spotlight lighting of cultural and historical monuments and facilities is not included in the list of basic equipment for the rehabilitation of the public lighting . The list does not include the lighting of facilities within these monuments either.

Old lamps, which are not produced any more, were replaced by new types, but the material for maintenance of existing lamps was planned in order to assure the maintenance until the replacement of lamps is completed.

Small elements and spare parts, such as cable lugs, tools for mounting of self-supporting cable, bolts, steel rope etc., were not listed.

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**Attachment 6**

## I. BASIC DEVELOPMENT FEATURES IN RECENT PERIOD

By the end of 1990 Elektroprivreda of Bosnia and Herzegovina had installed capacity of 3991 MW, of which in hydropower plants 2034 MW and thermal power plants 1957 MW, with total average yearly generation of 14.657 Gwh. Gross consumption in 1991 amounted to 11.174 Gwh with peak load of 1961 MW. The total number of consumers was 1.389.481.

The transmission network consisted of 5374 km lines of which 838 km of 400 kV, 1424 km of 220 kV and 3172 km of 110 kV lines. The installed capacity at the transformer stations was 10.216 MVA of which 4500 of 400/220/110 kV, 1350 MVA of 220/110 kV and 4366 MVA of 110/x kV.

The distribution network consisted of 2390 km of 35 kV lines with 1413 MVA installed capacity at transformer stations 35/x kV, 21.313 km of 10(20) kV lines with the installed capacity of 3704 MVA at the transformer stations 20(10)/0,4 kV and 68.495 km of 0,4 kV lines. Electric power system of Bosnia and Herzegovina functioned within UCPTE network as a part of the former Yugoslav electric power system.

In the period before 1990 great investments into new facilities were made. This resulted shortage of means necessary for the reconstruction and recovery of the generation, transmission and distribution facilities. Thus the development plan for 1990-1995 chose priority in the reconstruction and recovery of the basic thermal power plants and hydro power plants equipment, replacing electromechanical and hydromechanical equipment parts, modernization of the transmission and distribution network, standardisation of voltage levels at distribution network, application of 20 kV transformation as well as introduction of contemporary technical and business management system.

The war and its destruction at the beginning of 1992 stopped the started realization of development plans.

## II. WAR DAMAGES

From the beginning of the aggression on Bosnia and Herzegovina on 30 June 1995, due to direct war actions there are serious damages at hydro power plants with installed capacity of 579 MW or 14,5% of the total generating facilities. Out of all units located in the free territory the most damaged are HPP Mostar (75 MW) and HPP Salakovac (210 MW). TPP Tuzla (779 MW) suffered large damages through numerous shelling and missiles hits.

The damage degree of the transmission network is large and according to current data relating to the free territory, the state is as following: out of 838 km of 400 kV transmission lines, none is operating; out of 1424 km of 220 kV transmission lines, only 243 km line is in operation; out of 3172 km of 110 kV transmission line only 672 km is operating. All 8 transformer stations of 400/220/110 kV are out of operation and are used just as switching substations for lower voltage level. Out of 7 transformer stations of 220/110-kV only 3 are in operation and out of 101 transformer stations of 110/x kV only 18 are in operation after provisory and temporary sanation.

The distribution network in the besieged towns and places, particularly the overhead lines, is almost completely destroyed, while the cable network is partially damaged. The public lighting is destroyed and huge number of transformer stations is damaged; the electric teleinstruments and telecommands are out of order; working premises in: modern office building with accompanying equipment and inventory are completely destroyed.

According to uncomplete preliminary data the total damages imposed by war destruction on facilities and plants under B H Army control by 31 June 1995 are estimated in the amount of 1218 mill.DM. Out of this amount 485 mill. DM or 40% are direct damages and approximately 733 mill.DM or 60% are indirect damages. The amount varies, depending on the applied methodology.

The direct damages do not cover particular kind of war damages resulting difficult exploitation conditions, dynamic and thermal stresses the facilities had been exposed to during operation as well as damages arising due to inadequate conservation and corrosion process in vital parts of facilities due to durable delay in uncontrollable circumstances.

The total amount of war damages does not cover currently unknown damages at electric power plants under control of HVO and temporarily occupied territory by the aggressor (HPP Jajce I, HPP Jajce II, HPP Bošac, HPP Višegrad, HPP on Trebišnjica, and TPP Ugljevik, and TPP Gacko and Electro distribucija Banja Luka).

Despite huge destruction the generation of electric power during the war has not been completely stopped for a single moment.

### III. ELECTRIC ENERGY SUPPLY AND DEMAND OF THE FEDERATION OF BiH FOR PERIOD 1994 1998

The study of electric energy state for the area of the Federation of BiH for the following three years shows that consumers needs in most consumption, increases, can be satisfied, under condition to enable the operation of the generating capacities and to provide necessary production of coal for thermal power plants operation.

Electric energy supply and demand for period 1994 1998, given in table no. 1,2,3 and 4 with enclosed diagrams, represent achievement in 1994, estimation for achievement in 1995 and foreseeing circumstances in this respect for 1996 1998. Three increased consumption alternatives are prepared, elementary alternative, alternative with slow and quick consumption increase.

Besides the electric energy supply and demand for the Federation of BiH the same has been prepared for the territory under the control of B H Army.

#### III.1. Consumption of electric energy

The total consumption consists of gross distribution consumption (included distribution network losses), consumption of direct consumers supplied by high voltage network and transmission network losses.

Distribution consumption is planned (in the elementary alternative) so that the greatest increase appears in 1996 followed by the percentage decrease. In respect to 1994 by the end of the period the distribution consumption is increased by 2.1 and in respect of 1990 it is lower by 12%.

In consumption planning, the starting point was the fact that due to persecution of the population in occupied territory and significant migrations the number of inhabitants has increased in the free territory and larger city centres. Economy and industrial capacities are mostly damaged and destroyed. This will effect the structure and characteristics of consumption will larger participation of tertiary sector in whole economy.

Consumption limitations in 1994 in the territory of BiH, PE Elektroprivreda implemented constantly, depending on war damages on electric power facilities in B H, weather conditions, provision of coal, and production units exploitation and maintenance conditions. In the first six months of 1994 only the priority consumers were supplied and households with only 4 6 hours perday at intervals of 30 hours, or in ratio 30 40% of limitation degree. The limitation duration depended on battlefield situation, season of the year, outer temperature and consumers needs.

In period from June to October 1994 due to faults on generating units and damages on distribution and transmission network, the supply to mass consumers (households) was limited to 50%, connecting this category only in night hours.

From 20 October, on the situation improved with connection of electric power systems of Bosnia and Herzegovina and Dalmatia (Croatia). Even though due to problem in generation the limitations in supplying still continued and by the end of year reached 70%. Looking as a whole, in 1994 the limitation level amounted to 50%.

In 1995 the limitations for supply continued by daily and monthly consumption limitations to all consumer categories. In the beginning the households had 100 kWh available monthly. Exceeding the given consumption limit was sanctioned by switching off and imposing additional cost for reswitching. This principle in terms of electricity distribution improved considerably the electric power situation and facilitated the exploitation and operational maintenance of all electric power buildings. Thus the limits were gradually increased. As from 1 February 1995 the consumption of households is increased to 4 kWh/day, from 1 March 1995 to 5 kWh/day and as from 1 May 1995 to 6 kWh/day and continuing still.

Accordingly, the limitation level in 1995 is estimated to 30%.

In prewar period direct consumers held an extremely huge part. In 1990 these consumers overtook 3028 GWh which is 41% of the total consumption in that year in the area corresponding Federation of B H. In 1994 this part fell to 2.2% of the total consumption. Restarting these capacities shall mostly influence consumption rise so evaluations of this consumption do mostly differ in each alternative. The elementary alternative forces the consumption 60% smaller than in 1990.

The total consumption in 1998 is increased by 2.7 times in relation to 1994 and by 32% in relation to 1990.

The realization of this forecast shall mostly be affected by peace process establishment or the time dynamics of refugees returning to their homes, reconstruction of devastated country and creation of conditions for relieving the old and creating new economic capacities. Currently, all this is not so easy to foresee. Thus, three scenarios of consumption were made to provide a broader scope of plans for reconstruction of production capacities, with the aim to create conditions to satisfy consumers needs.

Gross consumption		in GWh			
Year	1994	1995	1996	1997	1998
elementary alternative	1904	2219	3561	4546	5226
Alternative no. 2	1904	2219	3215	4281	4896
Alternative no. 3	1904	2219	3781	5116	6376

### III.2. Exchange and supply

Electric energy exchange is planned only for 1996 considering current system state. The exchange has not been planned in the following two years. However, it should be noted that Elektroprivreda BiH has considerable natural debts (750 GWh) made before and during the war. Upon connection to UCPTE the return of this energy will be necessary. Although the electricity supply and demand statements do not show the supply, the generation shall have to be increased, due to this.

### III.3. Electric energy generation

The generation and engagement of each power plant is planned to provide sufficient reserve in thermal capacities for different consumption increase level and had hydrology circumstances. The plan included starting up of HPP Salakovac and all HP Plants on Vrbas in 1996 and HPP Mostar put into operation in 1997. In thermal power plants besides units currently in operation, a 200 MW block is planned for activation at TPP Tuzla and one 100 MW block at TPP Kakanj in the second half of 1996. Only the third alternative (fast consumption rise) urges the necessity to engage another 200 MW block at TPP Tuzla and block at TPP Kakanj.

The generation of each block is planned so that the small power block operation, due to their age and uneconomy, be brought to minimum and to provide more time for overhaul and maintenance of other blocks. Besides this the aim is to provide satisfactory cold reserve considering that the achieved system load level shall not need simultaneous engagement of all planned blocks.

Besides sanitation and provision of high operation ability of blocks the most important precondition for the operation of thermal capacities shall be the provision of adequate quantity of coal of corresponding quality. The sanitation of coal mines brought to had state during the war, shall have to be made so that their production be coordinated with thermal power plants needs.

The hydro power plants generation is planned on the basis of 70% probability of inflow in 1996-1985 and the desirable reservoir levels at Rama and Jablanica, except HPP Čapljina which is planned for 90% probability in 1996-1985 due to its specific inflow.

The given tables provide generation balance and in case of 90% inflow probability (dry season). The shortage of generation can be compensated by increased thermal power plants generation.

Generation		in GWh			
Year	1994	1995	1996	1997	1998
elementary alternative	1774	2107	3741	4546	5226
Alternative no. 2	1774	2107	3741	4546	5226
Alternative no. 3	1744	2107	3961	5116	6376

### III.4. *Electric energy supply and demand*

According to planned electric power consumption (the first alternative, Alternative no 2 and Alternative no 3), exchange and generation, the following electric power supply and demand estimate has been prepared for 1996-1998 period.

in GWh					
Year	1994	1995	1996	1997	1998
Gross consumption	1904	2219	3561	4546	5226
Exchange balance	-160	-112	180	0	0
Needs	1744	2107	3741	4546	5226
Generation	1744	2107	3741	4546	5226
Balance 70%	0	0	0	0	0
Balance 90%			-256	-449	-449

Alternative no. 2 in GWh					
Year	1994	1995	1996	1997	1998
Gross consumption	1904	2219	3215	4281	4896
Exchange balance	-160	-112	180	0	0
Needs	1744	2107	3395	4281	4896
Generation	1744	2107	3741	4546	5226
Balance 70%	0	0	346	265	330
Balance 90%			81	-184	-119

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Alternative no. 3 in GWh

Year	1994	1995	1996	1997	1998
Gross consumption	1904	2219	3781	5116	6376
Exchange balance	-160	-112	180	0	0
Needs	1744	2107	3961	5116	6376
Generation	1744	2107	3961	5116	6376
Balance 70%	0	0	0	0	0
Balance 90%			-265	-449	-449

Electric energy supply and demand for territory under control of B-H Army:

in GWh

Year	1994	1995	1996	1997	1998
Gross consumption	1223	1419	2242	2943	3508
Exchange balance	33	46	50	0	0
Needs	11266	1456	2292	2943	3508
Generation	1266	1465	2495	2987	3667
Balance 70%	0	0	203	44	159
Balance 90%			38	-213	-98

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**ELECTRIC POWER BALANCES OF THE FEDERATION B&H  
FOR PERIOD 1994 - 1998**

Table 1. - Basic variant

GWh

	Realization 1994	Estimation 1995	Plan 1996	Plan 1997	Plan 1998
	1	2	3	4	5
Capljina	228	117	141	141	141
Rama	250	520	780	650	650
Jablanica	556	600	735	670	670
Grabovica	160	230	300	270	270
Sarajevac	0	0	160	410	410
Mostar	0	0	0	235	235
Jajce 1	0	0	109	213	213
Jajce 2	0	5	79	158	158
Bočac	0	0	137	274	274
<b>HYDRO POWER PLANTS</b>	<b>1 194</b>	<b>1 472</b>	<b>2 441</b>	<b>3 026</b>	<b>3 026</b>
Tuzla G1	106	35	80	70	70
Tuzla G2	53	105	60	50	50
Tuzla G3	152	250	360	360	360
Tuzla G5	0	0	400	440	800
Tuzla G6	0	0	0	0	0
<b>TPP TUZLA</b>	<b>311</b>	<b>390</b>	<b>900</b>	<b>920</b>	<b>1 280</b>
Kakanj G1	28	55	25	20	20
Kakanj G2	80	45	25	20	20
Kakanj G3	86	45	25	20	20
Kakanj G4	45	45	25	20	20
Kakanj G5	0	55	220	220	410
Kakanj G6	0	0	80	300	430
Kakanj G7	0	0	0	0	0
<b>TPP KAKANJ</b>	<b>239</b>	<b>245</b>	<b>400</b>	<b>600</b>	<b>920</b>
<b>THERMAL POWER PLANTS</b>	<b>550</b>	<b>635</b>	<b>1 300</b>	<b>1 520</b>	<b>2 200</b>
<b>GENERATION</b>	<b>1 744</b>	<b>2 107</b>	<b>3 741</b>	<b>4 546</b>	<b>5 226</b>
Import - HEP	438	288	130	0	0
Import - TS Sarajevo 4	134	90	120	0	0
<b>TOTAL IMPORT</b>	<b>572</b>	<b>378</b>	<b>250</b>	<b>0</b>	<b>0</b>
<b>AVAILABLE ENERGY</b>	<b>2 316</b>	<b>2 485</b>	<b>3 991</b>	<b>4 546</b>	<b>5 226</b>
<b>DISTRIBUTION CONSUMPTION *</b>	<b>1 819</b>	<b>2 095</b>	<b>2 870</b>	<b>3 410</b>	<b>3 880</b>
ŽELJEZARA ZENICA	31	56	80	200	300
POUHEM	0	5	66	100	120
ZBH	3	3	20	30	40
ALUMINIJ	0	0	370	570	570
ELEKTROBOSNA	0	0	50	100	150
AZOT GORAŽDE	0	0	0	15	20
<b>DIRECT CONSUMERS</b>	<b>43</b>	<b>64</b>	<b>586</b>	<b>1 015</b>	<b>1 200</b>
<b>NET CONSUMPTION</b>	<b>1 862</b>	<b>2 159</b>	<b>3 456</b>	<b>4 425</b>	<b>5 080</b>
TRANSMISSION LOSSES	42	60	105	121	146
Losses in %	1.8	2.4	2.6	2.7	2.8
<b>GROSS CONSUMPTION</b>	<b>1 904</b>	<b>2 219</b>	<b>3 561</b>	<b>4 546</b>	<b>5 226</b>
Export - HEP	252	130	260	0	0
Export - TS Sarajevo 1	160	136	170	0	0
<b>TOTAL EXPORT</b>	<b>412</b>	<b>266</b>	<b>430</b>	<b>0</b>	<b>0</b>
<b>TOTAL ENERGY DEMAND</b>	<b>2 316</b>	<b>2 485</b>	<b>3 991</b>	<b>4 546</b>	<b>5 226</b>
<b>BALANCE</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>BALANCE for 90 % flow</b>			<b>263</b>	<b>449</b>	<b>449</b>

\* without generation at distribution network

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**ELECTRIC POWER BALANCES OF THE FEDERATION B&H  
FOR PERIOD 1994 - 1998**

Table 2. - Low variant

GWh

	Realization	Estimation	Plan	Plan	Plan
	1994	1995	1996	1997	1998
	1	2	3	4	5
Čapljina	228	117	141	141	141
Rama	250	520	780	650	650
Jablanica	556	600	735	670	670
Grabovica	160	230	300	270	270
Salakovac	0	0	160	410	410
Mostar	0	0	0	235	235
Jajce 1	0	0	109	218	218
Jajce 2	0	5	79	158	158
Bočac	0	0	137	274	274
<b>HYDRO POWER PLANTS</b>	<b>1 194</b>	<b>1 472</b>	<b>2 441</b>	<b>3 026</b>	<b>3 026</b>
Tuzla G1	106	35	80	70	70
Tuzla G2	53	105	60	50	50
Tuzla G3	152	250	360	360	360
Tuzla G5	0	0	400	440	800
Tuzla G6	0	0	0	0	0
<b>TPP TUZLA</b>	<b>311</b>	<b>390</b>	<b>900</b>	<b>920</b>	<b>1 280</b>
Kakanj G1	28	55	25	20	20
Kakanj G2	80	45	25	20	20
Kakanj G3	86	45	25	20	20
Kakanj G4	45	45	25	20	20
Kakanj G5	0	55	220	220	410
Kakanj G6	0	0	80	300	430
Kakanj G7	0	0	0	0	0
<b>TPP KAKANJ</b>	<b>239</b>	<b>245</b>	<b>400</b>	<b>600</b>	<b>920</b>
<b>THERMAL POWER PLANTS</b>	<b>550</b>	<b>635</b>	<b>1 300</b>	<b>1 520</b>	<b>2 200</b>
<b>GENERATION</b>	<b>1 744</b>	<b>2 107</b>	<b>3 741</b>	<b>4 546</b>	<b>5 226</b>
Import - HEP	438	288	130	0	0
Import - TS Sarajevo 4	134	90	120	0	0
<b>TOTAL IMPORT</b>	<b>572</b>	<b>378</b>	<b>250</b>	<b>0</b>	<b>0</b>
<b>AVAILABLE ENERGY</b>	<b>2 316</b>	<b>2 485</b>	<b>3 991</b>	<b>4 546</b>	<b>5 226</b>
<b>DISTRIBUTION CONSUMPTION *</b>	<b>1 819</b>	<b>2 095</b>	<b>2 670</b>	<b>3 260</b>	<b>3 700</b>
ŽELJEZARA ZENICA <i>Steel</i>	31	56	80	150	200
POLIHEM <i>Chem + Synthetic Fibre</i>	9	5	20	100	120
ŽBH <i>Elec. Rail</i>	3	3	20	30	40
ALUMINIJ <i>Aluminium</i>	0	0	320	570	570
ELEKTROBOSNA <i>CI + Plastics</i>	0	0	0	50	100
AZOT GORAŽDE <i>Fertilizer ?</i>	0	0	0	0	20
<b>DIRECT CONSUMERS</b>	<b>43</b>	<b>64</b>	<b>440</b>	<b>900</b>	<b>1 050</b>
<b>NET CONSUMPTION</b>	<b>1 862</b>	<b>2 159</b>	<b>3 110</b>	<b>4 160</b>	<b>4 750</b>
TRANSMISSION LOSSES	42	60	105	121	146
Losses in %	1.8	2.4	2.6	2.7	2.8
<b>GROSS CONSUMPTION</b>	<b>1 904</b>	<b>2 219</b>	<b>3 215</b>	<b>4 281</b>	<b>4 896</b>
Export - HEP	252	130	260	0	0
Export - TS Sarajevo 1	160	136	170	0	0
<b>TOTAL EXPORT</b>	<b>412</b>	<b>266</b>	<b>430</b>	<b>0</b>	<b>0</b>
<b>TOTAL ENERGY DEMAND</b>	<b>2 316</b>	<b>2 485</b>	<b>3 645</b>	<b>4 281</b>	<b>4 896</b>
<b>BALANCE</b>	<b>0</b>	<b>0</b>	<b>346</b>	<b>265</b>	<b>330</b>
<b>BALANCE for 90 % flow</b>			<b>81</b>	<b>-184</b>	<b>-110</b>

\* without generation at distribution network

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**ELECTRIC POWER BALANCES OF THE FEDERATION B&H  
FOR PERIOD 1994 - 1998**

Table 3. - High variant

GWh

	Realization	Estimation	Plan	Plan	Plan
	1994	1995	1996	1997	1998
	1	2	3	4	5
Čapljina	228	117	141	141	141
Rama	250	520	780	650	650
Jablanica	556	600	735	670	670
Grabovica	160	230	300	270	270
Salakovac	0	0	160	410	410
Mostar	0	0	0	235	235
Jajce 1	0	0	109	218	218
Jajce 2	0	5	79	158	158
Bočac	0	0	137	274	274
<b>HYDRO POWER PLANTS</b>	<b>1 194</b>	<b>1 472</b>	<b>2 441</b>	<b>3 026</b>	<b>3 026</b>
Tuzla G1	106	35	80	70	70
Tuzla G2	53	105	60	50	50
Tuzla G3	152	250	360	360	360
Tuzla G5	0	0	400	530	700
Tuzla G6	0	0	0	400	800
<b>TPP TUZLA</b>	<b>311</b>	<b>390</b>	<b>900</b>	<b>1 410</b>	<b>1 980</b>
Kakanj G1	28	55	25	20	20
Kakanj G2	80	45	25	20	20
Kakanj G3	86	45	25	20	0
Kakanj G4	45	45	25	20	0
Kakanj G5	0	55	300	300	300
Kakanj G6	0	0	220	300	330
Kakanj G7	0	0	0	0	700
<b>TPP KAKANJ</b>	<b>239</b>	<b>245</b>	<b>620</b>	<b>680</b>	<b>1 370</b>
<b>THERMAL POWER PLANTS</b>	<b>550</b>	<b>635</b>	<b>1 520</b>	<b>2 090</b>	<b>3 350</b>
<b>GENERATION</b>	<b>1 744</b>	<b>2 107</b>	<b>3 961</b>	<b>5 116</b>	<b>6 376</b>
import - HEP	438	288	130	0	0
Import - TS Sarajevo 4	134	90	120	0	0
<b>TOTAL IMPORT</b>	<b>572</b>	<b>378</b>	<b>250</b>	<b>0</b>	<b>0</b>
<b>AVAILABLE ENERGY</b>	<b>2 316</b>	<b>2 485</b>	<b>4 211</b>	<b>5 116</b>	<b>6 376</b>
<b>DISTRIBUTION CONSUMPTION *</b>	<b>1 819</b>	<b>2 095</b>	<b>2 970</b>	<b>3 550</b>	<b>4 000</b>
ŽELJEZARA ZENICA	31	56	100	200	300
POLIHEM	9	5	66	100	120
ŽBH	3	3	20	30	40
ALUMINIJ	0	0	470	1 000	1 520
ELEKTROBOSNA	0	0	50	100	200
AZOT GORAŽDE	0	0	0	15	20
<b>DIRECT CONSUMERS</b>	<b>43</b>	<b>64</b>	<b>706</b>	<b>1 445</b>	<b>2 200</b>
<b>NET CONSUMPTION</b>	<b>1 862</b>	<b>2 159</b>	<b>3 676</b>	<b>4 995</b>	<b>6 200</b>
<b>TRANSMISSION LOSSES</b>	<b>42</b>	<b>60</b>	<b>105</b>	<b>121</b>	<b>176</b>
Losses in %	1.8	2.4	2.5	2.4	2.8
<b>GROSS CONSUMPTION</b>	<b>1 904</b>	<b>2 219</b>	<b>3 781</b>	<b>5 116</b>	<b>6 376</b>
Export - HEP	252	130	260	0	0
Export - TS Sarajevo 1	160	136	170	0	0
<b>TOTAL EXPORT</b>	<b>412</b>	<b>266</b>	<b>430</b>	<b>0</b>	<b>0</b>
<b>TOTAL ENERGY DEMAND</b>	<b>2 316</b>	<b>2 485</b>	<b>4 211</b>	<b>5 116</b>	<b>6 376</b>
<b>BALANCE</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>BALANCE for 90 % flow</b>			<b>-265</b>	<b>-449</b>	<b>-449</b>

\* without generation at distribution network

**ELECTRIC POWER BALANCES FOR TERRITORY UNDER CONTROL OF B&H ARMY  
FOR PERIOD 1994 - 1998  
(at transmission network)**

Tabela 4. - Basic variant

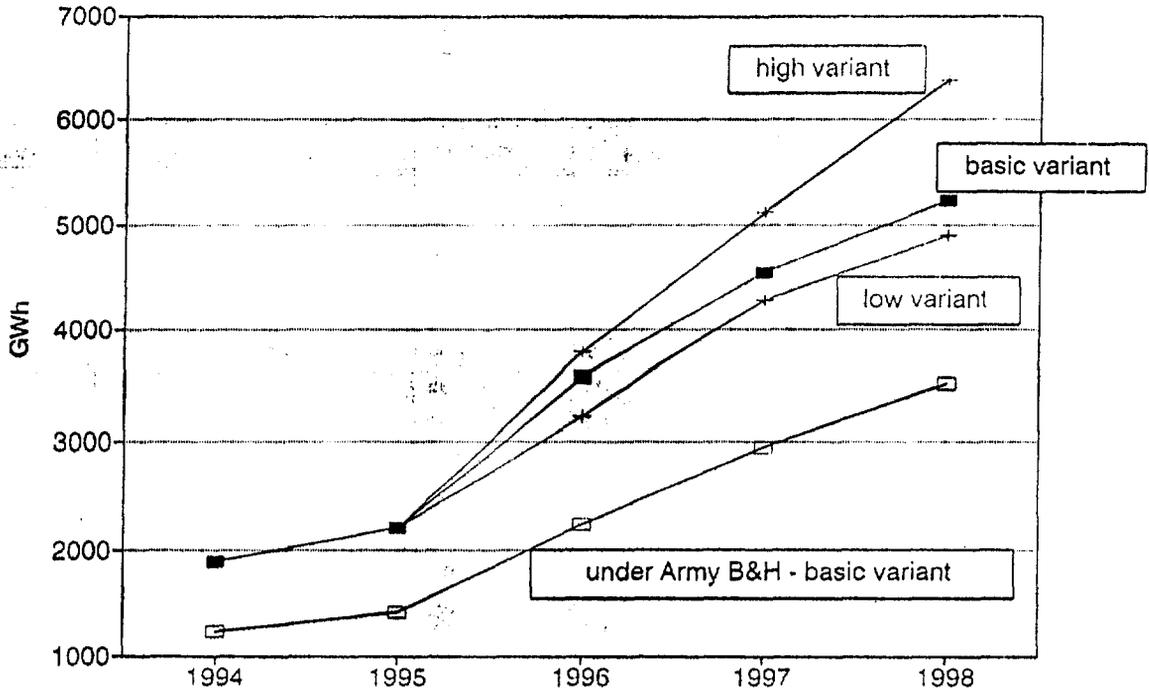
GWh

	Realization	Estimation	Plan	Plan	Plan
	1994	1995	1996	1997	1998
	1	2	3	4	5
Jablanica	556	600	735	670	670
Grabovica	160	230	300	270	270
Salakovac	0	0	160	410	410
Mostar 50 %	0	0	0	117	117
<b>HYDRO POWER PLANTS</b>	<b>716</b>	<b>830</b>	<b>1 195</b>	<b>1 467</b>	<b>1 467</b>
Tuzla G1	106	35	80	70	70
Tuzla G2	53	105	60	50	50
Tuzla G3	152	250	360	360	360
Tuzla G5	0	0	400	440	800
<b>TPP TUZLA</b>	<b>311</b>	<b>390</b>	<b>900</b>	<b>920</b>	<b>1 280</b>
Kakanj G1	28	55	25	20	20
Kakanj G2	80	45	25	20	20
Kakanj G3	86	45	25	20	20
Kakanj G4	45	45	25	20	20
Kakanj G5	0	55	220	220	410
Kakanj G6	0	0	80	300	430
<b>TPP KAKANJ</b>	<b>239</b>	<b>245</b>	<b>400</b>	<b>600</b>	<b>920</b>
<b>THERMAL POWER PLANTS</b>	<b>550</b>	<b>635</b>	<b>1 300</b>	<b>1 520</b>	<b>2 200</b>
<b>GENERATION</b>	<b>1 266</b>	<b>1 465</b>	<b>2 495</b>	<b>2 987</b>	<b>3 667</b>
Import - EP MO	98	170	190	220	250
Import - HEP	17	40	130	0	0
Import - TS Sarajevo 4	134	90	120	0	0
<b>TOTAL IMPORT</b>	<b>249</b>	<b>300</b>	<b>440</b>	<b>220</b>	<b>250</b>
<b>AVAILABLE ENERGY</b>	<b>1 515</b>	<b>1 765</b>	<b>2 935</b>	<b>3 207</b>	<b>3 917</b>
Distribution SARAJEVO	335	381	650	790	910
Distribution TUZLA	399	436	600	700	790
Distribution ZENICA	300	338	420	500	530
Distribution DOBOJ	16	44	60	100	130
Distribution MOSTAR	110	115	140	190	220
Distribution BIHAĆ *	0	0	130	230	340
<b>DISTRIBUTION CONSUMPTION</b>	<b>1 160</b>	<b>1 314</b>	<b>2 000</b>	<b>2 510</b>	<b>2 920</b>
ŽELJEZARA ZENICA	31	56	80	200	300
POLIHEM	9	5	66	100	120
ŽBH	3	3	20	30	40
AZOT GORAŽDE	0	0	0	15	20
<b>DIRECT CONSUMERS</b>	<b>43</b>	<b>64</b>	<b>166</b>	<b>345</b>	<b>480</b>
<b>NET CONSUMPTION</b>	<b>1 203</b>	<b>1 378</b>	<b>2 166</b>	<b>2 855</b>	<b>3 400</b>
TRANSMISSION LOSSES	30	41	76	88	108
Losses in %	2.0	2.3	2.6	2.7	2.8
<b>GROSS CONSUMPTION</b>	<b>1 233</b>	<b>1 419</b>	<b>2 242</b>	<b>2 943</b>	<b>3 508</b>
Export - EP MO	122	170	190	220	250
Export - HEP	0	40	130	0	0
Export - TS Sarajevo 1	160	136	170	0	0
<b>TOTAL EXPORT</b>	<b>282</b>	<b>346</b>	<b>490</b>	<b>220</b>	<b>250</b>
<b>TOTAL ENERGY DEMAND</b>	<b>1 515</b>	<b>1 765</b>	<b>2 732</b>	<b>3 163</b>	<b>3 758</b>
<b>BALANCE</b>	<b>0</b>	<b>0</b>	<b>203</b>	<b>44</b>	<b>159</b>
<b>BALANCE for 90 % flow</b>			<b>38</b>	<b>-213</b>	<b>-98</b>

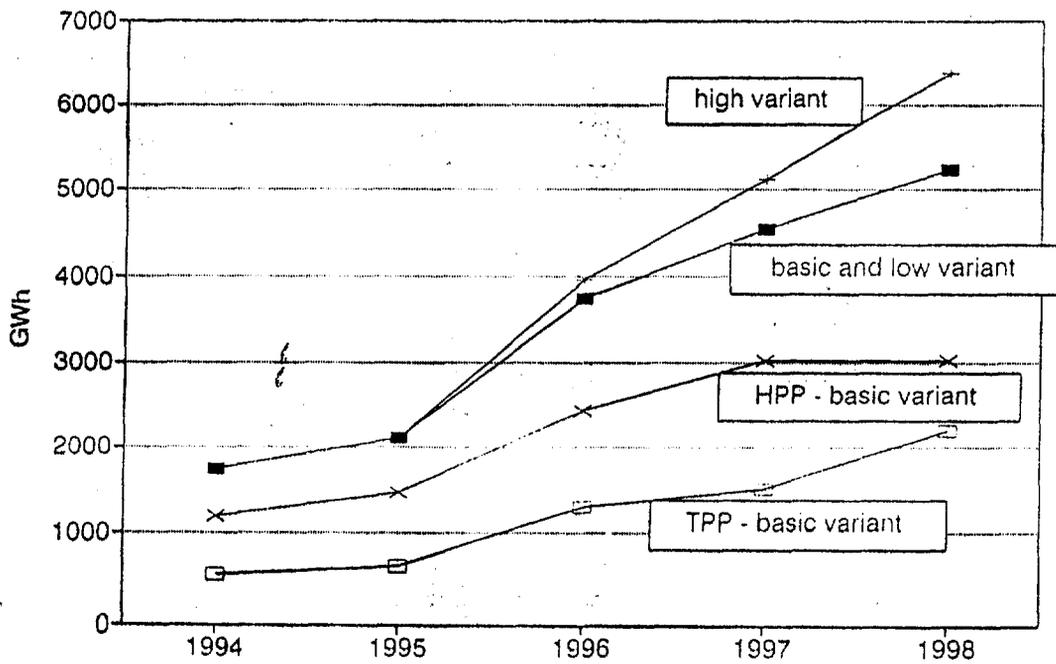
\* without generation at distribution network

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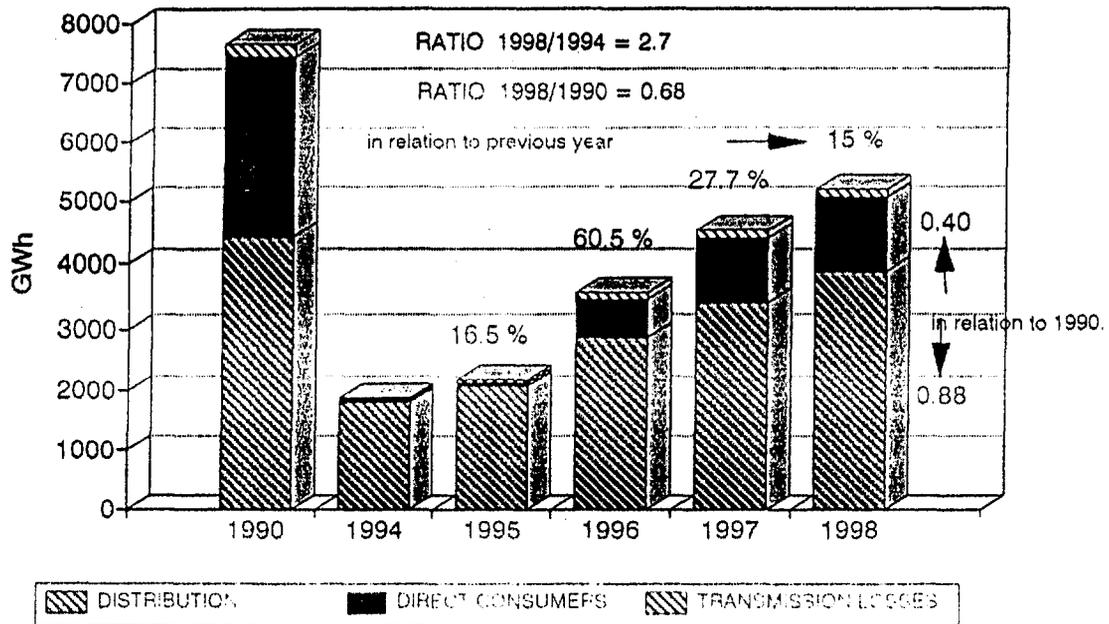
### CONSUMPTION IN FEDERATION B&H



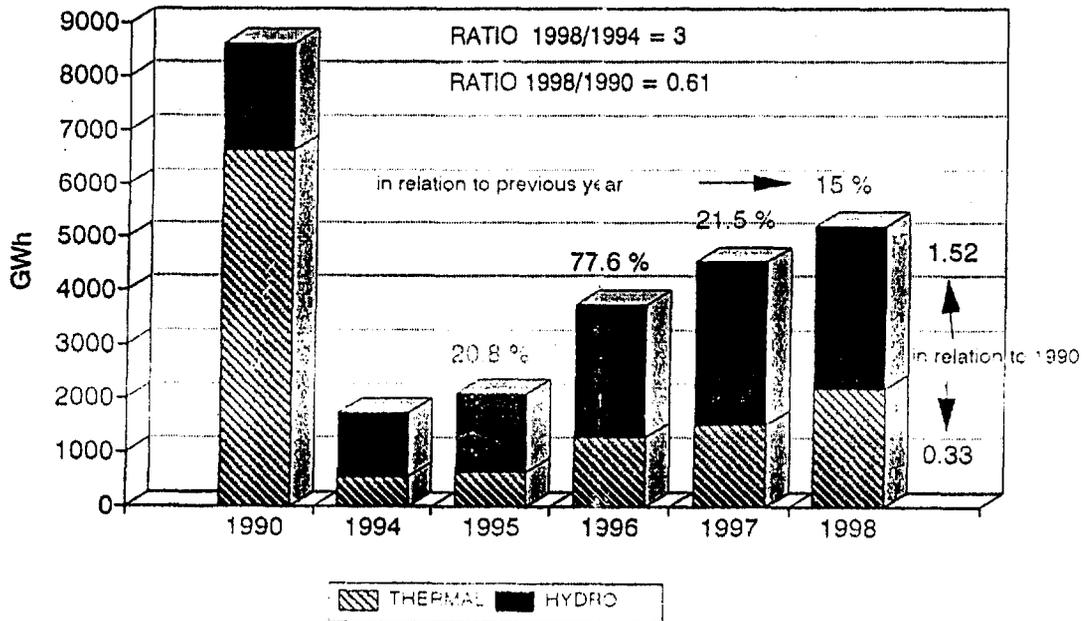
### GENERATION IN FEDERATION B&H



### CONSUMPTION IN FEDERATION B&H

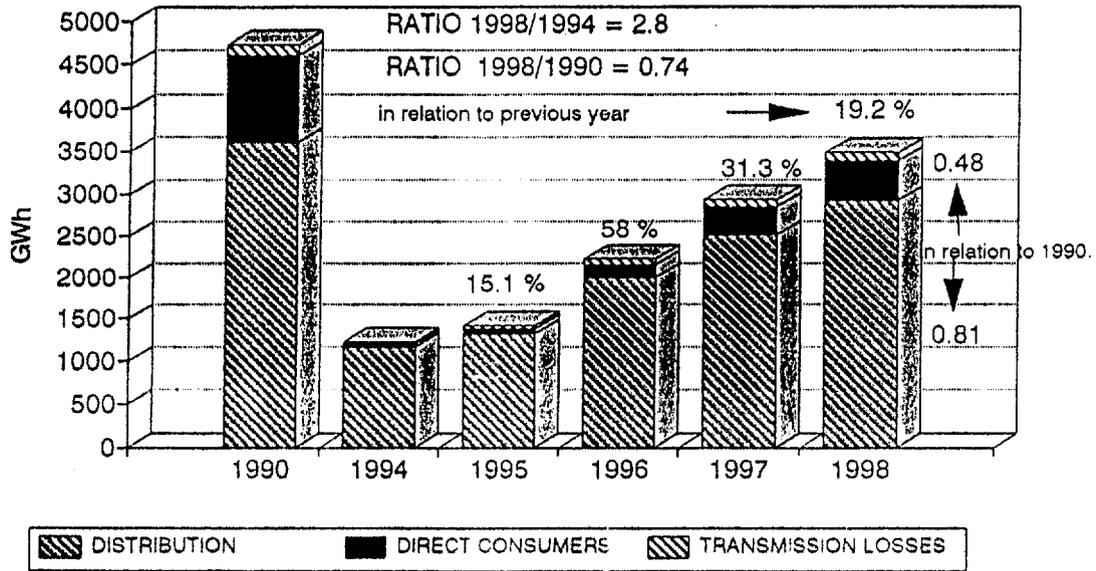


### GENERATION IN FEDERATION B&H

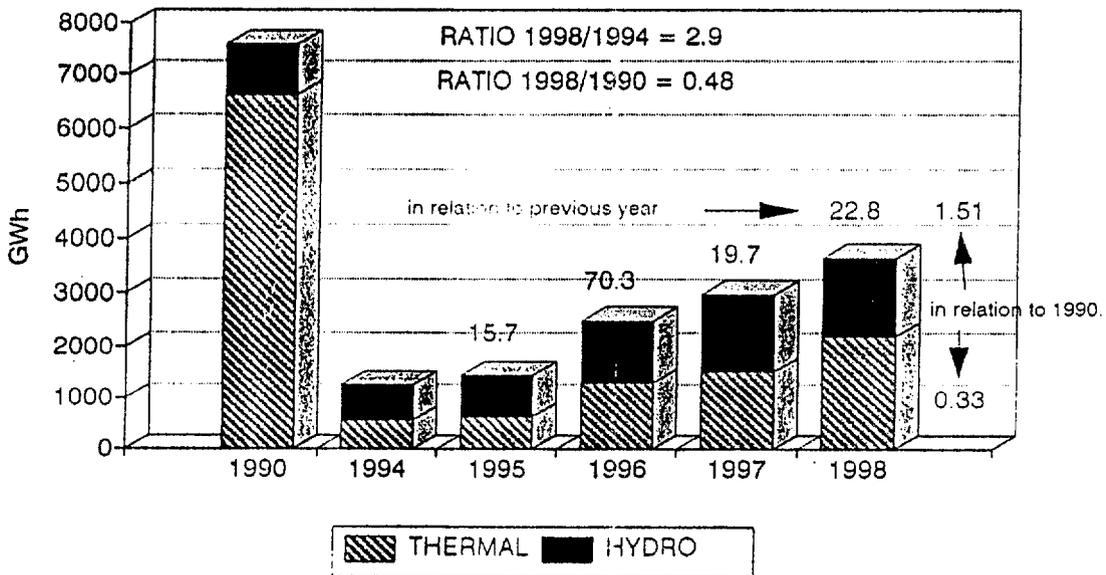


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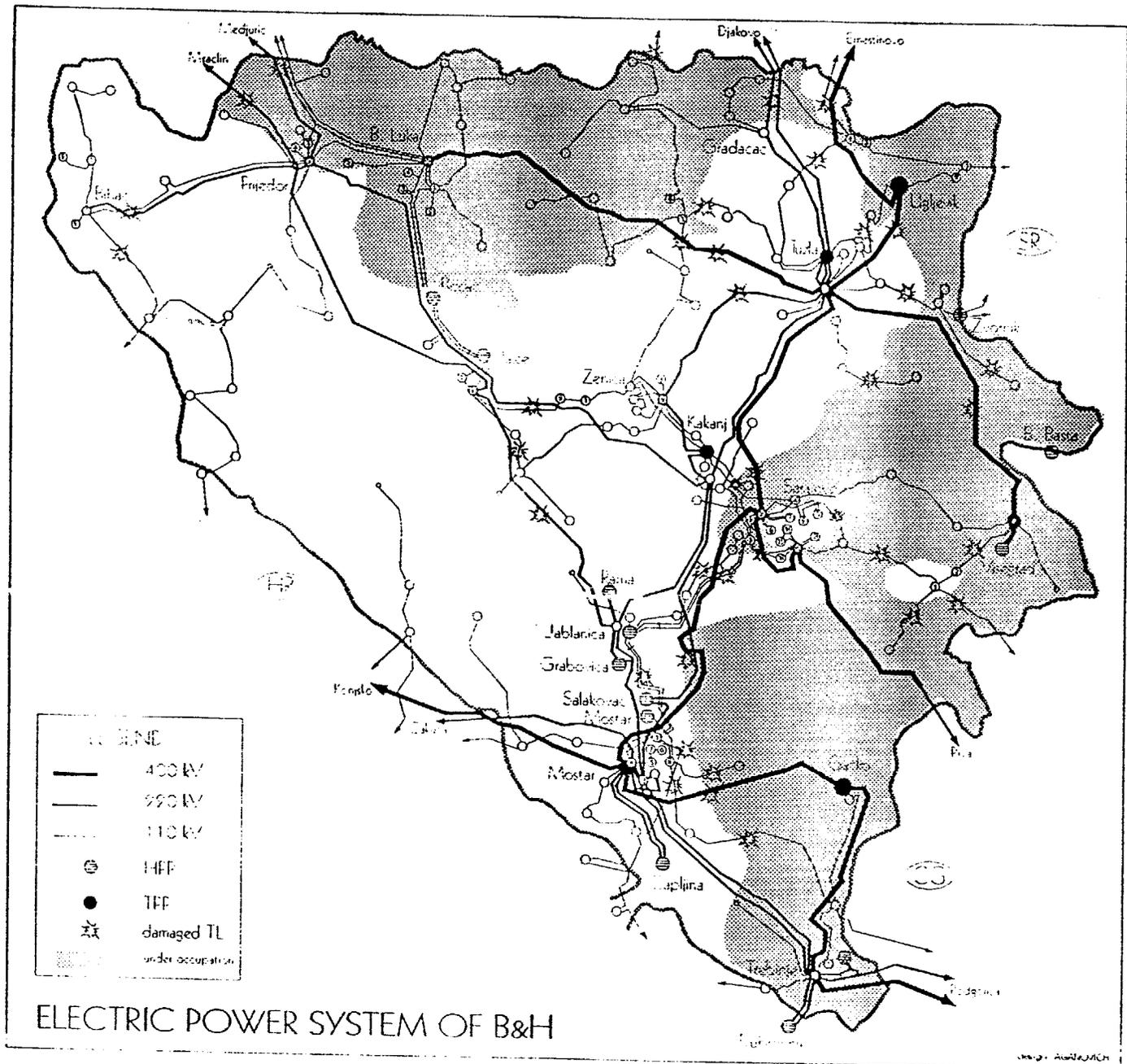
### CONSUMPTION ON TERRITORY UNDER CONTROL OF B&H ARMY



### GENERATION ON TERRITORY UNDER CONTROL OF B&H ARMY



BBHSE



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**IV. PE ELEKTROPRIVREDA B-H FINANCIAL STATEMENT  
FOR 1991, 1994 AND ESTIMATES FOR 1995 AND 1996**

The financial statement of PE Elektroprivreda BiH has been prepared on the basis of annual balance sheet by 31 December 1991 for the Public enterprise on the entire territory of the Republic of Bosnia and Herzegovina.

The financial statement for 1994 and estimated realization for 1995 and 1996 are give only for the Public enterprise Elektroprivreda BiH operating on free territory of the Republic of Bosnia and Herzegovina.

The accomplished business results of Elektroprivreda B H in 1991 and 1994 are not comparable because of the specific work conditions at war in 1994 as well as the fact that a part of generating, transmission and distribution capacities are not under the control of the legal B H authorities. The generating units (HPP on Trebišnjica, HPP on Drina, Rand TPP Gacko, Rand TPP Ugljevik are on the temporarily occupied territory and HPP Jajce I, HPP Jajce II, HPP Bočac, HPP Rama and HPP Čapljina are on the territory under the control of HVO). The distribution capacities of "Elektrokrajina", "Elektrodoj" and port of Sarajevo, Tuzla and Mostar region are under control of the aggressor as well as on the territory controlled by HVO. This implies how unrealistic is the comparison of business results of 1991 with war circumstances in 1994, 1995 and 1996.

Financial statment results are dependent of realized production (generation) of hydro and thermal energy, considering that coal costs participater significantly in total expenditures. The increase of thermal energy production participation increases the el.energy cost price and reflect negatively on business results.

In total realization of generation in 1991, thermal energy, participated by 61,9% and hydroenergy by 38,1%.

In 1994 the thermal energy participates by 42,2% and hydroenergy by 57,8%.

In 1995 and 1996 it is evaluated that the participation of thermal energy will be 47,6% and hydroenergy 52,1%.

This financial statement of PE Elektroprivreda BiH is given in Table no.5.

**ENTERPRISE ELEKTROPRIVREDA B-H  
FINANCIAL STATEMENT FOR 1991, 1994. AND  
ESTIMATES FOR 1995. AND 1996.**

Table number 5

Thousand DM

Item. no.	Description	Realized 1991 g.	Realized 1994 g.	Estimate 1995 g.	Estimate 1996 g.
<b>I.</b>	<b>INCOME</b>				
1.	Income from el.energy	1.918.159	76.812	88.708	135.281
2.	Positive exchange rate differences	740	1.401	9.368	11.242
3.	Other Income	164.469	12.984	86.680	112.684
4.	Total income (1 to 3)	2.083.368	91.197	184.756	259.207
<b>II.</b>	<b>EXPENDITURES</b>				
1.	Coal costs	532.494	27.923	52.314	87.414
2.	Total redemption	560.958	58.182	107.635	134.544
3.	Gross salaries	333.661	2.047	7.687	14.696
4.	Other material costs *)	398.927	16.333	34.070	47.698
5.	Interest	245.139	10.227	54	2.500

6.	Negative exchange rate differences	331.046	40.020	2.500	4.000
7.	Other expenditures	149.057	6.523	98.753	128.379
8.	Expenditure reduction in charge of revaluation reserves	468.347	49.647		
9.	Total expenditures (1 to 7 minus 8)	2.082.935	111.608	303.013	419.231
10.	Profit	24.988	-	-	-
11.	Loss	40.502	20.411	118.257	160.024

\*) Other material costs cover liquid fuel costs

#### Income

The estimated el.energy income structure is given in the Tables no.6 and 7. with accompanying rates used in 1991, and 1994 and still are valid.

The total income structure of PE Elektroprivreda B H in 1995 and 1996 consist of business means revaluation effects. On the basis of new accounting system the given indicators in 1995 and 1996 are uncomparable to 1991 and 1994.

#### ESTIMATE of income from electric energy for 1995

Table no. 6.

Item . no.	Consumption category or group	Electric energy consumption GWh	El.energy price pf/kWh	Incom from el. energy in 000 DEM
1.	Na 110 kV	88,8	7,76	6.887
2.	Na 35 kV	137,3	9,75	13.385
3.	Na 10 kV	142,2	10,73	15.260
4.	Na 0,4 kV	804,1	6,61	53.176
4.1.	I group consumers.	47,2	14,2	6.704
4.2.	II group consumers	159,3	16,09	25.634
4.3.	Public lighting	3,7	13,11	485
4.4.	Households	593,9	3,43	20.353
5.	Total (1 to 4)	1172,4	7,56	88.708

#### ESTIMATE on income from electric for 1996

Table no 7.

Item . no.	Consumption category or group	Electric energy consumption GWh	El.energy price pf/kWh	Incom from el. energy in 000 DEM
1.	Na 110 kV	135,8	7,76	10.538
2.	Na 35 kV	209,1	9,75	20.387
3.	Na 10 kV	216,2	10,73	23.198
4.	Na 0,4 kV	1225,8	6,62	81.158
4.1.	I group consumers.	72,3	14,20	10.267
4.2.	II group consumers.	242,7	16,09	39.050
4.3.	Public lighting	6,2	13,11	813
4.4.	Households	904,6	3,43	31.028
5.	Total (1 to 4)	1786,9	7,57	135.281

**ELECTRIC ENERGY RATES FOR CONSUMERS CONNECTED  
TO ELECTRIC POWER SYSTEM PE ELEKTROPRIVREDA B-H**

Table no. 8

Rates expressed in pfenings

Calculation elements	Rates		High voltage			Low voltage					
	Seasonal	Daily	110 kV	35 kV	10 kV	Households			Other consumers		Public lighting
						Do 100 kWh I Rate gr.	More than 100 to 200 kWh II Rate gr.	Over 200 kWh III Rate gr.	I rate group	II Rate group	
1	2	3	4	5	6	7	8	9	10	11	12
kV	Higher		4.990	5.433	5.570	1.348	1.348	1.348	3.945	3.945	
	Lower		3.317	3.637	3.723	898	898	898	2.640	2.640	
kWh	Higher	Larger	13,90	16,25	17,10	27,94	35,08	35,08	24,37	44,50	33,78
		Smaller	6,95	8,18	8,62		17,48	17,48	12,25	22,22	
	Lower	Larger	9,23	10,83	11,83	18,77	23,32	23,32	16,25	29,60	25,52
		Smaller	4,68	5,42	5,78		11,70	11,70	8,18	14,76	

These rates apply from 31.12.1991.

**NOTE:** The rates were expressed in YUDIN, calculated at the rate of 13 YUDIN per 1 DM. That was the official rate at dinar, considerably overestimated in respect to actual dinar, resulting relatively high rates and an average energy price at 21,70 pf-kWh. This price corresponds to parity price of coal for thermal power plants 9,17 DM-GJ. Both, the prices and the rates are unrealistic r.e., too high. The real rate was about 35 YUDIN per 1 DM, so the given prices would be lower. On 25. January 1992 the official rate 65 YUDIN-DM was brought.

Calculation	Rates		High voltage			Low voltage					
	Seasonal	Daily	110 kV	35 kV	10 kV	Do 100 kWh I Rate gr.	More than 100 up 200 kWh II Rate gr.	Over 200 kWh III Rate gr.	I rate group	II Rate group	Public lighting
						7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12
kV	Higher		2325	2400	2475				2250	2250	
	Lower		1550	1600	1650				1500	1500	
kWh	Higher	Larger	6.90	7.50	8.10	2.50	4.00	7.50	11.40	22.20	16.65
		Smaller	3.45	3.75	4.05				5.70	11.10	
	Lower	Larger	4.60	5.00	5.40				7.60	14.80	11.10
		Smaller	2.30	2.50	2.70				3.80	7.40	

## EXPENDITURES

Coal and lignid fuel cost in 1991 participated by 25% in total shawn expenditures of PE Elektroprivreda BiH. The participation of these expendes in total thermal power plants amounted 65%. In 1994 the coal and liguid fuel costs participate by 25% in the total realized production structure. The participation of these costs amounts to 66% in total thermal power plants costs.

The estimate sharo that coal and liguid fuel cost in 1995 and 1996 shall participate by 18% and by 22% in the total expenditures of PE Elektroprivreda B H. The participation of these costs I total thermal power plants, costs in 1995 and 1996 amount to 60% or 65%.

In total expenditures of the PE Elektroprivreda BiH the total redemption costs in 1991 participate by 27%, in 1994 by 52%, n 1995 by 35% and in 1996 by 32% and they present significant participation in the total expenditures.

In the total given expenditures the participation of gross salaries in 1991 amounted 16% and realized average gross salary per employee amornuted 1567 DM. In 1994 and 1995 the participation of means for gross salaries in total expenditures amounted 1,8% or 3,6% and the realized average gross salary per employec amonuted 22 DM or 151 DM.

According to estimation for 1996 the gross salary per employee is determined to by 256 DM. Realized salary average in 1994 and 1995 could not satisfy minimum egzistance needs.

Other business expenditures in 1995 and 1996 cover revaluation of business means on the basis of neco accounting system, presenting significant item in the total expenditures of PE Elektroprivreda B H, the some being unoperable with expenditures of previons years.

PE Elektroprivreda B H operated in 1991, 1994, 1995 and 1996 with loss, before all due to disparity of el.energy prices, inability to realize el.power generation plan, inability to realize billing and collection of el.energy greater participation of thermal energy in relation to Rydroenergy greater incomming generation factors than selling price, damage on distribution and transmission mettwork, destroyed electric power buildings, war condition economy and number of other factors.

The sharin bosses are not covered from any source in either year resulting inabitify to sattle any liability towards creditors, hanks, etc.

Since PE Elektroprivreda B H operates with constant losses which are, as noted, not compensated, if imperils significantly its economic power, hindering simple reproduction. This also means that it is imposible to set aside means for the sanation of the damaged facilities at war and to execution of current liabilities as well as credits.

Gress capital assets (constant) of the PE Elektroprivreda B-H as whole in 1991 (before the war) was 22.087.063 thousand DM and net value11.774.055 thousand DM.

In structure, the net value of capital assets im PE Elektroprivreda B-H in 1991 was 66,4% for building structures, 28,6% for egnopment and 5% other copital assets.

Capital assets value in PE Elektroprivreda BiH in 1994 and 1995 is giver jast for the PE Elektroprivreda B-H operating on free territory of the Republic of Bosnia and Herzegovina (in war circumstances).

Capital assets value in 1991 and 1994  
with estimate for 1995

DM		in 000			
Item. no	Description	1991.	godina	1994.	godina
		Gross *	Net**	Gross*	Net**
<b>1.</b>	<b>Total capital assets</b>				
1.1.	Building structures	22.087.063	11.774.055	7.400.370	3.226.490
1.2.	Equipment	13.945.377	7.818.498	4.423.600	2.174.130
1.3.	Other capital assets	7.552.518	3.366.210	2.882.210	958.680
		<b>589.168</b>	<b>588.925</b>	<b>94.560</b>	<b>93.680</b>

DM		in 000	
Item. no	Description	1995.	godina
		Gross *	Net**
<b>1.</b>	<b>Total capital assets</b>		
		8.529.386	3.677.825
1.1.	Building structures	5.055.949	2.542.925
1.2.	Equipment	3.329.556	1.077.043
1.3.	Other capital assets	143.881	57.857

\*) Gross presents acgrnisation value of capital assets

\*\*\*) Net presents current value of capital assets.

The structure net value of the Public Enterprise Elektroprivreda BiH capital assets in 1994 was 67,4% for building structures 29,7% for equipment and 2,9% other capital assets.

In structure, the net value of capital assets in PE Elektroprivreda B H in 1995 was 69,1% in building structures 29,3% in equipment and 1,6% other capital assets.

## V. NECESSARY MEANS FOR TURNOVER, CREDIT AND OTHER LIABILITIES

### 1) NECESSARY MEANS FOR TURNOVER

Besides the means for the sanitation of electric power buildings given in table charts it is necessary, to have in mind the provision of minimum working assets for planned generation of electric energy and putting units into normal operation.

Necessary working assets in 1996 are estimated in the amount of

dm 13.125.000,00

of which:

- for coal 12.425.000,00 DM, which, corresponds to two months reserves,
- for lignite fuel 700.000,00 DM, which corresponds to needs for lignite fuel for boiler ignition and heating five, for two months.

Needs for working assets are greater but due to means limitation they are given only for financing coal and lignite fuel reserves.

### 2) CREDIT DEBTS ON 31.12.1991

Credit debts on 31.12.1991 are shown only for buildings located on the territory under control of legal authorities and amount to 392.1 mill. DM, of which:

DM

in 000

	Principal	Estimated rate	Total debt estimated
Foreign credits	268.691	107.524	376.215
of which from: IBRD	81.322	27.644	108.966
EIB	7.879	9.235	17.114
Other credits	179.490	70.645	250.135
domestic credits	6.346	9.517	15.863
TOTAL	275.037	117.041	392.078

(All data are given at the exchange rate 1US\$=1,65DM on 26.March 1992.)

We note that all credit obligations were not executed from the beginning of the war because of imposed moratorium on all credit liabilities for credits used prior the war.

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3) DUE AND UNSETTLED LIABILITIES FROM 1.JANUARY 1992. HILL 31.DECEMBER.1994

The total due annuity liabilities in this period amount 185,1 mil.DM of which:

DM	in 000		
	Principal	Estimated rate	Total debt estimated
Foreign credits	107.250	67.064	174.314
of which from: IBRD	53.418	19.835	53.252
EIB	31.142	5.527	36.670
Other credits	42.690	41.702	84.392
domestic credits	4.331	6.498	10.829
<b>TOTAL</b>	<b>111.581</b>	<b>73.562</b>	<b>185.143</b>

Because of the credit moratorium during the war no payment of annuity liabilities has been made.

4) CREDIT LIABILITIES IN 1995

Obligations for credits and buildings located on the territory under control of legal authorities, amount to 47,3 mill. DM, of which:

DM	in 000		
	Principal	Estimated rate	Total debt estimated
Foreign credits	29.398	16.175	45.573
of which from: IBRD	11.246	5.201	16.447
Other credits	18.152	10.974	29.126
domestic credits	680	1.018	1.698
<b>TOTAL</b>	<b>30.078</b>	<b>17.193</b>	<b>47.271</b>

These obligations as well as obligations from 1992 up to 1994 have not been fulfilled to banks because of moratorium to credits in the time of war.

Under estimated obligations under item III and IV, eventual obligations due to delay in execution of the same are not included.

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## 5. OBLIGATIONS TO COAL MINES FOR OVERTAKEN COAL

Obligations to coal mines are as following:

- . for overtaken coal quantities in 1994... 24,2 mil.DM
- . obligation to coal transporters in 1994.. 2,9 mil.DM
- for overtaken coal quantities by 2.11.1995... 19,4 mil.DM
- TOTAL: 46.5 mil.DM

## 6. OTHER OBLIGATIONS

- obligations on account of the sanitation
- of el.energy buildings in 1995..... 4,8 mil.DM
- current business obligations in 1995..... 3.5 mil.DM

The given obligations do not include coal, because it is separately given in item V. Neither are the lignid fuels included, because they are provided from the Republic commodity reserves, without compensation.

## VI. INVOICED AND COLLECTED ELECTRIC ENERGY

Invoiced, collected and uncollected el.energy realization

Year	Invoiced realization DM	Collected realization DM	Uncollected realization DM	% of collection (3:2)
1	2	3	4	5
1991.	1.918.159.230	1.549.171.384	373.987.846	80,50
1994.	76.812.577	22.984.081	53.828.496	28,92
1995.	87.149.593	39.443.954	47.705.639	45,26*
Total	2.082.121.400	1.606.599.419	475.521.981	77,16

Note: Data for this Table are taken from bookkeeping (1991-1994)  
1995 - Collection Department

1995 - The given data as of 30.09.1995

\* Invoicedrealization: Invoiced in 1995

49.362.262 DM

and invoiced uncollected el.energy

from 1994

37.787.331 DM

TOTAL

87.149.593 DM

Uncollected realization is not written off and every measure is taken to collect, according to General el.energy supply conditions (payment warning notification or warning prior switching off, lodging claims and disconnecting the consumer), so that the uncollected realization in most cases is collected in years to come. However a small percent is written off in cases when collection is impossible. Writing off percentage was usually 2 to 3% in prewar period. Because of war this percent will probably increase considerably although writing off has not been made officially.



In years during war the biggest debtors are consumers financed from budget, such being:

- Water works and other public utilities;
- Health institutions;
- Schools;
- Displaced persons and collective refugee homes;
- Heating plants;
- Public transportation companies;
- Educational institutions.

Households are also large debtors, firstly, because people do not receive any personal income (maybe insignificant) so they cannot pay bills.

MEASURED FOR COLLECTION

This work is done according to General electric energy supply conditions, in force before the war and currently with some amendments and supplements for application in war state.

In accordance with this enactment, a consumer is given a warning with payment term. In case he does not pay due amount a claim is lodged followed by disconnection.

#### COLLECTION OF BILLS HX 1995

Electric energy bills collection is given in the enclosed Table.

#### POSSIBILITY OF COLLECTION FROM CONSUMERS WHO DO NOT HAVE COUNTERS

We do not bill nor collect from such consumer because there is no legal element for doing so.

Consequently, if it is necessary to provide financial means for acquisition of counters to be put in function of gauging and collection of consumed electric energy.

Total shortage of counters is 50.335, of which:

- For Elektrodistribucija Sarajevo 10.000 counters
- For Elektrodistribucija Tuzla 12.000 counters
- For Elektrodistribucija Zenica 10.335 counters
- two-rate and single rate)
- For Elektrodistribucija Doboj 5.000 counters
- single phase and three phase)
- For Elektrodistribucija Mostar 5.000 counters
- For Elektrodistribucija Bihać 8.000 counters
- Unsko-Sanski canton

#### DISTRIBUTION COLLECTION DEGREE

STATE ON 30 SEPTEMBER 1995

Item no.	Electro Distribution	31.08.95. Overtaken energy Mwh	Invoice element KWx0,85	Price kWh DM	Invoiced DM	Uncollected invoiced el. energy from 1994	Total invoice	Uncollected DM	DM collected in Dinars	Collected total	Collection rate
0	1	2	3	4	5	6	7(5+6)	8	9	10(8-9)	11(10-7)
1	Sarajevo	233882	198798	0,075	14909850	9952014	24867864	2978046	6599366	9577412	38,52
2	Tuzla	264167	224542	0,075	16840646	167611	33608257	1332676	1942025	15263901	45,42
3	Zenica	153947	156355	0,075	11726671	8837,00	20544371	4514407	1225374	11037181	53,49
4	Doboj	24477	20805	0,075	1560409	594194	2155303	349859	5921	943015	43,75
5	Mostar	67837	57663	0,075	4324736	1635,12	5959849	486764	2133061	2619845	43,92
6		774310	658163	0,075	4962262	37787331	87149593	2150952	17493002	39443954	45,26

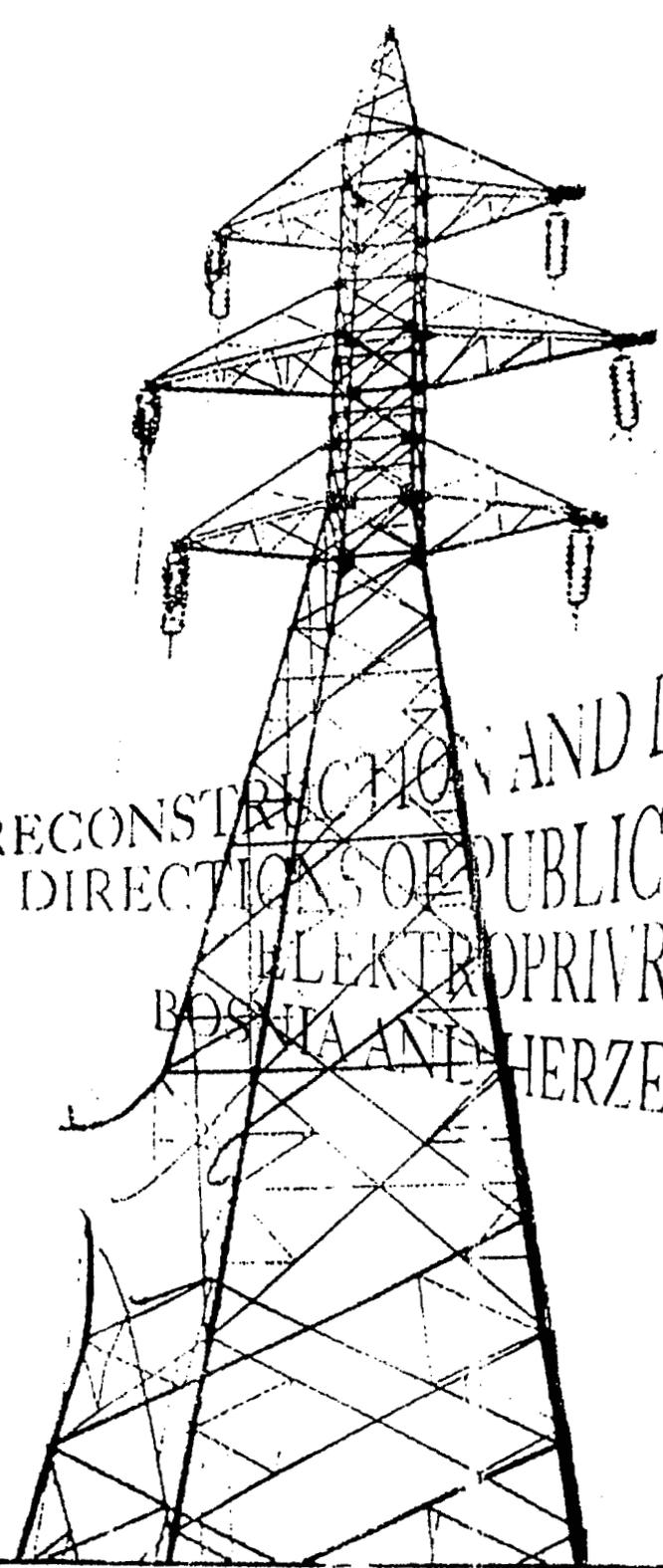
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**Attachment 7**



JP Elektroprivreda BiH LTD  
Sarajevo  
BOSNIA AND HERZEGOVINA

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RECONSTRUCTION AND DEVELOPMENT  
DIRECTIONS OF PUBLIC ENTERPRISE  
ELEKTROPRIVREDA  
BOSNIA AND HERZEGOVINA

EXTRACT

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Sarajevo, March 1994

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**RECONSTRUCTION AND DEVELOPMENT DIRECTIONS  
OF PUBLIC ENTERPRISE ELEKTROPRIVREDA  
BOSNIA AND HERZEGOVINA**

**EXTRACT**

YUGOSLAVIA 1994

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**JP Elektroprivreda BiH LTD Sarajevo • Direction for Generation • Development and Study Sector**

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# RECONSTRUCTION AND DEVELOPMENT DIRECTIONS OF PUBLIC ENTERPRISE ELEKTROPRIVREDA BOSNIA AND HERZEGOVINA

## EXTRACT

### Summary

*Both the character and the intensity of the changes at the political macroeconomical and business environment expect the Public Enterprise Elektroprivreda Bosnia and Herzegovina to be significantly adaptable.*

*The elaborate "Reconstruction and Development Directions of PUBLIC ENTERPRISE ELEKTROPRIVREDA BOSNIA AND HERCEGOVINA presents the basic assumptions of the business strategy noting the most important activities and hypotess necessary for its realization. The initiation for such an elaborate came from the current changes at the state-law subjectivity and the international status of Bosnia and Herzegovina; from the actual economical transformation of the system; from the changes provoked by the aggression on the Republic Bosnia and Herzegovina.*

## 1. INTRODUCTION

The milieu of far-from-market economical system: an enormous influence and voluntary decision-making of the official authorities; complex and disordinated relations inside the total energetics. The identification of Elektroprivreda, as an enterprise and a dependent economic subject, was not expressed. The aim of this elaborate is, besides the conditions and possibilities of the post-war reconstruction and development, founding of the basic principles both of efficiency and profitability of Elektroprivreda. Its strategy of management and development is to be based on the streams of the contemporary management inside the expected macroeconomic and business surroundings.

The preparations of all segments of the elaborate is determined by the fact: the war is still on. The total amount and scope of the damages and destructions are still unknown. The activities at the constitutional government of the Republic are underway. The competencies and resolutions at the state level are yet undetermined. The activities defining our economical system and policy of economics are in its final phase. Due to the shortage of the mentioned elements of surroundings - they will be evidently influential on the process of reconstruction and development - starting from the modern tendencies of the developed European electric power industries, we have tried to identify some important indicators principles and criteria. They are to be the main orientation at the process of the transformation of our enterprise. They will also be the starting point for outlining and creating the business policy in further periods.

These reconstruction and development directions are presented as a general synthesis material, based on the larger documentation basement, a number of materials. Analysis and studies - prepared at Elektroprivreda for its needs or for other purposes - are used for the elaborate. It was made under extremely difficult conditions and the complementary investigations could not be undertaken. Still, the detailed explanations of certain phenomena are wanted.

This elaborate is to be considered as an initiation for further studies and analysis of certain strategically important problems that were insufficiently worked out and they ask to be actualized. Taking into consideration the above limitations as well as the inevitability of the documents defining the basic business determinations of the Public enterprise, it is obvious that the enterprise strategy can be only reached by an itinerary procedure together with the following repetitions: studies of certain problems\preparation\ actualization of the strategy-analysis of the realization - decision for the necessary analysis of certain problems and for complements\ changes of the strategy. In that sense, the inevitable planning of the strategy is to be taken as a permanent duty of Elektroprivreda B&H. After all, this elaborate has its explicit purpose: initiation for an organized activity at studying and answering certain questions, necessary for the definition of the business strategy. The answers will be found at the very aims of the management. At the same time the strategy of each functional entity (departments) is to be initiated.

The paper "Reconstruction and Development of Public Enterprise Elektroprivreda B&H" can

be a temporary basis for short-term, middle-term and long-term plans of development. It can also be a basis for achieving the consistency among the concrete activities that are in process (or will be soon underway) of preparing and realizing the reconstruction. The prepared elaborates for the sanation and reconstruction of some units (and the studies that are in their final phase) are to be considered as one of the very important bases for the realization of the proposed programs. That is also the way how "Reconstruction and development directions" will be realized. The strategy in its definite (or temporary) form can be achieved just on this way. Within the first period of the reconstruction (so called "sanation period") probably great many problems will be autonomously solved. Without a deep insight into the problematics of the enterprise on the whole; and the complete and coordinated usage of all resources of the enterprise are to be reached. On the way to the efficient enterprise, a next step is to be prepared and made.

Hereafter there is the contents of the complete elaborate: Reconstruction and development directions of Public enterprise Elektroprivreda B&H.

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## 2. CHANGES OF SURROUNDINGS

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After the socialist self - management system was disintegrated and due to the war consequences, Bosnia and Herzegovina is faced with significant social changes influencing any future development. Besides the inevitable functioning of the state on the new constitutional bases, the complex program of the social system transition is to take place. The very first step is the change of the present structure of ownerships. In regard with the war damages and the break of the economic activity, the program of the technological development and environment protection will have a particular significance within the scope of all changes.

**WAR DESTRUCTIONS AND DAMAGES** According to the available information, a great number of important economic and industrial facilities is damaged and destroyed. Many of them are looted or dislocated out of the Republic. After many residential buildings were bombed, people were moved from their homes, all areas, villages were burnt down. The number of households at the occupied areas was significantly reduced. There is the human concentration at the free territory and in bigger urban centers. All these facts show that the war consequences will influence changing of the structure and characteristics of the electric power, and the reconstruction and development of Elektroprivreda in next periods too.

**TOTAL DAMAGES AT THE ELECTRIC POWER UNITS ARE ENORMOUS** Due to the war casualties and unreachable location of certain number of the power units and substations for the expert commissions, the details about the size of damages are missing. According to the preliminary and incomplete data referring to a part of the free territory and to the town Sarajevo, the total damages at the electric power units amount to about 700.131.705 DEM in December 31, 1993. Out of the number there are 410,182,500 DEM for the damages at the units, and 289,949.200 DEM are damages in management.

**OTHER CONSEQUENCES OF THE WAR CASUALTIES** such as massacres, moving and migrations of a large number of people at the territory of all Republic, particularly at the occupied territory will reflect negatively to the numerical state and qualifying structure of the employees at Elektroprivreda.

The shortage of the qualified experts of some professions was already present and this question will become very serious after the war. The proper personnel policy of the Enterprise has to be established enabling the structural moving of the employees on behalf of the highly qualified persons of various specialties. The personnel problematics will be paid attention as it can be a leading promoting factor of the activity and development, or its great limiting factor.

**CHANGES AT THE POLITICAL AND MACROECONOMIC SURROUNDINGS** The influence of the political and macro-economic surroundings on the organization and development of Elektroprivreda B&H, as a Public enterprise, is of a large social significance, and it is very important and complex. The operation and management of Elektroprivreda are established mostly by legal regulations. The limits of the business independence are determined by the economic-system solutions, namely by the elements of the accepted policy of economics and the realization of the fixed global social-economic aims of the development.

If the idea of the international subjectivity of Bosnia and Herzegovina is followed, all economic relations with foreign countries have to go over the central government (capital, goods, technologies and others). Since Elektroprivreda is closely dependent on the international surroundings, such a position of the state B&H can justify the strategic planning and programming at the level of the central electric power enterprise.

If the concept of the Republics is carried out inside the state B&H, they will keep their natural and social resources. The Republics will plan their own development on that basis. Then the influence of Elektroprivreda on programming of the unique electric power system would be devaluated disregarding the organizing forms of the electric power system.

The question of building the economic system of the state is closely connected to the political organization. If each Republica builds its own system, it means a different structure of ownerships, a different influence of the market and an different regulative of the economic life. They will prevent

the electric power system to function with the unique and common relation for the state B&H. The political organization can ask the question of forming the power systems of the Republics with the common central power enterprise. The organization will be reduced to the association form. The technological unity of the power system will be considered together with its optimal exploitation for the maximum techno-economic effect on all subject.

In case of splitting the actual Elektroprivreda, the division balance both of assets and liabilities is to be made. Each "Republican enterprise" would have a different form and quality of their funds and resources. Therefore their possibilities for the development would be different, asking a particular elaboration.

The changes of the state-political organization of B&H and their reflections on Public enterprise Elektroprivreda B&H will be a topic of a separate elaborating. Following the experience of more developed European power systems, we have accepted the standpoint "the optimal solution for Elektroprivreda is the organization of a unique organizing, techno-technical and economic system for all Republic.

**MACROECONOMIC SURROUNDINGS** The most important decisions about the further construction of the economic system of the Republic are defined at the paper: "Economic system and elements of the policy of the economies-starting bases". They are as follows:

1. *Operation system with economic freedom both of producers and consumers*
2. *Market in all segments of the social reproduction*
3. *Radical change of the existing ownership structure and forming the economic-social structure applicable to the market operation*
4. *Modern macroeconomic policy*
5. *Innovated economic functioning of the state with necessary regulative and operative functions*

In accordance with the mentioned decisions, the following questions need an inevitable answer: character and structure of the Elektroprivreda organization ownership structure, character of management, prices of the electric power, tariff system and general conditions: was of investing the development programs, characters and efficiency of planning and management control; various aspects of relations with the surroundings-state business partners and consumers.

The expected changes of the political and macroeconomic surroundings will require the radical changes of the organization and management. The changes will intensify the social demands for Elektroprivreda B&H efficiency. At the same time, for the quick repair of the war damages, there will be also other demands of the society to Elektroprivreda. There will be a stimulus for the national industry engagement of the civil building operatives, and the realization of the social aims. The responsibility of Elektroprivreda and government authorities has to be clarified for the successful management.

**BUSINESS SURROUNDINGS** of Elektroprivreda B&H are all electric power consumers, suppliers of the primary energy (coal mines) builders and - deliverers of the equipment and technology for the electric power industry.

Gross consumption of the electric power in B&H in 1990. reached 11535 GWh; for the distribution consumers there were 7050 GWh, consumers 3192 GWh, and the losses at the transmission and distribution network 1293 GWh

The consumption structure in B&H is: 56% industry, 28% households, 2% traffic and 14% other consumers.

From 1990. the power consumption suddenly falls and in 1993. it is almost half cut when compared to the amount from 1990.

So far there are no general information necessary for the forecast of the electric power consumption in postwar period. The global limits of the possible needs are to be found out enabling the activities that are in accordance with the expected results of the long-term electroenergy balance. Before making any concrete business decisions it is necessary to carry out the complementary investigations of our own potential export market of the electric power.

On the basis of the expert estimation, the post war development of the electric power will follow two scenarios. Table II 1.

Table II.1 Future development of the electric power consumption GWh

year	GROSS CONSUMPTION			DELIVERIES		TOTAL NEEDS		
	lower sc	realized	upper sc	ELES	HEP	lower sc	realised	upper sc
1993		5292*		0	868		3204	
1994	5292**		5292**	0	0	5292		5292
1995	6101		6139	493	798	7392		7430
1996	6809		7059	527	630	7966		8216
1997	7531		7977	527	488	8546		8992
1998	8126		8934	527	522	9175		9983
1999	8711		9829	497	522	9730		10847
2000	9222		10712	527	522	10271		11761

\*Estimation of the realized gross consumption in 1993.

\*\*Forecast of the gross consumption in 1994 according to the power balance 1994.

On the basis of the estimated needs for the electric power and after the inspection of the production capacities, the calculation of the electric power balance is made, showing that in period 1995-2000, it is possible to have a surplus of the electric power.

Table II.2. Total production capacities of EP B&amp;H in period from 1994-2000. GWh

Descriptions	1994.	1995.	1996.	1997.	1998.	1999.	2000.
HPP	3185	3336	3336	3336	3336	3336	3336
TPP	733	8612	9308	9319	8533	9414	8073
TOTAL	3918	11948	12644	12655	11869	12750	11409

The realization of such a production asks the necessary foreign currency funds for revitalization, sanation and reconstruction of the generating capacities as well as the investing into our coal mines.

Due to the war casualties, the ignorance of the real state and generating capacities of the units and necessary supplies of the coal; the above assumptions can be easily changed. Still, at the current situation, they can indicate the expected changes of the surroundings aiming at future development direction to the realization of the strategic decisions of the enterprise.

It is very hard to foresee what quantities of the coal can be provided by the coal production (and what prices of the coal will be) for the installed power capacities up to 1995, particularly to 2000. Such a forecast asks a detailed analysis for all units supplying therm plant with the coal.

Elektroprivreda B&H is greatly interested in prompt sanation of the coal mines, bringing them to the level of the profitable management. In that way the coal can never be a limiting factor of the power production. All future business relations of Elektroprivreda and coal mines are to be based on the long-term contracts, enabling the coordination of their developments.

\* \* \* \* \*

The changes of the surroundings (due to the war destructions changes of the state organization the expected changes of the macroeconomic and business environment) are of such a character and intensity that they require the significant strategic adaptations of Elektroprivreda enabling its efficient operation. The list of the most significant changes affecting Elektroprivreda is shown at the following table.

Changes at the surroundings	Consequences for Elektroprivreda
<b>A. THREATS</b>	
1. War destructions	Limited usage of the capacities Lack of production and income Weak financial power of the Republic and Elektroprivreda B&H
2. Political-territorial organization	Limits in using the natural resources Limits in Elektroprivreda B&H organization
3. Payment-Balance limits	Difficult supply of spare parts and equipment
4. Slowed sanation and development of the coal mines	Possible shortage of the coal for thermoplants
5. Demands for the enviroment protection	Limited usage of the part of the thermo energy capacities
6. Increased presence of the natural gas	Reduction of the electric power consumption
7. Impossibility of the electric power payment	Reduction of the income
<b>B. CHANCES</b>	
1. Changes of the ownership relations	Clear definition of the relations with the owner of Elektroprivreda B&H Promotion of the management
2. World Community help for the reconstruction of the Republic	Procurement of the financial funds for the reconstruction under favourable conditions Possibility of writing off a part of debts of Elektroprivreda B&H
3. Strengthening of the market followed by the fall of the electric power consumption	Initiation of the export of the electric power
4. Changes of the economic structure	Possibility of clarifying the economic prices of the electric power
5. Structural transformation of the coal mines-the coal suppliers for the thermoplants	Possibility of clarifying the relations with the coal mines
6. Concession buildings	Possibility of the procurement of the investment funds and more efficient usage of the existing capacities

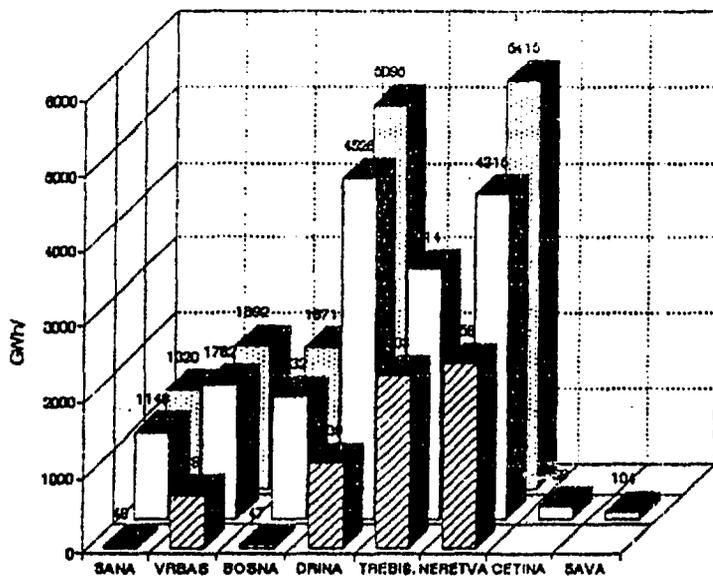
### 3. ACTUAL STRATEGIC POSITION AND RESOURCES AVAILABLE TO ELEKTROPRIVREDA B&H

The quality and availability of the resources and the changes of the surroundings define the management and development of Elektroprivreda, finding out all possibilities for their realization over the corresponding strategies.

The following business resources are extremely important for the electric power industry: natural resources electric power capacities, efficiency of the business system, financial resources, personnel, research activity, international relations and reputation of the enterprise.

#### NATURAL RESOURCES

HYDROPOTENTIAL of the Republic B&H and the actual exploitation are given at the diagram III.1.



The exploitation of the hydropotential is 40% and an intensive construction is possible. In regard with the level of investigation of the project documentation, the unused hydropotential is at the different degree of readiness for the construction - diagram III 2. The danger that the existing hydropotential states worthless lies at the insufficiently effective environment protection. Inadequate solutions of the property-law, social and ecological questions cause a great resistance of the public opinion to the construction of new units.

dijagram III.1 Technical, economic and exploited hydro potential

**THERMOPOTENTIAL** Deposits of stone and brown coal and lignite are discovered in Bosnia and Herzegovina and they are geologically explored. The reserves of the stone coal are very few without great economic significance. The reserves of the brown coal and lignite are large and their favorable concentration at some areas enables the mass and long-term exploitation of the coal. Total reserves of the brown coal and lignite are given at table III 1.

Table III.1 Total reserves browncoal and lignite 10<sup>6</sup>t

Category of reserve	Brown coal	Lignite	Total	%
Balances (A+B+C1)	1.294	2.136	3.430	42
Potential (C <sub>2</sub> D <sub>1</sub> )	1.580	2.267	3.847	42
Out of balances	178	782	960	12
Total 10 <sup>6</sup> t	3.052	5.185	8.237	100
%	37	63	100	
Equivalent coal 10 <sup>6</sup> t	1.666	1.840	3.506	
%	47	53	100	

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**ELECTRIC POWER CAPACITIES**

**HYDRO POWER PLANTS** There are thirteen plants with the installed capacity of 2034 MW and ultimate production of 5412 GWh\per year. On the basis of the joint investment construction, 71 MW of these are used by the electric power industry of Croatia.

Table III.2. gives all characteristics of the hydro plants, ultimate and realized production in 1990. average factor of the electric power exploitation for the period 1980. to 1990; auxiliarey consumption and extra expenses of the production realized in 1990.

The average auxiliary consumption of the hydro power plants is rather higher than it is in other states of former Yugoslavia.

Out of all generating capacities 11% of them are older than thirty (30) years; 25% older than twenty five years (25); owing to these ages the operation readiness of the units is reduced. Certain electro machinery and hydromechanic equipment are by their expiring age, and the investments into reconstruction and revitalization of the units are obviously inevitable.

The factor of the capacity exploitation is within the limits of the world experience besides the situation with the storage hydro power plants. Due to the insufficiency of the electric power system of B&H, sometimes they operate as the run-of-the river plants. On the other hands, some run-of-the river plants are still financially unfinished

**Table III.2** Characteristic of hydro power plants

HPP	river	placed into operati.	HPP type	usef. volume mil.m <sup>3</sup>	ins. capaci t MW	ultimate production prjmar. secun. 10 <sup>3</sup> te.u.GWh/g		realized production 90 prjmar.secun. 10 <sup>3</sup> te.u.GWh/g		CF %	aux. cons. %	cost pf/ kWh
Trebinje I (100 %)	Trebišn.	1968	PA	1100	168	174	417	64	154	23	0,4	
Dubrovnik (100 %)	Trebišn.	1965	DA	9	216	472	1130	254	608	58	2,7	
Trebinje II	Trebišn.	1981	P	-	8	5	13	3	7	26	6,4	
Čapljina	Trebišn.	1979	RHE	5	430	153	367	169	405	12	2,2	6,2
Rama	Neretva	1965	DA	466	160	270	645	179	429	46	1,4	
Jablanica	Neretva	1955	DA	288	150	268	640	173	414	53	1,4	
Grabovica	Neretva	1982	PA	5	114	113	270	73	174	26	1,2	
Salakovac	Neretva	1982	PA	16	210	172	410	104	250	20	1,7	
Mostar	Neretva	1987	PA	6	75	98	235	65	156	28	3,4	7,0
Jajce I	Pliva	1957	DP	5	48	91	218	59	140	49	0,5	
Jajce II	Vrbus	1954	DP	2	30	66	158	46	110	58	0,5	
Bočac	Vrbus	1981	PA	43	110	115	274	70	167	26	0,2	6,0
Višegrad	Drina	1989	PA	101	315	406	971	240	575	21	1,0	15,9
TOTAL						2262	5412	1500	3589	-	1,4	8,16

P - run-of-the river plant, PA - storage plant, RHE - revers. plant, DA - derivation - storage plant, DP - derivation - run-of-the river plant, CF - factor of the capacity exploitation

**THERMOPOWER PLANTS** there are twelve (12) with the installed capacity of 1957 MW and the ultimate production is about 10.000 GWh\per year.

The operating time of the available capacity for the electric power production. These load sets alternatively generate the electric and heat power. For - average rate of the forced outages for the period 1986.-1989.

Out of the total capacities, 30% are older than twenty (20) years. Being the ultimate limit for the equipment to be replaced Economic-financial resources of Elektroprivreda B&H.

**Table III.3.** gives the basic characteristics of the thermopower plants.

Table III.3 Characteristic of thermopower plants

TPP	placed into operation	kind of coal	heat rate kJ/kWh	P <sub>inst.</sub> MW	P <sub>gate</sub> MW	W <sub>planned</sub> GWh /god.	W <sub>real. 1990.</sub> GWh /god.	aux. cons. %	operatin g time h	FOR %	$\eta$ %	cost pf /kWh
Tuzla I	1964	LM	14 298	2 x 32	12	175	255	11.3	7045 *	6.1		
Tuzla II	1966	LM	13 750	100	77	420	490	14.8	5443 *		25.5	
Tuzla III	1971	LM	12 700	200	182	1090	1045	8.9	5234	11.3		
Tuzla IV	1974	LM	13 150	200	182	1090	1214	8.6	6149	9.6	30.1	
Tuzla V	1978	M	12 084	215	198	1186	1214	8.4	5651	11.6	30.2	
Tuzla				770	671	3961	4218	9.5	5716			9.3
Kakanj I	1956	M	15 450	2 x 32	50	250	643	9.8	5039	7.3	21.5	
Kakanj II	1960	M	15 450	2 x 32	50	250				6.8		
Kakanj III	1969	M	12 820	110	86	504	465	10.6	4545	6.5	26.9	
Kakanj IV	1977	M	12 349	110	96	548	584	11.1	5122	14.9	26.4	
Kakanj V	1988	M	11 769	230	208	1246	1450	11.1	6165	11.0	28.5	
Kakanj				578	490	2798	3142	10.7	5420	16.3	31.0	10.8
Gacko I	1983	L	12 420	300	276	1565	1509	9.3	4948	13.3		12.2
Ugljevik I	1975	M	11 403	300	276	1583	1797	7.2	6032	9.3		9.8
TOTAL				1957	1713	907	10666	9.5	5556			10.2

\*The operating time of the available capacity for the electric power production. These load sets alternatively generate the electric and heat power. FOR - average rate of the thermo power plants is within the limits of the Yugoslav experience.

The average auxiliary consumption of the thermo power plants is within the limits of the Yugoslav experience.

**THE ECONOMIC-FINANCIAL RESOURCES** of Elektroprivreda represents the successful management with favorably realized financial results and the rational usage of the currency means. That is the commercial efficiency in its narrow meaning, representing the degree of the realized profitability, being the main purpose of each enterprise under the market condition.

As for Elektroprivreda B&H, whose management had some losses in the last decade, it was not economical-financially efficient. Just in 1990, the total loss was 214.516.000 DEM (1 DEM = 7 din): hydropower plants had 25,976.000 DEM; thermopower plants 112.090.000 DEM, transmission: 10.506.000 DEM and distribution 65.944.000 DEM

Table III 4. gives the compared list of the sale prices for the electric power at the gate of transmission and distribution for B&H and the relevant European countries. Their prices are the world price criterium for the power price forming in B&H.

The data from this table show significant deviations of the sale prices of the electric power in B&H compared to the level of the realized cost prices (ratio:75:100) and to the world sale prices of the electric power (ratio: 75:126).

This table is the picture of some systematic measures influencing the efficiency of the Elektroprivreda management. The electric power prices were kept under their permanent control of the government and the growth of the prices was far slower than the production expenses. In last ten years the sale price was not enough for payment of the simple reproduction expenses let alone the reserves for the development. So far, it is very difficult to quantify and analyze the influence of the systematic measures, installed technologies, degree of the capacity utilization, expenses of the capital and the coal prices functioning as the heat values. The analysis of all indicators of the management efficiency will be inevitable according to the mentioned criteria.

Keeping in mind the results of these investigations, the Elektroprivreda B&H management would be mainly based on the relations enabling the real sale prices. They are enough for paying the simple reproduction expenses and providing the reserves for the development.

Table III 4. List of the electric power prices in B&amp;H and five European countries p/kWh

	Description	Transmission gate	Distribution gate	Average price	Ratio
1.	Realised cost prise in B&H	10.38	17.44	13.87	100
2.	World sale price	14.17	24.03	17.5	126
3.	Austria	11.76	26.07	17.4	125
4.	Geramany	15.3	27.2	19.28	139
5.	Greece	15.46	19.3	17.01	123
6.	Italy	12.36	19.68	14.58	105
7.	Switzerland	14.74	18.04	16.27	117
8.	B&H sale price	8.21	12.78	10.46	75

DEBTS OF ELEKTROPRIVREDA are rather high du to its low accumulative and reproductive ability, Elektroprivreda had to rely on the home and foreign accumulation in realization of the construction program for new power units and in reconstruction of the installed capacities.

For the period 1986. to 1990. the participation of the credit investments in program of development was from 69% to 73%.

Their participation was significant and owing to it the rate of obligations was 73% in 1989. By the end of 1990. this rate fell to 30%, being the result of the high increase of the amortization included into its own investment funds. The increase amounted 6,3 times compared to the amortization 1989. There were also a slow increase of the obligations by the payment of credits due to the frozen exchange rate of the dinar compared to the international currencies. There was also a break of the development plan realization.

The situation of the Elektroprivreda B&H obligations by the end of 1990.-by home and foreign credits - both for the capital and interest is shown at Table III.5.

Table III.5 Elektroprivreda B&amp;H obligations

DEM

Description	Total debts	Debt on capital	Debt for interest
Home credits	220.722.222	142.511.111	78.211.111
Foreign credits	1.106.233.333	785.122.222	321.111.111
<b>T O T A L</b>	<b>1.326.955.555</b>	<b>927.633.333</b>	<b>399.322.222</b>

Note: 1 DEM=9 YU din from 1991.

Due to the constant valorization of the obligations by the home credits, the obligations for the interest by home credits are approximately stated when the debt situation was established. The interests for the foreign credits are real and taken from the existing payment plans.

However when analyzing the participation of home and foreign investments in total resources of the funds. Table III.6. shows a permanent increase of the home funds.

Table III.6 Resources of the funds

%

Description	1986.	1987.	1988.	1989.	1990.
Resources of the funds	100	100	100	100	100
Own funds	54	50	48	71	76
Foreign funds	46	50	52	29	24

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The period in last five years shows that the participation of our own funds increased from 54% to 76% and the foreign funds changed from 46% to 24%. A part of the credit used for the installation of the electric power units within the observed period was paid off.

The noticeable decrease of the foreign fund participation at the total funds happens after the part of the foreign funds-used for the construction of the electric power units-was paid off under the favourable, agreed conditions.

In the course of its development Elektroprivreda trusted both home and foreign accumulation. The annuity obligations are rather high with their negative influence on the total liquidation. The total amortization of the major part of the power units - obligatory the new units - is insufficient for paying off the reached payments of credits. Due to it, a part of the free amortization was used for financing the development in the last period.

The detailed plan of the financial consolidation of Elektroprivreda is to be inevitably made under the new economic conditions (new structure of ownership, economic - systematic solutions, and potential possibilities of using the foreign accumulation).

**DEVELOPMENT FINANCING** of Elektroprivreda met a number of obstacles in last period. One of them is the Elektroprivreda impossibility to provide its own participation for financing the accepted programs of development, as well as the absence of the appropriate mechanisms for creating the conditions of the planned own participation.

This discoordinated situation with the total available funds and the planned dynamics of the work realization ought to be clarified by the engaged foreign accumulation; through common direct investing into the construction of the electric power units; collecting and engaging the free investments of the economy and inhabitants by issuing the securities; engaging the funds. For development and the other funds from the special institutions for development (that are to be formed in the next period); providing the investments through the consortium construction; by giving the concessions for the construction of certain capacities and through other forms of investment collecting.

Besides the activity at the financial consolidation of Elektroprivreda, the constant investing activities at the following fields are to be carried out in the future:

- organization of the financial department and the implementation of the principles of the modern financial management,
- analysis of the structure of the capital and the way of its utilization,
- permanent analysis of the capital generating and decreasing,
- perceiving the needs for the capital in certain phases (sanation, reconstruction and development)
- perceiving the needs for the working capital,
- analysis of the credit ability as a prerequisite for the credit procurement,
- perceiving the possible resources of capitals and conditions for their procurement.

## **PERSONNEL, RESEARCH AND ORGANIZING RESOURCES**

**PERSONNEL RESOURCES** Immediately after the war is over, the employment and the available staff structure have to be analyzed. The number of the workers necessary for the normal operation of the electric power system and the realization of the development aims has to be known. The process of employing and promoting the personnel has to start immediately as their training will precede the realization of the development programs and all further developing activities of Elektroprivreda. The program of the staff training has to include the training of the workers engaged at the electric power activity under the market conditions and permanent tracking and overtaking of the world experience. The experts will be needed the specialization in all branches of technics, economics, financing, marketing, together with the education of the contemporary methods, computer technic and foreign languages.

**RESEARCH RESOURCES** The very quick development of the new technics and technology from the energetics, the complexity of the electric power system and the environment influence of the electric power units provoke a number of problems that can be solved only by the modern scientific-research methods. During the last fifteen years, a part of the scientific-research problems of Elektroprivreda B&H was solved thorough its own scientific-research and study-developing activity, and the other part through the cooperation with other institutions in and out of the Republic.

As Elektroprivreda is of some social importance and the society is interested in its activity and development, it is necessary to organize the functions of the scientific-research activity. In that way, very stable bases can be founded. They are inevitable for the strategic decisions concerning the Elektroprivreda development, its relations with the society and with foreign electric power industries. The scientific-research activity has to be offered the material and personnel prerequisites for the high quality activity and development of Elektroprivreda, meaning also its proper organization in accordance with the regulations.

A special problem of the coordinated development of the B&H energetics is the absence of a unique scientific-research activity and unified development plans of the integral energetics. Due to it, the development of the coal mines is not coordinated with the construction of thermo power plants; there was no long-term and consistent price policy for the giving-energy substances. There was no adequate law regulation and the consumers were not stimulated for a more efficient usage of the electric power. All these above mentioned had a negative influence on the electric power consumption and on the situation at the electric power system of B&H. The institutional solutions through the government authorities and adequate forms of organization can enable the coordination of the development plans of the total energetics by adapting the consistent long-term energetic strategy of the Republic. The strategy has to be coordinated with all changes at the world energetic market. A systematic and qualified inspection of the energetic demands; analysis of the energy problematics, preparations of the energy balances applying all modern scientific methods and models.

**ORGANIZING RESOURCES** From its forming phase up to now, the development of Elektroprivreda B&H was carried out under the direct influence of the official authorities, going through few, very characteristic phases. The basic differences of these phases make a degree of independence of all organizing departments of Elektroprivreda B&H as well as the economic relations resulting from that independence. In accordance with the above and the Regulation with the legal force for the public enterprises and the regulation with the legal force for the electric power system, public enterprise Elektroprivreda B&H is formed as a unique enterprise with just one legal subjectivity at the territory of the whole Republic.

As this Public enterprise is a big and complex operating system, its inner organization is founded with a necessary decentralizing degree of the operation.

The basic organizing departments of Elektroprivreda are directions and divisions of the Public enterprise being the integral parts of the corresponding directions. Directions are smaller organizing entities carrying out certain functions of Elektroprivreda while the parts of the Enterprise carry out the activities from the basic operation of the Public enterprise. The Regulation for Elektroprivreda defines the number of the parts in Public enterprise while the scientific-research activity is organized as a direction.

This kind of organization means the corporative way of the organization and it is under the constant control of its Founders, namely official authorities, as the members of the Board of directors are appointed by the Government of B&H.

The market orientation of the economy and its adoption to the new conditions of the business efficiency, expenses and equalization of the Public enterprises with the other working organizations ask the application of the legal solutions clarifying the scope of responsibility and authority between the government and the corresponding authorities from one side and the Board of directors and the managers from the other side.

Taking all these into consideration, this corporative model of the organization is an advantage for Elektroprivreda B&H, particularly after the war during the sanation and reconstruction phase of the electric power system. This is the way of centralizing the capital and procuring extra funds at the international financial market. The decentralization of all operative functions from the departments of the public enterprise unite all personnel and material resources creating favorable conditions for the stable operation and the future development.

**INTERNATIONAL RELATIONS AND PROFESSIONAL ASSOCIATIONS** The electric power system of B&H, as a part of the Yugoslav system, was included into the activity of UCPTE-unity for the coordination of the production and transmission of the electric power. The experts from Elektroprivreda B&H were members of the professional associations such as UNIPEDE (International unity of the electric power producers and consumers) CIGRÉ (International Conference about Great High Voltage Power Systems).

The changed political relations inevitably demand the reestablishment of the relations with the

above associations and other societies at the level of the international cooperation. Some steps have already been made, particularly for CIGRE that functions on the principle of the national committees.

As for the connection with the UCPTÉ interconnection, Elektroprivreda B&H has to provide the necessary technical conditions such as the network reconstruction and the normal operation of all units.

Besides the exchange of the actual technical knowledge and information the other way of the connection with the professional associations is the experience after the reconstruction of the war-damaged power systems. A part of such an activity is the initiation for closer joining the international organizations for reconstruction and development and finding out the possibility for including the foreign experts into the professional teams.

REPUTATION OF PUBLIC ENTERPRISE ELEKTROPRIVREDA is a significant part of the wealth that the enterprise possesses estimated with the quality and no quantity marks that are highly appreciated by the world business experts.

The relation of the public information and the public with the problems and activities connected to the enterprise is very important. Our experiences in this branch are not satisfactory, particularly our relations with the consumers besides the facts they are an integral part of the electric power system.

\* \* \* \* \*

As an answer to the changes in surroundings, the following list gives the synthesis estimation both of strong and weak points of Elektroprivreda:

RESOURCES	ESTIMATIONS OF ELEKTROPRIVREDA CAPACITY
1. Natural resources -hydropotential -thermopotential	-strong -medium
2. Efficiency of Elektroprivreda as an operating system -technological -economic -externally social	totally insufficient -strong -weak -strong
3. Financial resources	-medium
4. Personnel	-medium
5. Research	-weak
6. Organization	-medium
7. International relation and professional association	-weak
8. Reputation of the enterprise -in business world -in public opinion	-strong -medium

#### 4. DEFINITION OF ELEKTROPRIVREDA AIMS AND INDICATORS

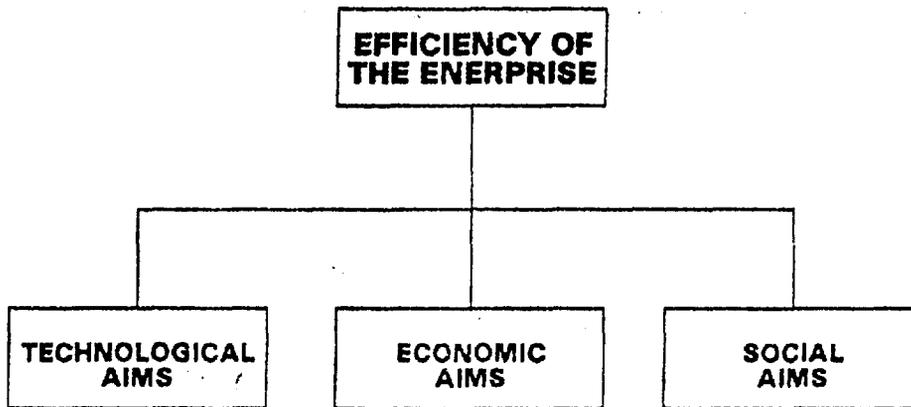
The purpose of the Elektroprivreda existence is to satisfy the electric power market on the long-term basis, with the minimal expenses and the acceptable quality. The term "long term basis" includes the permanent ability to be adapted to all changes at the electric power market that is a part of the total energy market.

This social task defines the basic scope of the operation, while the very decision for its realization by forming a public enterprise promises Elektroprivreda B&H will operate with a profitable motive and the market efficiency. Still, there is the responsibility of the state as a creator of the macroeconomic policy and a manager of Elektroprivreda over the state ownership for the business operation of the system. So, the state as the owner of the capital at Elektroprivreda has the full responsibility for the reproduction and increase of the capital.

The management of the enterprise overtakes the business responsibility. The main purpose of Elektroprivreda operation is the efficiency of the engaged capital at the electric power production, meaning the realization of the acceptable level of the profit. The profit realized by Elektroprivreda is controlled by the state and the acceptable level of the profit is determined on the basis of the wanted level of the reproduction ability of Elektroprivreda. The acceptable level of the profit is changeable and dependent on the demands for the investments at the electric power system, namely from the expected growth of the electric power consumption.

Placing the profit at the very top of the business aims means no ignorance of other aspects of the business efficiency. The profit can easily explain the efficiency of Elektroprivreda to its market surroundings.

Due to any possible deviations from the market mechanism by regulative functions, and the complexity of the real structure of Elektroprivreda aims, hereafter is the structure of the aims shown as follows:



The connection between the technological, economic and social efficiency is a J - logic type, namely, the realization of each aspect separately contributes to the main purpose: PROFIT. There is no question of the preferable group of aims. They are horizontally placed, enabling the analysis of their influence on the total efficiency of the enterprise. The profit (short-term increase of the technological efficiency on account of the economic and social efficiency) can affect the central aim of the operation based on the long-term foundation. Or, the insufficient social efficiency of Elektroprivreda is reflected on the environment and it reflexively acts at the possibility of the profit realization.

Here is the definition of all indicators enabling the estimation of the each aspect contribution to the realization of the named aim groups.

**TECHNOLOGICAL AIMS** mean the technological efficiency and the aspects of the

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development. The following basic indicators are suggested:

TECHNOLOGICAL AIMS	INDICATORS
* Quality of supplies -reliability of supply	-unserved energy, LOLP
* Utilization of capacities -energy efficiency	-efficient rate, losses, auxiliary consumption
* Operation readiness	-availability of the capacities
* Engagement of the capacities	-age, degree of the engagement compared to the installed capacity
* Advancement of the development and ecological acceptance	-readiness of the documentation, possibility of the developing adaptation of the technology

ECONOMIC AIMS mean all aspects of the current and developing financial situation of Elektroprivreda. The following indicators are suggested:

ECONOMIC AIMS	INDICATORS
* Profitability -productibility of the capital -productibility of the labour power -profit rate	-realised profit/used profit -total income/expences of the labour power -profit/total income
* Liquidity -ability of satisfying the short-term financial obligations -ability of satisfying the momentary financial obligations	-current assets/current obligations -liquid assets/current obligations
* Structure of the capital (solvenity) -obligation rate	-credit payment/own funds for the investment (amortization and income)
* Cost rate	-cost per product units
* Level of the electric power price (average level)	-realized/projected level of the electric power price
* Efficiency of investing	-recurrence rate on investment

SOCIAL AIMS are the responsibility of Elektroprivreda for larger, social effects. The next aspects are important for Elektroprivreda: environment protection, space planning, influence on the balance of payments; influence on the regional development, social influences and other influences on the infrastructure activities. In some cases these aspects are limits for Elektroprivreda, but from the long-term point of view, the positive influences of Elektroprivreda on the wide social surroundings have to be positively reflected on Elektroprivreda itself. Some social aims have to be built-in into the structure of Elektroprivreda aims. They have to be clearly identified, particularly by the construction of large electric power units.

The analysis of the influences and contribution of Elektroprivreda to its social surroundings is seen by the moments of decisions about investments. The analysis is also important for the estimation of the total efficiency of the enterprise. At the situations, when the market mechanism of the prices are not realized (then the expected business results are missed) the amount of the lost income has to be stated. The analysis using the world prices indicates the user of the market deviations.

The main social aim of Elektroprivreda is realized if it supplies the consumers with the electric power with the lowest expenses, endangering no developing needs. Then the other social aims

are not important for Elektroprivreda itself, but they cannot be ignored, otherwise they can easily become limiting factors for the efficient functioning of the enterprise.

SOCIAL AIMS	INDICATORS
* Safe environment -air pollution	-pollutant emission (absolute amounts: tons/yearly, specific indicators: kg SO <sub>2</sub> /kWh
* Contribution to the social welfare	-total complementary value
* Social efficiency	-b/c ratio of social benefits and expenses
* Influence on balance of payment	-direct and indirect net foreign effects, effects of the important substitution
* Energy efficiency	-energy consumption per product unit

Definitions of the aims and operationalization of a number of the most important indicators are crucial for the objective estimation of the management efficiency of Elektroprivreda B&H. The determination of the standard aim values of certain indicators and their lower limit has to enable the deviations of the operation as early as possible pointing out the problem sources and directing the action for their elimination.

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## 5. RECONSTRUCTION AND DEVELOPMENT DIRECTIONS OF ELEKTROPRIVREDA B&H

The actual situations and circumstances around the enterprise do not enable the complete work out of the reconstruction and development program of Elektroprivreda B&H. The following discussion is to be understood as a concept or elements of the program duty for the operation strategy.

A main uncertainty for Elektroprivreda is connected to the question of our future governmental structure and the authority of the government on each level. The assumption about a unique Public enterprise can easily prove unrealizable, and it will greatly define the concept of the further operation. Any eventual independent electric power organization at some parts of the territory will complicate all relations at the Republic level, but affecting the operation of such organizations too besides.

There are also other facts provoking uncertainties:

- *war casualties are not over, and the estimation of the war damages will be carried out after the war end.*
- *changes at the macroeconomic surroundings are in the work-out phase of the initial concepts and preparation of the legal solutions.*
- *changes at the business surrounding being under a strong influence of the above factors - are very intensive with unknown result.*

At the moment it is hard to give a final suggestion for the strategy of Elektroprivreda operation. But it is possible and necessary to fix certain directions defining the activities that will, after the war is over, start the realization of the strategy. A great number of the external influences on the Elektroprivreda operation come directly or indirectly from the government and the clear definition of the relations between Elektroprivreda and the state is inevitable. Besides all these ready regulations with legal force, the definition and operationalization of all significant questions have to be made, and the realization of the top priority. Question is the Energetic strategy of the Republic.

The possible influence of Elektroprivreda on the state depends on the soon prepared study-analytic materials. They will be a basis for the further strategic documents and legal solutions. Elektroprivreda is particularly interested in solutions from the following fields:

- *environment protection and duties of Elektroprivreda*
- *space-planning problematics*
- *coordinated planning at the state level particularly the aspect of the long term planned power consumption*
- *solutions concerning the coal mines*
- *substitution rationalization and the electric power saving.*

An active approach of Elektroprivreda to the state can have an important influence on the strategic position of the enterprise.

Considering the enterprise as an entity, the strategic determinations are close to the following:

1. *Question of the market - export orientation*
2. *Question of the ownership - public enterprise into the state ownership or joint ownership*
3. *Question of the scope and character of the decentralization inside the single enterprise.*

The answers to the above questions are given by the realization of the fixed aims, based on the detailed elaboration.

The main characteristics of the reconstruction period will be:

- *initial revitalization of the war-devastated economy followed by a low but progressing increase of the population.*
- *active role and help of the world community at the realization of the reconstruction program, especially for the infrastructure activities.*

The shortage of the capital will be outstanding under such conditions as well as the strict selection of the investment projects \candidates for the reconstruction. The qualitative and soon preparation of the business\ planning and investment \technical documentation is the crucial moment together with the appropriate organization for the realization of this task.

This material shows that the balance surplus can be expected at the long term period after the war, and the idea of the electric power export is to be taken into consideration but, the final decision about the export is possible just after the detailed analysis of the following questions:

- *consumption of the electric power in B&H*
- *expenses of the electric power production and possible prices for the electric power export.*

Besides all these study activities, the organizing and personnel hypotheses for the eventual realization of the export arrangement will be also needed. The question of the concession arrangements, both for any new or existing generating capacities, has to be procured capital for the reconstruction and modernization of the power plants and other investment needs within Elektroprivreda.

The question of the ownership has to be answered by the complementary capital, efficiency of investing and total business efficiency of Elektroprivreda. Under the conditions of the joint ownership there are higher possibilities of finding the complementary financial resources through a greater interest of the foreign financiers in all projects for the electric power industry. The progress of the Elektroprivreda business efficiency is close to the question of an adequate inner organization, where the scope and character of the decentralization is very important. The decentralization is observed as an economic motivation of the enterprise parts helping the realization of the defined aims of the operation, and the centralization of the functions means the technical-technological unity and the place for the capital investments.

It is the way, to consider the tasks of Elektroprivreda and its all parts for the preparation of the bases (studies, investment-technical documentation) necessary for defining the reconstruction and development) strategy directions, as well as for the project documents.

Besides all these inevitable prerequisites, from the surroundings, the definition of the strategy for the business aim realization asks the enough worked - out strategic alternatives prepared by Elektroprivreda meaning the definition of the activities with the following requirements:

1. *To have its own mission, aims and conditions managed from the level of the enterprise.*
2. *To have its own relation with the surroundings particularly with the market*
3. *To represent a complete program with clear expenses of the capital, operative expenses, estimation of the possible profit and contribution to the realization of the business aims*
4. *A real possibility to consider it as a complete program but also together with other activities of the enterprise*

These requirements are from the investment projects for the electric power production and the transmission units. The choice of the strategy is a global estimation and the investment choice including analysis \choice of the market. This way of approach asks some significant activities preparing all actual data and investment studies. Their soon, organized realization is inevitable.

**CONCEPT OF THE RECONSTRUCTION STRATEGY** Regarding the importance of the electric power for the operation of the economy, it will be necessary for Elektroprivreda to start the operation of its electric power system, creating all prerequisites for activation of all war-damaged economic capacities. The very close aims in the period of the reconstruction are:

- *recovery of the electric power system operation*
- *recovery of the operation readiness to the necessary level*
- *organizing and personnel consolidation of the enterprise.*

The realization of these tasks is inevitably preceded by:

- *detailed estimation of the war damages and the situation after the temporary sanation of certain units.*
- *technical documentation and investment programs for the units candidates needing the*

*reconstruction*

- prepared electroenergy balance up to 2000 on the basis of the detailed estimations of the electric power needs in B&H.
- suggested list of the priorities for the reconstruction, keeping in mind the long-term aims of the enterprise.

This is the way to create the conditions for the strategy defining, then the reconstruction programs with the following questions

- prepared investment programs have to go through the check procedure from the aspect of: technical, economic and social justification
- the above procedure is followed by the unit ranking according to their activities: generation, transmission-management and distribution
- extracts from the investment programs and the unit ranking are a basis for the decisions at the corresponding level.

There are two proposed levels of decisions:

1. for all projects with the investment amount over 3 million USD-the board of directors gives decisions
2. for the projects up to 3 million USD-the general management gives decisions.

The preparations of the investment-technical documentation and the procedure of deciding are clarified by extra instruction.

One of the important activities of Elektroprivreda B&H during the reconstruction period has to be directed to the cooperation with legal authorities when preparing and accepting the energetic strategy of the Republic, the relations with the state have to be regulated too. Besides the activities for the preparation and realization of the reconstruction programs during this period, all works and activities creating the prerequisites before entering the forthcoming period of the development are also highly significant. During the period Elektroprivreda ought to realize its full efficiency of the operation to satisfy all social requirements. One of the strategic projects, if not the most important one, is the realization of the business information system - the basis of the decisions and management of the enterprise.

**CONCEPT OF THE DEVELOPMENT STRATEGY** The definition of the development strategy of Public enterprise Elektroprivreda B&H is to be considered as a dynamic duty going through many phases of the elaboration. The first step is the coordinated formulation of the Elektroprivreda aims and their acceptance by the state, then the preparations of all appropriate republic strategies. Elektroprivreda has to elaborate these following subjects:

1. necessary quality of the electric power supplies for the domestic market (stable supply, possible breaks in-supply) regarding the electric power prices
2. dynamics of the consumption increase at the domestic market and possibilities for the engagement of the generating capacities for the export arrangements.
3. management of the electric power consumption including the saving and rationalization programs.
4. coordinated planning process in Elektroprivreda with the methodology development of the investment resource allocation among the main activities.
5. appliance of the information technology at the process of deciding and managing of Elektroprivreda
6. investigation of the European market of the electric power
7. procedures of coordinating the process of planning in the Republic
8. justification of the integrity: Elektroprivreda - coal mines producing the coal for thermo power plants.

Besides all these above mentioned questions there are others too deserving elaboration, permanent study and watch all changes that are vital for the Elektroprivreda operation. An easy approach to the strategy elaboration is enabled both on the enterprise level and all functional

directions together with the strategy of each enterprise part. All these strategies are to be closely connected by the accepted aims of Elektroprivreda. The control of their realization has to be operatively precised by the check of the appropriate efficiency indicators, suitable to the segmen. of the enterprise that is analyzed.

## 6. BASIC PRINCIPLES FOR THE RECONSTRUCTION AND DEVELOPMENT REALIZATION

On the basis of the mentioned concepts of the reconstruction and development strategies, this chapter gives the principles where the strategic are based on: principles of reconstruction, development, modernization, organization, management; price policy (during the post-war period) and financial consolidation.

**PRINCIPLES OF THE RECONSTRUCTION** The planning of the reconstruction and development of the electric power system has to be based on the analysis of the profit-expenses ratio for various unit combinations, with the suggestion for the optimal combinations of all possible solutions. Each proposed unit - nevertheless a new unit, reconstruction or revitalization - needs the analysis of performance. The results of the analysis are the first step followed by the preparations of the economic prices showing if the project is realizable and then make the list of the units. The economic analyses have to show the total contribution of the projects both to the development aims of the system part where the units are located and to the development of the total electric power system. These analyses are a condition for getting the international credits.

Simultaneously with these activities, the other activities, creating the favorable conditions for the successful reconstruction and development, are to be carried out too.

Clarifying certain phases of the development, the phase of the reconstruction of the electric power units has to bring the units up to their full function at the complete technological scheme. The reconstruction means: satisfying the requirements of the economy, criteria of the modernization and rationalization stated by the international financial institutions together with the necessary respect of the development criteria elaborated and accepted by Elektroprivreda B&H.

Besides other criteria applied by the elaboration of the medium-term plans and developments, the most important ones are as follows:

- *recovery of the operation readiness and reliability up to the necessary level*
- *improvement of the thrift*
- *increase of the capacity*
- *increase of the generation*
- *modernization of certain systems inside the unit up to modern technic level*
- *adaption of the unit to be connected to the new information system,*
- *protection and improvement of the human environment.*
- *improvement of the condition and humanization of the work*
- *procurement of necessary spare parts*
- *many sided utilization of resources*
- *quality increase of the power supply*
- *decrease of the energy losses at the unit and at the power system*
- *appliance of new type solutions and standardized equipment*

By stating the priorities, the following main systematic characteristics of the electric power units are:

For generating capacities:

- role of the unit in satisfying the consumers
- role of the unit at the frequency and voltage regulation
- contribution of the unit to the safety and flexibility of the electric power system operation
- contribution to satisfying Elektroprivreda B&H obligations with its foreign cooperants.

For transmission, transformer and switchgears:

- significance of the substation for the supply of the wide consuming areas and the priority consumers
- contribution to the normalization of the voltages and flexibility of the power system operation.
- reserves for other units.

- significance for the connection with foreign systems.

**For transmission lines:**

- significance of the electric power units and their consumers
- characteristic of the transmission line regarding its transmitting possibilities.

**For distribution, transformer and switchgears**

- priority of the consumers connected to the transformer station
- significance of the unit for the connection with the electric power system and reserves for the priority transformer stations

**For distribution lines:**

- priority of the consumers
- priority of the connected substations

**For information - management systems:**

- significance of the managing part of the power system
- significance of the managing function for the operation of the power system and its section
- significance of the parts of the information system for the efficient business functions

By making the list of priorities, the other conditions vital for the operation of the substations are to be taken into consideration:

- *possibility of the primary energy supply*
- *necessary quantities of liquid fuels*
- *necessary quantities of oil, grease*
- *necessary quantities of chemicals*
- *necessary quantities of other consuming and repro materials, inevitable for the substation operation*

If a unit wants to be candidate for approving a credit, the elaborate of the sanitation and reconstruction has to be prepared. The elaborate clearly separates sanitation works and reconstruction works.

Parts of Elektroprivreda - users of the units, are charged for the elaborate preparation

The responsible directions and authorities will propose the priority consumers for the areas where the consumers are located, namely the regional authorities are charged for the consumers of the state importance.

The priority of the power unit will be decided by Board of directors of Elektroprivreda on the basis of the above procedures, documentation and suggestions of the authorized services of Elektroprivreda B&H direction.

**PRINCIPLES OF THE RECONSTRUCTION AND MODERNIZATION** Both the reconstruction and modernization will be realized partly through the reconstruction program, and partly through the development program. The approach to the preparation and deciding about the investment programs is the same as the procedure that is to be established for the investment programs, but the following characteristics are important.

- *the precise estimation of the forthcoming age of the existing units, their operation readiness, the generating characteristics in case if there is no exchange of the vital equipment*
- *the real period the unit will operate after its reconstruction, then do the estimation of the proposed works, within the scope of the proposed reconstruction, analyze all possibilities of improving the unit performances (decrease of the fuel consumption, increase of the capacity fall of losses and auxiliary consumption)*
- *an extra analysis of the reconstruction effects at the rate of the emitted pollutants and the elements for the value estimations of the unit at the environment security.*

The technical - technological modernization can be manysided. One common thing for all units is their sanitation, namely the recovery of their operation readiness. Then, from the marginal

expenses (expenses of the technological modernization in regard with the increased, economical operation of the block or the power plant) try to decide about the modernization and revitalization of certain blocks, or in some cases give us the utilization of the block (placing the block into the reserve). Owing to the rate of investing into the technological modernization, the adequate environment-sanation will be carried out. The expenses of the environment sanation will be included into the reconstruction and revitalization program with some percentage of the marginal expenses. Some other serious environment activities will be carried out simultaneously with the construction of new blocks, and still the emission standards automatically can not follow the standards of the developed countries.

The deciding about the investment programs of the reconstruction and modernization is to be done on the basis of ranking all investment programs, equally with the development programs. Regardless to the age of the many units and they were faced with the faster aging during the war, it is necessary to start their stage by stage reconstruction combining: sanation, revitalization and modernization for a long-term period. A big amount of the investments will be needed and the adequate choice of the priorities is crucial on the basis of the complete investment - technical documentation.

The above principles refer to the generation, transmission and distribution units, but each of these areas will be needed the defined specified indicators enabling the preparation of the ranking within the activity.

Such a task has to be done at the strategies of separate functional directions while the process of deciding for the investments will be based on the principle of equalizing the technical technological work conditions for each section of the electric power system.

The preparation of the investment technical documentation for the reconstruction and modernization is the duty of Elektroprivreda departments, while the ranking and investment deciding would be carried out at the level by the enterprise. The organizing sections would be charged to carry out the realization of the accepted programs.

**PRINCIPLES OF THE DEVELOPMENT** The future development of Elektroprivreda B&H is based on:

- utilization of its own energy resources with the possibility of installing the natural gas for the diversification of the fuel
- development of the electric power consumption defined on the basis of the total energy needs and the efficient coordination of the power industry development and its consumers by preparing and realizing the program of development for the state energetics.
- efficient coordination of the development of the electric power system and coal mines; the electric power system and the water supply system.
- many purposed utilization of the existing and future units, the priority is given to the food production.
- giving rights for the concessions of using the built units and of building new unit - both to domestic and foreign partners
- orientation to the export of the electric power surplus into the west European countries and the demand for passing some efficient measures and regulations, increasing the concurrence at the electric power market.
- reconstruction of old units with a possibility of transition from coal to gas if there is the economic justification.
- closing of unprofitable units
- gradual introducing of the private capital by giving concessions for the construction of mini hydro power plants, utilization of the distribution network and other sections of the electric power system, active participation in defining and deciding about the ecological standards and their respect by the reconstruction and construction of new units
- increasing the energy efficiency of the power production and its final usage
- open, neutral and intensified communication with the public with the purpose of gaining the social trust and supporting the forthcoming energetic policy.

The realization of the future development will be carried out on the long-term (15-30 years) medium (5-10 years) and short-term (1 year) plans of the development. The actualization of the long-term plans is to take place each 5 years and the medium-term plans are actualized every year.

For the sake of improving and simplifying, the process of planning has to be revised, creating

very efficient relations with professional organizations societies and universities. It is necessary to have an influence on the educational programs (general and specific) for the students of the electric power industry (particularly the region of the energy economics) and the personnel from the authorities of the government and the public.

Information and dialogue are to be an important element of the phase of planning. These two elements can prevent any difficulties that are new projects faced with.

**PRINCIPLES OF THE ORGANIZATION AND MANAGEMENT** The organization of Elektroprivreda as a unique enterprise with many organizing parts is to be promoted and coordinated with other corresponding solutions of all modern complex corporations. The main purposes is the definition of the profit centers inside the enterprise. The principal prerequisite for such a definition is the possibility of showing and measuring the results, namely stating out the financial income and expenses. Such an organizing solution enables a real estimation of the contribution rate of each part of the enterprise - the profit center of the total income of the unique enterprise; management of the operation and development on the basis of the modern portfolio theory; and the possibility of the internal communication and business relations on the market bases.

Any concrete solutions for the organization - particularly concerning the decisions for certain centers and the system on whole; interconnected relations of some profit centers and their role and place at the total system and other aspects and questions ought to be the subject of extra investigations done by a competent professional team. Any concrete organizing solutions have to take into consideration numerous specifics of Elektroprivreda as the enterprise of a large social interest, whose market operation is highly limited by the realization of larger social aims.

The organizing scheme has to enable a clear distinction of the levels where the operation strategies are formulated and their successful realization.

#### **I level of a corporation:**

The following items are defined from this level:

1. Global strategy including:
  - strategy of increase
  - strategy of decrease
  - strategy of stability
2. Strategy of the business portfolio
3. Functional strategies include:

*Marketing function with:*

- *Investigation of demands*
- *Planing of the production and the energy consumption*
- *Price strategy*
- *Promoted relations with the public*

- *Financial function defining the obligation policy, dividend policy, the structure of the capital, financial management*

- *Production function including the realization of the operation schemes, productibility increase, appliance of regulations and regulative*

- *Research and development comprissing planning and coordinated development, watching the technological development*

- *labor power with the personnel policy, educational programs, employment policy, working relations, legal regulative*

#### **II Level of the part of the enterprise**

The strategy at the level of the part of the public enterprise includes:

1. Model of adaptation to the changes at the surroundings:
  - *strategy of defence*
  - *strategy of research*

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## 7. RECOMMENDATIONS FOR THE ENERGETIC STRATEGY OF B&H MEASURES FOR THE REALIZATION OF THE RECONSTRUCTION AND DEVELOPMENT DIRECTIONS OF ELEKTROPRIVREDA B&H

The directions of the Elektroprivreda construction and development are restricted by a great number of the unknown facts from the political, macroeconomic and business surroundings. They have to be defined by the Energetic strategy. It is supposed that the foreseen Energetic strategy of B&H will be based on the following aims:

- *stability of the supply with quantitative and various kinds of energy with the minimal expenses*
- *reduction of the energetic dependence*
- *rational utilization of the domestic resources and the energy saving with a flexible and efficient adaption to all changes at the surroundings.*
- *decrease of the special energy consumption together with a constant increase of the energetic efficiency both at consumers and at the electric power system*
- *rational price policy with the stable relations between the prices of separate kinds of the energy*
- *introducing the new and improving the existing technologies with the unification and standardization of the project solutions and equipment*
- *environment protection*

The operationalization of the mentioned aims by the energetic policy is an extremely complex task dependent on great many elements defining both the operation and development of Elektroprivreda and here are some of them:

**1. Regulating of the ownership relations over the natural resources** is a vital prerequisite for the rational utilization of the domestic energy resources. The question of the ownership at the public enterprises is the priority, together with the precise definition of the common relations between the founder and the Enterprise. These two mentioned questions have to be solved using the experience of the market economies.

**2. Hydropotential and manypurposed utilization of the water resources** requires a multidisciplined and modern approach to the research, starting from the economic valorization of the effects of all resource users (water supply system, electric power system, agriculture, tourism) including the space, demographic and sociological influences on the surroundings. The participation at the financing of research, investment-technic documentation and construction of the units has to be proportional to the economic effects of all resource users. The hydropotential of mini hydro power plants ought to be more intensively used by applying all modern solutions of the unification both of project and equipment including the private capital too.

The complex questions of giving concessions to the interested partners have to be professionally watched by the corresponding ministries through a coordinating authority nominated by the Government of B&H

**3. Thermopotential** ought to have a special place at the energetic strategy regarding the respectable coal reserves and the wide spectrum of its uses.

The coal stays one of the basic factors in solving the energy problems in future, the regulating of the coal consumption provides the necessary rate of the energy independence. Due to it, the real estimation of the coal consumption demands has to be carried out for the power production of the existing and future electro energy capacities, industry and households.

The changes at the economic structure of the Republic should have to effect on the continuity of research and exploitation of the coal. The process from the geological researches to the final user has the time dimension of six to eight years and it can be a limiting factor for the utilization of the coal for the required quantities if the energetic policy requires it.

**4. Coal mines** are, owing to the lagging behind the technological development unfinished

invested units, surplus of the labour power, and low productivity in a very difficult position. The started process of prestructuring is to be realized enabling the transformation to the market economy. The program of the prestruction foresees retaining of the production in the profitable mine units introducing the modern technological solutions, followed by the optimal organization, production and efficiency increase, and having the influence on the efficiency of Elektroprivreda. Coal mines and Elektroprivreda B&H are to base their business relation on the long-term contracts, providing the coordination of their development. The program of the coal mine prestruction represents technical - technologic., economic, organizing and personnel consolidation of the profitable mine capacities with an adequate solution of the labour power surplus by preparing an extra social program.

Due to the war destructions and the stopped production at the coal mines the sanation program will be year - long. After the estimation of the current state of the coal mines, the priority mines for the sanation are to be stated. The production at the mines giving their major part of the production to the thermo power plants as well as to other priority economic branches, has to be recovered.

The realization of the above tasks requires passing the adequate acts of law and regulations by the corresponding authorities. The acts will provide normative, organizing financial and personnel conditions for the realization of these tasks.

**5. Natural gas** is becoming more popular for its efficiency in consumption, ecological acceptance, economic and market concurrence. The increased consumption of the gas in industry and at households effects the decrease of the consumption of other energies. But the foreign currency - payment position of the country and problems of the payment for the procured goods can be some limits for the consumption of the gas. Still, there is the technical - economic justification of building the combi - power plants (gas plant + classical power plants with the waste gas heat) at urban areas where the gas infrastructure is installed.

**6. Decrease of the specific consumption of the energy per unit of the social product** has to be a significant support at the energetic policy. The aim of decreasing this production for 70% compared to the pre-war one has to be the first step. Still, with such a big decrease, the energy consumption per a product unit would be bigger than the consumption at developed countries. This can be carried out by the market concurrence at consumers, including an extra program of the energy efficiency together with some regulations and standards. Then there will be the reduced consumption of all kinds of the energy in industry, production of the electric devices, and apparatus for households civil building and residential building. The realization of the energetic efficiency requires the corresponding investments from the real financial resources.

**7. Dimensioning of the development** (construction of new units) is based on the expected demands of the electric power consumers. The responsibility for the realization or unrealisation of the planned amount of the consumption has to be precised through the Energetic strategy. Elektroprivreda is responsible for an efficient construction of new units within the terms fixed by the state. The consumers and the state have to overtake the responsibility for any eventual significant deviation from the planned growth of the consumption. This question is very important since Elektroprivreda, by the construction of its new units, increases its fixed/partially changeable expenses.

**8. Power prices** are to be based on the economic regulations and the influence of the wide "world" market. The creation of its own energetic policy is to be carried out through taxes realizing the wanted structure of the production. The prices for the electric power have to be a reflection of the economic regulations these latter can besides paying the expenses of the simple reproduction, provide a part of the funds for the development and investing into new units together with the expenses of the environment protection. If the agreed price policy for the electric power is changed, the system of compensation (from the budget) has to compensate the lost income. Besides all this, the system of financing the Elektroprivreda reconstruction and development is to be adopted. The system will include: the resources of the developing funds at the level of the Republic; credit means from the domestic and foreign resources under favourable conditions; donations; commercial credits of the equipment

deliverer and the work realizers, followed by the exemption from fees and customs for the imported goods. Besides all these means of payment, the construction of new units required the funds of the concession building and other kinds of the joint investments.

9. Due to the serious war damages at the electric power units, it is necessary to have a unique program of the reconstruction and development for Elektroprivreda including the reconstruction and revitalization of the existing units. The priority list and the estimation of some units will be carried out on the basis of the study of rentability and the analyses of expenses and benefits for each unit separately, including their contribution and significance for the operation of the electric power system as a whole. The preparation of this program is a prerequisite for using the foreign funds from donators and international financial institutions. It is necessary to prepare all documentation, carry out the organizing and personnel preparations for the realization of this task.

10. For its financial consolidation, Elektroprivreda has, besides the defined price policy for the electric power, to write off its debts at the home banks and ask the postponing or writing off its debts by the foreign creditors. Elektroprivreda has to regulate its relations with foreign electric power systems on new bases and international contracts. The relation will be on the basis of the deposits for the utilization of some of the electric power capacities as well as the disposition and the utilization of the hydropotential at the common river catchments.

11. Some surpluses of the electric power are expected before 2000. and their sale at the west European market would bring significant foreign currency means for the reconstruction of the power units, for the recovery of the economy and other branches in post-war period. The organized and personally reinforced management is inevitable for Elektroprivreda B&H. The potential market has to be researched. A prerequisite for the realization of the expected surpluses is the planned production of the power plants, meaning also the necessary foreign currency funds for the sanation and the reconstruction of the generating capacities and investing into the coal mines.

12. For the optimal operation of the electric power system of B&H and the disposal of the expected surpluses of the electric power, the technical and organizing prerequisites are inevitable. They will enable the connections and the interconnection with European Unity for coordination of the production and the transmission of the electric power - UCPTE. Before gaining all necessary conditions, the personal membership with the assembly and other bodies of UCPTE has to be activated and the bilateral relations with the electric power enterprises within the Unity have to be established.

13. Realization of the project of the information system is an important condition for the modern management and the progress of the electric power and business system of Elektroprivreda. A quick realization of this program requires organizing, financial and personnel hypotheses, while the contribution and engagement of the home industry for the project realization can create all conditions for mastering new technologies and gaining the references for the foreign market.

14. Technological development, standardization and unification of the energetic and other equipment asksto be followed all actual world movements of the energetic efficiency, meaning a gradual exchange of the old equipment and assembling of the energetically, economically and ecologically efficient equipment. This can be enabled by the market freedom in choosing the equipment deliverer in the period of the reconstruction and the development. On the other hand, our producers in B&H are obliged to watch the technological trends, coordinating their programs of the development with the market demands.

15. Environment protection is to be based on the principles of the maintainable development restricting the duties of the state and the Elektroprivreda tasks. It means the limited emission of the pollutants from the thermo plants, coordinated with the technical - economic conditions of the country with a gradual and long-term reaching the e.c. standards.

**16. Forecast of the energy consumption** is to be based on the experienced methodologies of forecasting. Such a way of forecasting requires a qualitative data base. In the world, there are a number of developed forecast methodologies for the energy demands of the direct consumers, among them is MEDEE (a model for long-term Energy Demand Evaluation) that has already proved reliable. This model respects the social product by the economic sectors; demographic changes; expected life and social standard; influence of the organizing and technical measures on the progress of the efficiency, verification and treatment of a great number of special statistic data, using the system of the computer equipment with the engagement of the appropriate experts. The first step is the preparation of "Energy balance of B&H" conceived on the modern bases. The corresponding ministries through the Republican institutions have to develop a modern information system for the realization of the above balance. All data about the realized energy consumption by the consumers have to be collected. The energy offer at the international market is watched and the energy prices at the world market using the international information system.

**17. Successful energetic policy** means a clearly worked-out system of planning, coordination and matching of the plans within the energetics. The way of the coordination of the current and developing plans with the mines and the water supply system is particularly important for Elektroprivreda. The process of planning is to be coordinated with the procedures and planning periods defined for the space planning in the Republic. It is necessary to form an independent institution (institute or agency) for the energetics whose founder would be the Government of B&H.

The realization of the above duties needs the corresponding legal measures, provided funds and necessary personnel including a high level of the international cooperation.

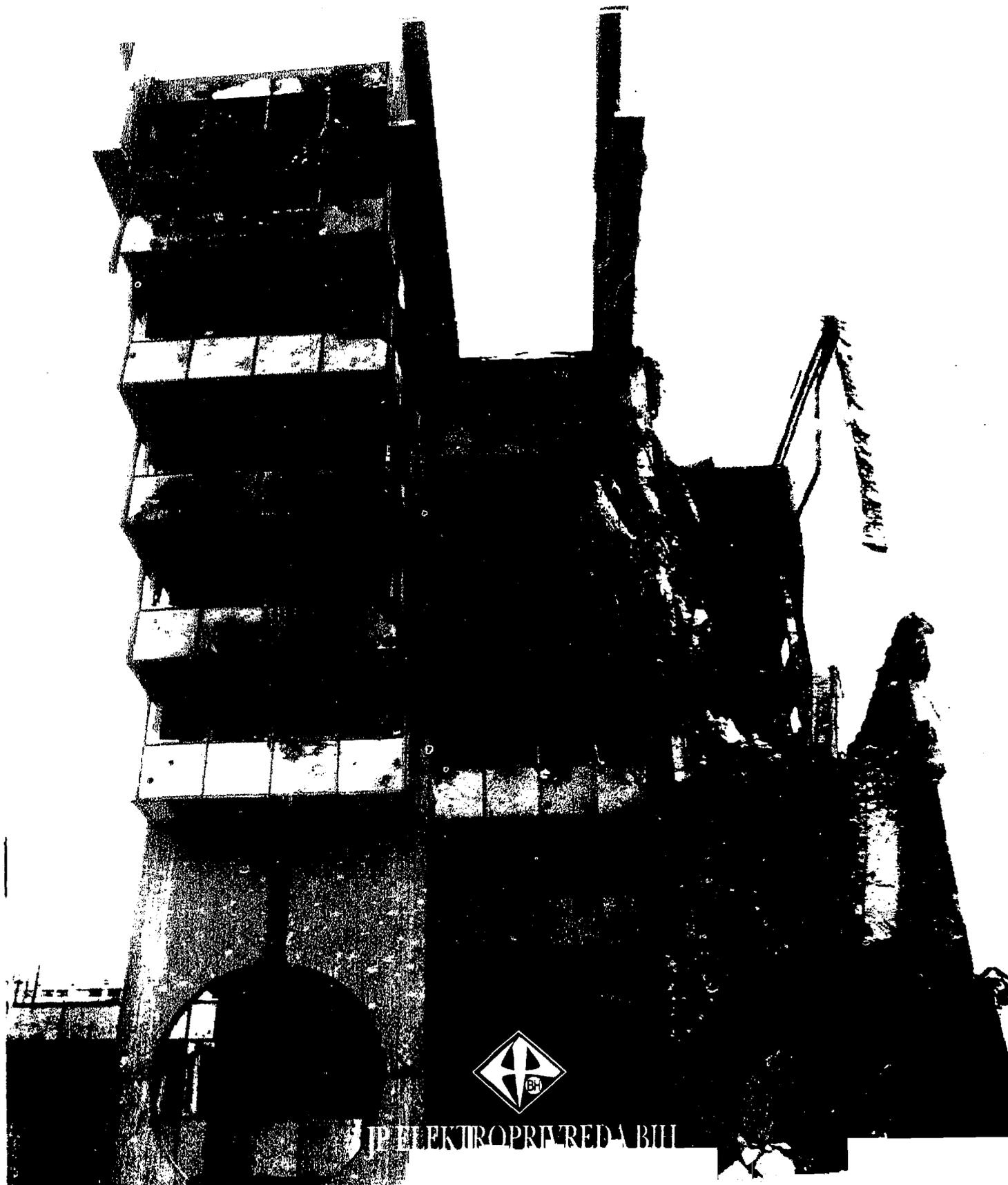
**18. Scientific - research activity** is very significant for the successful realization of the complex duties of the operation and the development of Elektroprivreda. How the applied and developing researches are used in industry, transmission, distribution and in other segments of the business and development policy, all these will depend upon the organization and the development of the scientific-research activity and its connections with other parts of the Enterprise. All material and personnel assumptions for the qualitative performance of these activities will be created during the forthcoming period.

**19. Consistent personnel policy** and the employment of the skilled staff are an inevitable condition for the realization of the developing plans of Elektroprivreda. A permanent education and expert training at home and abroad, together with the definition of the real labour price; stimulating rewards, can create the assumptions for long year provided qualitative staff, necessary for the successful realization of the Elektroprivreda development.

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**Attachment 8**

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**P**očetak 1994. godine elektroenergetski sistem Bosne i Hercegovine je radio ostrvski, usljed ratnih djestava i sukoba na cijelom području Republike. I pored povoljnih hidroloških prilika, zbog velikih oštećenja prijenosne i distributivne mreže, nije bilo moguće zadovoljiti ni minimalne potrebe potrošača. Nakon isteka prvog kvartala uslijedio je period smirivanja sukoba sa postrojbama HVO-a, pojave pozitivnih trendova u svim oblastima, pa tako i brzog oporavka elektroenergetskog sistema (EES). Intenzivno se sanirala prijenosna, a zatim i distributivna mreža. Povezali su se proizvodni kapaciteti termoelektrana Tuzla i Kakanj, hidroelektrana na Neretvi, Jablanica i Grabovica, koji su bili sa manjim oštećenjima, a sa osposobljavanjem komunikacionih veza ostvareno je uspješno upravljanje sistemom. To je omogućilo brz porast potrošnje električne energije, tako da u drugoj polovini 1994. godine proizvodni objekti nisu bili u mogućnosti da zadovolje potrebe potrošnje. Došlo je do uvođenja redukcija, koje su se nastojale ravnomjerno rasporediti na sva područja. Izgradnja i sanacija prijenosne mreže napredovala je zavidnom brzinom.

**Edhem Bičakčić**  
generalni direktor  
General Manager

Druga polovina godine karakteristična je po izuzetno lošim hidrološkim uvjetima. Radi se o izostanku dotoka vode, koji su najniži od kada se vode statistički podaci. Teret proizvodnje preuzele su termoelektrane u Kaknju i Tuzli, koje su radile u izuzetno teškim uvjetima, izložene stalnim termičkim i dinamičkim naprezanjima, suočavane sa hroničnim nestašicama repromaterijala i uglja, neophodnih za proizvodnju. Istovremeno, izgradnja i sanacija prijenosne mreže ubrzano napreduje. Ova godina će biti zabilježena po izgradnji novih objekata, transformatorske stanice 110 kV, nekoliko transformatorskih stanica 35 kV i sanaciji velikog broja distributivnih stanica. Izgrađeni su novi 35 kV i 10 kV dalekovodi. Ovi veliki graditeljski poduhvati omogućili su da se pokrene veći dio očuvanih privrednih kapaciteta u Republici. Koncem godine sva područja, izuzev istočne obale Neretve u Mostaru i enklava, povezana su u jedinstven EES, a sanirana prijenosna i distributivna mreža omogućile su snabdijevanje skoro svih potrošača.



Veoma važan datum u prošloj godini je 12. oktobar kada je došlo do spajanja EES Bosne i Hercegovine i Hrvatske, što je rezultiralo daljom stabilizacijom njegovog rada. Nakon ovoga povezivanja raspadi su svedeni na minimalnu mjeru, odnosno na eksczesne slučajeve, kada dođe do ispadanja iz pogona nekog dalekovoda. Istog dana u EES je uključen i proizvodni objekt HE Rama, a došlo je i do zajedničkog korištenja ovog objekta. Ovo je bilo moguće ostvariti zahvaljujući izuzetnim naporima radnika Elektroprivrede BiH, pomoći Vlade, ali i pomoći donatora iz inostranstva, od kojih na prvom mjestu treba spomenuti ODA-u. Uključivanje SOROS fondacije u obnovu EES i početak realizacije ugovora sa EDF-om iz Francuske na planu rekonstrukcije mreže u Sarajevu i početak radova na sanaciji prijenosne i distributivne mreže u Mostaru, uz finansiranje Evropske uprave, obilježili su 1994. godinu.

Međunarodne aktivnosti i saradnja Elektroprivrede Bosne i Hercegovine u 1994. godini odvijale su se u okviru organa i radnih grupa evropske interkonekcije u statusu punopravnog člana UCPTÉ, regionalne grupacije SUDEL i CIGRÉ Paris, kao i nastavku aktivnosti na sticanju punopravnog članstva u strukovnim organizacijama značajnim za Javno preduzeće (UNIPEDE, Euroelectric, IEEE, IEA/OECD, IAEA, WEC...)

Rezimirajući rezultate u 1994. godini, reći ćemo da je ona za Elektroprivredu BiH bila mnogo uspješnija od prethodne i da je, posebno u drugom polugodištu, nastavljen trend porasta u svim segmentima. Prema sagledavanjima Elektroenergetskog bilansa, očekuje se nastavak ovih pozitivnih tokova.

Generalni direktor  
Edhem Bičakčić

A handwritten signature in black ink, which appears to read "Edhem Bičakčić". The signature is written in a cursive, flowing style.

**B**y the start of 1994, the electric power system of Bosnia and Herzegovina operated on an island regime, due to the war casualties and the conflicts at the whole territory of the Republic. In spite of very favorable hydrology conditions, due to numerous damages at the transmission and distribution grids, even the minimal consumers demands could not be satisfied. After the first quarter was over, there was a cease-conflict period with the forces of HVO, some positive trends appeared at that time and the result was a quick repair of the electric power system (EPS). First the transmission and then the distribution grid were intensively sanated. There were connected all generation capacities, TPP Tuzla and Kakanj, HPP on the river Neretva (Jablanica and Grabovica which were slightly damaged) and a complete control system was realized, after the communication connections were recovered. A quick increase of the electric power consumption was realized and in the second half of 1994, the generation units were not capable to satisfy all current consumption requirements. Then there were the electric power reductions introduced, and Elektroprivreda of B&H has tried equally to distribute them at all regions. The construction and the sanation of the transmission grid went on with an enviable speed.

The second half of the year was characterized with extremely unfavourable hydrology conditions. There was the lowest shortage of the water inflow since the evidence data had been filed. This heavy burden of the power generation was overtaken by TPP in Kakanj and Tuzla, operating under extremely difficult conditions, displayed to constant thermic and dynamic strains and faced with permanent shortages of repromaterials and coal, inevitable for the power generation. Simultaneously, the construction and sanation of the transmission grid goes on fast. This year will be marked by the construction of some 110 kV transformer stations, a number of 35 kV transformer stations and a high number of the distribution stations were sanated too. Certain new 35 kV and 10 kV transmission lines were installed too. These building results drew our complete remained, undamaged economy production in the Republic into refunctioning. By the end of the year all regions, except the east bank of the river Neretva in Mostar and the enclaves were connected to the unique EPS, and the repaired transmission and distribution grids enabled the power supply for almost all consumers.

An important date of the last year was October 12, when the electric power systems of B&H and Croatia became connected, leading to a further stabilization of the operation. After the systems were connected, black-outs were reduced to their minimum, namely to a few excessive cases when a transmission line happened to drop from operation. The very same day, HPP Rama was connected to EPS and its operation restarted; this generation unit has been mutually used.

All these works could be realized thanks to extraordinary efforts of the Elektroprivreda of B&H workers, the Government help and aid of numerous foreign donators, among which ODA deserves to be primarily mentioned. The introduction of SOROS foundation into the reconstruction of our EPS, starting realization of the contract signed with EDF from France (the plan of the Sarajevo grid reconstruction) and the startup of the sanation works at the transmission and distribution grid in Mostar (financially supported by the European administration), they all marked 1994, as a relevant year.

The international activities and cooperation of Elektroprivreda of B&H in 1994, were carried out within the bodies and working groups of the European interconnection, with the status of a fully authorized member of UCPTE, regional group SUDEL and CIGRÉ in Paris. There were great and permanent activities in becoming an official member of some professional organizations relevant for the Public Enterprise (UNIPEDE, EUROELECTRIC, IEEE, IEA/OECD, IAEA, WEC....).

The résumé of our business results in 1994, shows that the last year was, for Elektroprivreda of B&H, far more successful than 1993, and, in its second half, the growth trend in all segments went on. According to the predicts of the Electric Power Balance for 1995, these positive trends will be kept going on.

General Manager  
Edhem Bičakčić



**M**aksimalnim angažiranjem zaposlenih u TE Kakanj i TE Tuzla i pored niske pogonske spremnosti blokova u 1994. godini ostvarena je proizvodnja električne energije od 671 GWh. Od ukupno instaliranih 578 MW u TE Kakanj su bila ispravna četiri bloka od 32 MW, a ostali agregati su konzervirani. Sa prosječnom snagom 75,1 MW i prosječnim satnim angažiranjem od 3.952 h ostvarena je proizvodnja od 297 GWh. U TE Kakanj izvršena je njega blokova 1,2,3 i privremena sanacija turbinskih lopatica oštećenih za vrijeme prisilnog ispada turbine bloka 1, a blok 4 je dekonzerviran i pušten u pogon 7.10.1994. godine.

U TE Tuzla su pogonski bila ispravna i korištena dva agregata od po 32 MW i agregat od 100 MW sa kapacitetom od 50%, jer je od dva kotla koja ima ovaj blok samo jedan u ispravnom stanju. Elektrana je imala raspoloživo samo 114 MW od ukupno instalisane snage od 779 MW.

Sa prosječnom snagom od 84,6 MW i prosječnim satnim angažiranjem od 4.421 h, ostvarena je proizvodnja od 374.020 MWh. I pored teških uvjeta, nedostatka opreme, rezervnih dijelova i repromaterijala, tokom 1994. godine radilo se na održavanju i poboljšavanju pogonske spremnosti blokova. U TE Tuzla izvršena je njega bloka 2, završen remont bloka 3 (bez kotla K3, čija je sanacija u toku i planira se završetak koncem marta/ožujka 1995. godine). Izvršena je zamjena 27-og reda lopatica niskotlačnog dijela turbine uz pomoć specijalista ABB-a i završeno produženje šljakovoda do novog odlagališta šljake Divkovići II.

Svakodnevno su se pratili rad, proizvodnja, zalihe tečnih goriva i uglja na depozitima u termoelekttranama, kao i potrošnja ovih energenata. Prema potrebi analizirana je pogonska spremnost svih agregata koji su u radu, a praćeno je pogonsko stanje konzerviranih blokova. Nedostatak opreme, rezervnih dijelova i repromaterijala zahtijevao je kontakt sa humanitarnim organizacijama. Nabavka se odvijala vrlo sporo, uglavnom zbog nemogućnosti transporta opreme iz Zagreba i Ploča do termoelektrana.

Od ukupno 705 MW instalisane snage HE na Neretvi, na slobodnom teritoriju u pogonu je bilo 235 MW, od toga 5 agregata u HE Jablanica i 2 agregata u HE Grabovica, koji su ostvarili proizvodnju u 1994. godini 726 GWh

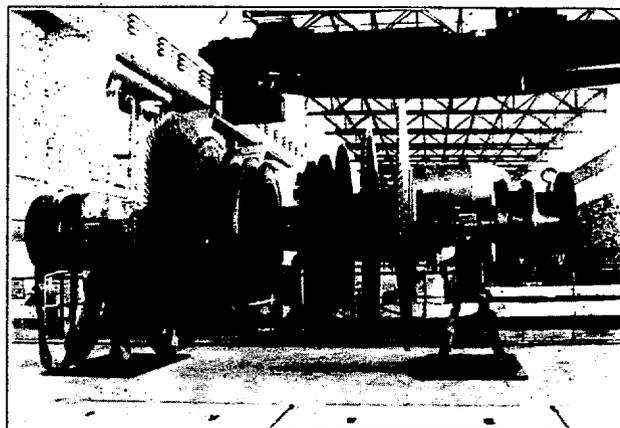
Redovno je praćen rad, proizvodnja, dotoci i energetska vrijednost akumulacija i pogonska spremnost svih agregata u hidroelektranama. Prema prispjelim izvještajima o pogonskoj problematiki hidroelektrana, analizirani su svi problemi koji su se javili u toku rada i odmah su rješavani u mjeri koliko su date okolnosti dozvoljavale. Uspostavljen je kontakt i obavljena posjeta tvornicama glavne opreme i uređaja, te poručena i nabavljena oprema neophodna za održavanje pogonske spremnosti elektrana. Realiziranje ovih poslova se odvijalo vrlo sporo zbog otežanog transporta i finansijskih razloga. Popravljen je u "Litostroju" predturbinski zatvarač agregata br. 3 HE Jablanica i montiran u elektrani, tako da se nesmetano mogu odvijati radovi na završetku generalnog remonta agregata i njegovo stavljanje u pogon.

Na bazi snimanja stanja u elektrani i prikupljenih ponuda od glavnih proizvođača opreme sačinjen je Program sanacije HE Salakovac. Prema ovom programu, prvi agregat bi se mogao pustiti u pogon za 6 mjeseci. Od pripremnih radova, završena je popravka 35 kV voda i dizel agregata, tako da elektrana ima sigurno napajanje električnom energijom. Izveden je izvjestan broj sanacionih radova na RP 220 kV Jablanica i sačinjena specifikacija krupne opreme, čija je nabavka u toku.

Sektor za razvoj i studije realizirajući poslove u oblasti strateškog planiranja, izradio je plan prioritarnih zadataka koji proizilaze iz elaborata "Pravci obnove i razvoja JP Elektroprivreda BiH", organizirao i koordinirao rad Komisije za popis i procjenu ratnih šteta na nivou JP, izradio i usmjeravao realizaciju programa međunarodnih aktivnosti u 1994. godini. Pored toga, Sektor je izvršio pripreme za kolokvij "Male hidroelektrane", saradivao sa Službom za odnose s javnošću u izradi stručnih publikacija, te pružao stručnu pomoć organima BH K CIGRE-a u organiziranju stručnih sastanaka i izvršavanju operativnih zadataka.

*Rotor turbine bloka broj 2 u remontu, TE Tuzla*

*Turbine rotor under the overhaul, block no.2, TPP Tuzla*



## DIRECTION OF THE ELECTRIC POWER GENERATION

maximal engagement of the personnel at TPP Kakanj and Tuzla, in spite of a low operative readiness of the blocks in 1994., enormously contributed that the power generation of 671 GWh could be realized. Out of all installed capacities of 578 MW at TPP Kakanj, only four 32 MW blocks were operative, other aggregates were conserved. With an average capacity of 75,1 MW and with average hourly engagement of 3.952 h, there was realized the generation of 297 GWh. Three blocks, no. 1,2,, and 3 TPP Kakanj were refurbished, a temporary sanitation of the turbine blades damaged by the forced outage of the block 1 turbine, and the block 4 was deconserved and placed into operation in October 7. 1994.

At TPP Tuzla there were operative and used two aggregates each of 32 MW and one 100 MW aggregate with its capacity of 50%, since only one block (out of two installed in the boiler) was in operative state. The thermo power plant had on disposal no more than 114 MW out of its total installed capacity of 779 MW.

With an average capacity of 84,6 MW and average hourly engagement of 4.421 h, there was realized the generation of 374.020 MWh. In spite of all unfavourable conditions, shortage of equipment, spare parts and re-promaterials, in 1994. there had been carried out the maintenance and the improvement of the block operative readiness.

The block 2. at TPP Tuzla was refurbished, the overhaul on the block 3 was over (without the boiler K3 whose sanitation is under way, and is planned for the end of March 1995), the 27th row of blades at the low pressure turbine part was replaced with the assistance of the ABB experts, and the slag system was extended to the slag depot Divkovići II.

There was a permanent control of operation, generation, fuel and coal reserves at the thermo power plants depots, together with their consumption. When necessary, the operative readiness of all operating aggregates was analyzed, and the operative readiness of the conserved blocks was also inspected. The shortage of equipment, spare parts and re-promaterials asked our contact with humanitarian organizations. The purchase went on slowly due to the impossibility of any equipment transport from Zagreb and Ploče to these thermo power plants.

Out of all installed capacity of 705 MW at HPP on Neretva ( on the free territory), there were 235 MW - 5 aggregates at HPP Jablanica and 2 aggregates at HPP Grabovica in operation, and in 1994. they generated 726 GWh.

### CIGRE

In December 1993. there was the First conference of B&H K CIGRE with more than 250 experts and 78 professional papers. The international magazine "Electra" published in April 1994. an article dealing with this important event and activities which still successfully go on in spite of all these difficult conditions.

In 1994. there were some activities relevant for the realization of our resolutions of the First conference. All study committees and working groups were formed. The meetings with the representatives and members of CIGRE were held in Zenica and Tuzla too.

The library of CIGRE was being formed and a great number of professional magazines and books of interest for the members of CIGRE were collected. The bulletins no. 2,3,4 and 5 are issued, and there was organized a colloquial with the topic "Production and appliance of coils". There were seven reports and our recognized experts of this field (from faculties, institutes, competent ministries and enterprises interested in the coils production) have pointed out the importance of this field for the economy of R B&H, since our country is approaching the period of reconstruction and sanitation.

We have established a cooperation with the international CIGRE conference in Paris. At the 35th assembly of the international CIGRE in Paris, our delegation submitted the paper "Elektroprivreda of BiH in war". There was also the presentation of "Elektroprivreda of B&H in war" with 20 photographs showing the damages at the electric power units and facilities. The publication "War damages" is also presented. Our representatives took part at the study committees activity, professional circles and working groups and they attempted to create favourable conditions for the future cooperation at all CIGRE activity fields.

There is a number of contacts with many National CIGRE Committees and the cooperation with some of them has been already realized.

Our members of B&H K CIGRE are engaged at solving the problem of our electric power system functioning under these war circumstances.

There is a Centre for electro energy transitory phenomena (EMT centre), and we have started the activities of forming a high voltage Laboratory and general measurements under the war conditions. There is being organized a colloquial "Mini hydro power plants", "Application of ZnO Lightning arrestors", "Reconstruction and development of distribution grids", "Actual moment of the reconstruction and development of the tele-communications in R B&H" and the round table "Exploitation and development of MV coils".

We have initiated the procedure for the membership of our country at the international organization CIGRE, and there are the organizing activities of Second BH K CIGRE conference.

**F**unkcioniranje elektroenergetskog sistema u 1994. godini odvijalo se u vrlo složenim uvjetima. Zbog oštećenja prijenosnih dalekovoda i ratnih djestava koja su onemogućavala popravke visokonaponskih vodova, veći dio godine elektroenergetski sistem BiH je radio razdvojen u više podsistema. Centralni dio sistema sa HE Jablanica, HE Grabovica, TE Kakanj i TE Tuzla napajao je električnom energijom slobodna područja Sarajeva, Zenice, Tuzle, Konjica i Jablanice. Područje Bihaća, Cazina i Velike Kladuše napajalo se iz lokalne hidroelektrane "Slapovi na Uni" ograničenim količinama električne energije. Područja Coražda, Srebrenice i Žepe tokom cijele godine nisu imala električnu energiju, a područje Maglaja, Žepča i Tešnja uključeno je u sistem sredinom maja/ svibnja 1994. godine.

Zapadna Hercegovina ostala je, nakon razdvajanja od EES BiH u 1993. godini, vezana na elektroenergetski sistem Dalmacije i napajana iz tog sistema i iz HE Čapljina. Područje Barja Luke i Prijedora (okupirani teritorij) napajano je iz hidroelektrana na Vrbasu, lokalnih industrijskih termoelektrana i dijelom iz mreže 110 kV Podrinja, ograničenim količinama električne energije. HE Trebinje I i II i jedan agregat HE Dubrovnik ostali su vezani na EES Crne Gore i napajali su konzum Trebinja, Bileće, Gacka i Nevesinja. Drugi agregat HE Dubrovnik, vezan na mrežu 110 kV,

napajao je područje Dubrovnika i južne Dalmacije. Prema nepotpunim podacima, bilo je pokušaja da se u proizvodnju stavi i TE Gacko, ali se zbog kvarova nije održala u pogonu. Tokom godine u pogonu je bila i HE Višegrad iz koje su se napajala okupirana područja istočne Bosne (Višegrad, Rogatica, Rudo) i Sarajeva (Pale, Vogošća). Dio energije utrošen je za napajanje slobodnog dijela Sarajeva, kao kompenzacija za snabdijevanje dijela okupiranih područja iz centralnog dijela EES-a (Iliđa, Hadžići, Ilijaš).

Sjeveroistočna Bosna (Zvornik, Ugljevik, Bijeljina, Brčko) napajano je iz EES-a Srbije. TE Ugljevik je bila van pogona tokom cijele godine. Dio Bosanske posavine napajan je iz EES-a Hrvatske elektroprivrede (Orašje).

Zbog samostalnog rada centralnog EES-a i kvarova u mreži rad sistema je bio dosta nestabilan. Tokom 1994. godine registrirano je oko 30 raspada sistema. Najteži raspad desio se 28.7. kada je kompletan centralni sistem bio bez napona oko 19 sati.

### CIGRÉ

U decembru/prosinocu 1993. godine je održano Prvo savjetovanje BH K CIGRÉ-a na kojem je učestvovalo 250 stručnjaka sa 78 stručnih radova. U međunarodnom časopisu "Elektra" aprila/travnja 1994. godine objavljen je članak o ovom značajnom događaju i aktivnostima koje se kod nas, pored teških uvjeta, uspješno vode.

Tokom 1994. godine vođene su značajne aktivnosti na realizaciji zaključaka I savjetovanja. Dovršeno je formiranje studentskih komiteta i radnih grupa. Održani su i sastanci sa povjerenicima i članovima CIGRÉ-a u Zenici i Tuzli.

U cilju formiranja biblioteke CIGRÉ-a prikupljen je veći broj stručnih časopisa i knjiga. Izdati su brošure br. 2, 3, 4 i 5, te je održan stručni kolektiv "Proizvodnja i primjena pričušnica". Podneseno je sedam referata, a priznati stručnjaci iz ove oblasti (sa fakulteta, instituta, rezervnih ministarstava i preduzeća zainteresiranih za proizvodnju pričušnica) istakli su da je ove područje od velike važnosti za privredu R BiH, budući da našoj državi predstoji period obnove i sanacije objekata.

Uspostavljena je saradnja sa međunarodnom konferencijom CIGRÉ-a Pariz. Naša delegacija je na 35. zasjedanju međunarodne CIGRÉ-a u Parizu podnijela referate "Elektroprivreda BiH u ratu".

Prezentirala publikaciju "Ratno šteto" sa pratećom izložbom fotografija. Naši predstavnici su učestvovali u radu studentskih komiteta i stručnih skupova stvarajući uvjete za buduću saradnju u svim oblastima rada CIGRÉ-a.

Uspostavljeni su kontakti sa velikim brojem nacionalnih komiteta CIGRÉ-a, a sa pojedinim je ostvarena saradnja.

Članovi BH K CIGRÉ-a angažirani su na rješavanju problema funkcioniranja EES-a u ratnim uvjetima.

Formiran je Centar za elektroenergetske prijelazne pojave (EMT centar), te pokrenute aktivnosti na formiranju Laboratorije visokog napona i općih mjerenja u ratnim uvjetima. Pokrenute su aktivnosti na organiziranju kolektivja "Male hidroelektrane", "Primjena ZnO odvodnika napona", "Pravci obnove i razvoja distributivnih mreža", "Sadašnji trenutak u obnovi i razvoju telekomunikacija R BiH" i okruglog stola "Eksploatacija i razvoj SN čelija".

Pokrenuta je procedura za uklanjanje naše zemlje u međunarodnu organizaciju CIRED, a otpočele su i aktivnosti na organiziranju Drugog savjetovanja BH K CIGRÉ-a.

There was a permanent control of operation, generation, water in-flows and energy value of the storage, with the operative readiness of all aggregates in hydro power plants. According to the available reports about the operative problematic of the hydro power plants, there were discussed all problems which appeared in the war and they were tried to be solved to the measure which the current conditions allowed. After the factory of the main equipment and installation was visited, the contact was created and the equipment necessary for the maintenance of the power plant operative readiness was ordered and procured. The realization of these steps was carried out very slowly due to the difficult transport and financial reasons.



*H/E Salakovac,  
zgrada  
telekomunikacija*

*HPP Salakovac,  
telecom-  
munication  
building*

After the preturbine gate of the aggregate no.3 from HPP Jablanica had been repaired at "Litostroj", it was successfully installed at the power plant, enabling smooth finishing works of the general aggregate overhaul and its preparation to be placed into operation.

On the basis of the power state inspection and gathered data from the main equipment manufacturers, there was prepared the Program of HPP Salakovac sanation. According to this Program, the first aggregate could enter operation in next 6 months. As for the preparatory works, the repair of 35 kV line and diesel aggregate was over, and at the moment the power plant has a stable power supply. A number of the sanation works were carried out at the switch gear 220 kV Jablanica, and the procurement of all bulky equipment is under way according to the prepared specification.

The Sector for development and studies, in realizing its activities of the strategic planning activities: prepared the plan of the priority tasks in accord with the elaborate "Directions of development and reconstruction of Public Enterprise Elektroprivreda of B&H; organized and coordinated the activity of the Commission for evidence and estimate of war damages on the level of the Public Enterprise; made and directed the realization of the international activities program in 1994. Then, the Sector also carried out all preparations for the colloquial "Mini Hydro Power Plants", coordinated with the Service for Public Relations in issuing the professional publications, and offered a significant help to the competent bodies of BH K CIGRE in organizing professional meetings and realizing all operative tasks.

## **DIRECTION FOR ELECTRIC POWER CONTROL AND TRANSMISSION**

The electric power system functioning in 1994. was carried out under extremely difficult circumstances. Due to numerous damages at transmission lines and permanent war casualties preventing any repair at high voltage lines, a major part of the year elapsed with the electric power system of B&H operating in many subsystems. The central system part with HPP Jablanica, HPP Grabovica, TPP Kakanj and TPP Tuzla supplied free areas of Sarajevo, Zenica, Tuzla, Konjic and Jablanica. The region of Bihać, Cazin and Velika Kladuša was supplied from a local hydro power plant "Slapovi na Uni" with limited electric power quantities. The areas of Goražde, Srebrenica and Žepa remained unsupplied the whole year, while the territory of Maglaj, Žepče and Tešanj was switched to the system by the middle of May 1994.

After the EPS of B&H was disconnected in 1993., West Herzegovina remained linked to the power system of Dalmatia, supplied from that system or HPP Čapljina. The area of Banja Luka and Prijedor (occupied territory) was supplied from the hydro power plants on Vrbas, local industry thermo power plants and partly from 110 kV Podrinja grid, but with limited electric power quantities. HPP Trebinje I and II and one aggregate of HPP Dubrovnik remained connected to EPS of Monte Negro, supplying the consume of Trebinje, Bileća, Gacko and Nevesinje. The other aggregate from HPP Dubrovnik, connected to the 110 kV grid supplied the area of Dubrovnik and South Dalmatia. According to the insufficient information, there were some attempts to place TPP Gacko into operation, but due to certain faults, the power plant was not capable to remain in function. Last year,

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Nakon prestanka sukoba sa postrojbama HVO-a, u Hercegovini i srednjoj Bosni prišlo se sanaciji prijenosne mreže 220 i 110 kV i neophodnim radovima na HE Rama. 12.10.1994. godine povezani su centralni dio EES-a BiH sa EES-om R Hrvatske (Dalmacije) i puštena je u pogon HE Rama. To je znatno utjecalo na stabilnost rada sistema i poboljšanje elektroenergetske situacije. Proizvodnja HE Rama plasirana je za podmirenje potrošnje zapadne Hercegovine i srednje Bosne i za vraćanje preuzete električne energije tokom prvih 10 mjeseci na osnovu naturalne razmjene.

U dijelu sistema kojim upravlja JP Elektroprivreda BiH Sarajevo, ostvarena proizvodnja nije mogla podmiriti planiranu potrošnju električne energije tako da su tokom godine, s izuzetkom u aprilu/travnju i maju/svibnju, bila nužna oštra ograničenja potrošnje (50-60% od potreba). Prvenstveno je osiguravana električna energija za potrošače od značaja za preživljavanje stanovništva, osiguranje osnovnih humanitarnih potreba i odbranu zemlje. Uz ove kriterije potrošnja domaćinstava je bila rigorozno ograničavana.

Podaci o ostvarenju Elektroenergetskog bilansa dati su u tabelarnom dijelu.

Hidroelektrane na Neretvi nisu ostvarile planiranu proizvodnju zbog kvarova na dalekovodima, koji su u nekim periodima potpuno onemogućavali plasman električne energije do potrošačkih centara, a u drugim je bio moguć jedino naizmjeničan rad HE Jablanica i HE Grabovica, preko jednog dalekovoda na dva naponska nivoa (110 i 220 kV).

Termoelektrane nisu ostvarile planiranu proizvodnju zbog problema s osiguranjem dovoljnih količina uglja, repromaterijala i tekućih goriva za podržavanje vatre, kao i nestabilnog rada sistema i čestih ispada termoblokova.

Veliki doprinos u stabilizaciji rada sistema dao je "Elektroprenos" Sarajevo. Pored otklanjanja brojnih kvarova na dalekovodima za napajanje grada Sarajeva, obavljani su slijedeći značajni radovi na sanaciji prijenosne mreže i postrojenja:

- popravka DV 110 kV Jablanica-EVP Konjic čime je omogućen željeznički saobraćaj na relaciji Jablanica-Pazarić i napajanje Konjica iz mreže 110 kV;
- popravak DV 220 kV Jablanica-Mostar i DV 220 kV Jablanica-Rama, što je omogućilo povezivanje EES BiH i Dalmacije i stavljanje u pogon HE Rama;
- sanacija dijela postrojenja u RP 220 kV Kakanj (ugradena dva nova prekidača);
- sanacija oštećenja ugradnjom dva nova stuba na DV 220 kV Salakovac - Kakanj (dionica Konjic - Kakanj);
- popravak DV 110 kV Jablanica-Prozor što je omogućilo napajanje gradilišta u HE Rama i Prozora;
- sanacija DV 220 kV Tuzla-Gradačac i DV 110 kV Lukavac-Srebrenik;
- popravak DV 35 kV, a kasnije i DV 110 kV Zenica-Zavidovići-Žepče-Maglaj, što je omogućilo napajanje Maglaja, Žepča, Zavidovića i Tešnja električnom energijom;
- stavljanje u funkciju dalekovoda 110 kV Zenica-Busovača-Vitez-Bugojno i DV 110 kV Bugojno-Gornji Vakuf pod 10 kV, čime su ova područja dobila napajanje električnom energijom;
- sanacija DV 110 kV Zenica-Travnik 1;
- sanacija učinskih transformatora i postrojenja u Travniku 1, Zavidovićima, Maglaju, Bugojnu, Visokom, Sarajevu 7, Konjicu i Mostaru 2;
- projektiranje i pripremni radovi za izgradnju DV 110 kV Maglaj-Tešanj;
- projektiranje, pripremni radovi, izgradnja i puštanje u pogon TS 110/35/10 kV Pazarić i priključnog voda 110 kV, dogradnja TS Sarajevo 15 i Sarajevo 18 i sanacija DV 110 kV Jablanica-Sarajevo 2 (do Pazarića).

## SAVEZ ENERGETIČARA

Obnoviteljska Skupština Saveza energetičara BiH održana je 26. jula/srpnja 1994. godine u Sarajevu, uz prisustvo 80 članova.

Prirediteljski zadatak Saveza energetičara je aktiviranje podružnica na slobodnom dijelu Republike. U Programskoj orijentaciji, između ostalog je istaknuto da će Savez djelovati multidisciplinarno, jer razvoj energetskog sistema nije samo energetski, tehnički i privredni problem, već zahtjeva ukupno odnose življenja. Popularizacija energetske struke, obrazovanje u području energetike i povećanje energetske kulture bit će oblasti u kojima će se također posebne aktivnosti djelovati.

Ovisno o temi i aktuelnosti problema, rad će se odvijati po komisijama i drugim radnim tijelima. U okviru raspoloživih mogućnosti formirat će se informacijski sistem, sa podacima relevantnim za korištenje energije i uspostaviti veza sa postojećim bazama podataka u vezi sa nivoom i načinom korištenja energije u svijetu.

HPP Višegrad was in operation supplying the occupied areas of East Bosnia (Višegrad, Rogatica, Rudo) and Sarajevo (Pale, Vogošća). A part of the energy was consumed for the power supply of the free territory of Sarajevo, compensating the power supply of the occupied regions from the central EPS part (Ilidža, Hadžići, Ilijaš).

North East Bosnia (Zvornik, Ugljevik, Bijeljina, Brčko) was supplied from the EPS of Serbia. TPP Ugljevik was out of operation the whole last year. A part of Bosanska posavina was supplied from the EPS of Croatia (Orašje).

Due to an independent operation of the central EPS and many faults at the grid, the system operation was rather unstable. In 1994, there were registered some 30 system outages. The most serious catastrophe occurred in July 28, when the complete central system remained all 19 hours without any voltage.

After the conflicts with the HVO forces in Herzegovina and Central Bosnia were over, the sanation works at the 220 kV and 110 kV transmission grids began and the inevitable works at HPP Rama were carried out. In October 12, 1994, the central part of EPS of B&H was connected to the EPS of Croatia (Dalmatia) and HPP Rama was placed into operation. All this significantly influenced the system operation stability, improving the electric power situation. The power generation of HPP Rama was placed satisfying the consumption of West Herzegovina and Central Bosnia, and the power quantities, overtaken in first ten months, on the basis of the exchange in kind, could be paid back.

At the system part controlled by the Public Enterprise Elektroprivreda of B&H Sarajevo, the realized generation could not satisfy the planned consumption and in the last year (except in April and May), severe consumption reductions were inevitable (50-60% of demands). Primarily secured electric power was intended for the consumers vital for the residents survival, basic humanitarian requirements and country defence. Besides these criteria, the households consumption was rigorously limited.

All data regarding the Electric power balance are given at the tables.

HPP on Neretva failed to realize their planned generation due to faults at transmission lines, which, in some periods, totally prevented the electric power reach its consumption centres, in other times only an alternative operation of HPP Jablanica and HPP Grabovica was possible over one

transmission line with two voltage levels (110 and 220 kV). TPP failed in realizing their planned generation due to the problem of ensuring enough coal quantities, re-promaterials, and liquid fuels, as well as an unstable system operation followed by frequent black-outs of the thermo blocks.

A significant contribution to the system operation stability was given by Elektroprenos Sarajevo. A great number of faults at the transmission lines supplying Sarajevo were repaired and there were carried out the sanation works of the transmission grid and facilities:

- repair of TL 110 kV Jablanica-Electro drive facility Konjic enabled the railway transport from Jablanica-Pazarić and Konjic was supplied from the 110 kV grid.
- repair of TL 220 kV Jablanica-Mostar and TL 220 kV Jablanica-Rama enabled a connection EPS of B&H to EPS Dalmatia and placing HPP Rama into operation,
- sanation of the installation part at 220 kV switch gear Kakanj (two new circuit breakers are assembled),
- sanation of damages by assembling two new towers at TL 220 kV Salakovac-Kakanj (section Konjic-Kakanj),
- repair of TL 110 kV Jablanica-Prozor enabling the power supply of the building site at

#### UNITY OF B&H ENERGETICERS

The reestablishing Assembly of the B&H Unity of energeticers was held in July 26, 1994 in Sarajevo, and there were 80 members of the Unity present.

The priority task of the Unity is the branches opening all over the free territory in the Republic. The Program orientation points out, among all others, the multinational future activity of the Unity, since the development of the energy system is not only an energetic, technical and economic problem, but it also encroaches on all life relations.

Popularization of the energy profession, education at the energy field and energy culture are all fields of the Unity future activity.

Depending of the topic and the problem actuality, the activity will be carried out by commissions and other working bodies. Inside the available possibilities, there will be formed an information system with all data relevant for the energy usage. There will be a connection realized with the existing data bases referring to the level and way of the energy usage in the world.

Značajan doprinos u navedenim radovima dao je UNPROFOR, koji je učestvovao u organiziranju dogovora sa agresorskom stranom, organiziranju radova na linijama razgraničenja, obezbjeđenju pratnje ekipama, te transportu ekipa i opreme. Upravljanje elektroenergetskim sistemom bilo je otežano zbog nedovoljnih komunikacija. Sistemom je upravljano iz Republičkog dispečerskog centra i dislociranog dijela RDC-a u RP Kakanj.

Zajedničkim naporima Elektroprivrede i PTT osposobljene su osnovne veze između RDC-a i objekata na terenu i neophodna telemjerenja u RDC-u. To je omogućilo uspješno upravljanje sistemom, saniranje poremećenih režima rada i brzo uspostavljanje sistema kod brojnih kvarova u mreži i raspada.

Sektor za razvoj informacionog sistema je osigurao funkcioniranje standardnog seta poslovnih aplikacija i realizirao njihovo prilagođenje sadašnjem organizacionom ustrojstvu Javnog preduzeća. Osim toga, osigurane su minimalne pretpostavke za savladavanje novih tehnologija razvoja, koje uključuju jezike četvrte generacije i relacione baze podataka. Ovladano je tehnikama rada sa softverskim alatima novih generacija i u njima su razvijeni slijedeći moduli informacionog sistema: "Evidencija investicionih kredita", "Tehnička baza podataka" i "Evidencija ratnih šteta".

## DIREKCIJA ZA DISTRIBUCIJU

**S**mirivanje ratnih dještava krajem prvog tromjesečja omogućilo je početak radova na osposobljavanju mreže i dovođenju napona na područja Zavidovića, Žepča, Maglaja i Tešnja, koja su gotovo devet mjeseci bila bez električne energije.

Repromaterijal za stavljanje u funkciju dalekovoda Zenica- Žepče - Maglaj i Žepče - Zavidovići osiguran je demontažom dalekovoda koji u tom trenutku nisu bili prioritetni. Početne količine prene-

sene energije su bile male. Daljim radovima, popravkom 35 kV vodova je prosljeden napon u TS 110/35 kV Maglaj, a sanacijom trafostanica 35/10 kV u Maglaju i Tešnju, osnovnih 10 kV vodova i pripadajućih trafostanica 10/04 kV i niskonaponske mreže osigurano je kvalitetnije snabdijevanje potrošača. Počeli su i radovi na gradnji DV 110(35) kV Maglaj - Tešanj, a stvoreni su i uvjeti za napajanje slobodnog teritorija općina Doboj i Teslić, te područja Usore.

Tokom aprila/travnja i maja/svibnja električnom energijom su snabjevena područja Gornjeg Vakufa, Fojnice, Starog Viteza i Novog Travnika. U regionu Gornjeg Vakufa u pogonu su samo 4 trafo- područja, zbog oštećenja velikog broja trafostanica 20/0.4 kV. Jedanaest mjeseci, koliko je Fojnica bila bez napona, samo tri mjeseca se uspijevalo prosljediti 200 kW. Dovođenjem 110 kV napona poboljšane su mogućnosti snabdijevanja Bugojna.

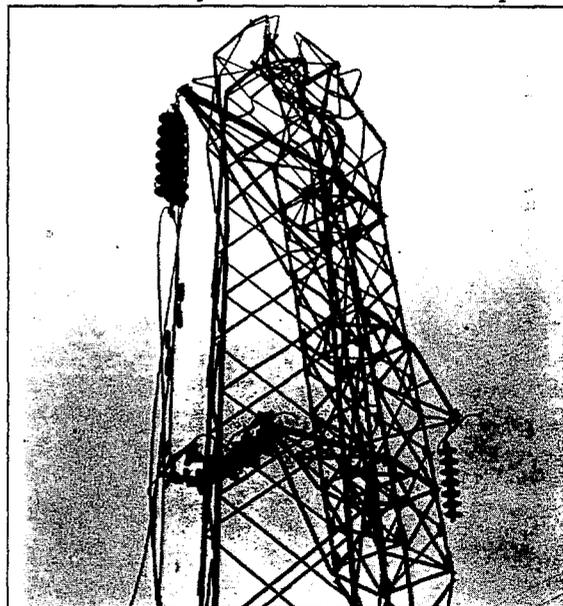
Otklonjena su uska grla u napajanju Srebrenika, Gračanice, Gradačca, Čelića i dijelova općine Brčko sanacijom i izgradnjom TS 35/10 kV Gornji Rahić i pripadajućeg 35 kV dalekovoda. Izgrađena je nova TS 35/10 kV Toke i DV 35 kV Gornji Rahić-Čelić.

Maja/svibnja mjeseca 1994. godine počele su stizati prve ograničene količine električne energije na istočnu obalu Mostara sa tri 10 kV napojna voda preko Neretve, kojim se moglo plasirati samo 4 - 5, a maksimalno 9 MW. Iz pravca Jablanice prespajanjem vodova je osigurano napajanje područja Bijelog Polja, prosječno 1,5 MW. Oštre mjere ograničenja potrošnje u regionu Mostara se neće izmijeniti dok se ne dovede 110 kV napon u TS Mostar 2.

Na području Sarajeva je problem predstavljalo napajanje Olova, Pazarića, Butmira, Kobilje Glave, Mojmila, Sokolović kolonije, Starog grada i Centra, zbog uništenih glavnih napojnih puteva. Ovi dijelovi su bili bez napona ili su električnu energiju dobijali u minimalnim količinama, samo za

*DV 110 kV Doboj-  
Teslić, lokacija Jelah*

*TL 110 kV Doboj-  
Teslić, Jelah*



HPP Rama and Prozor,

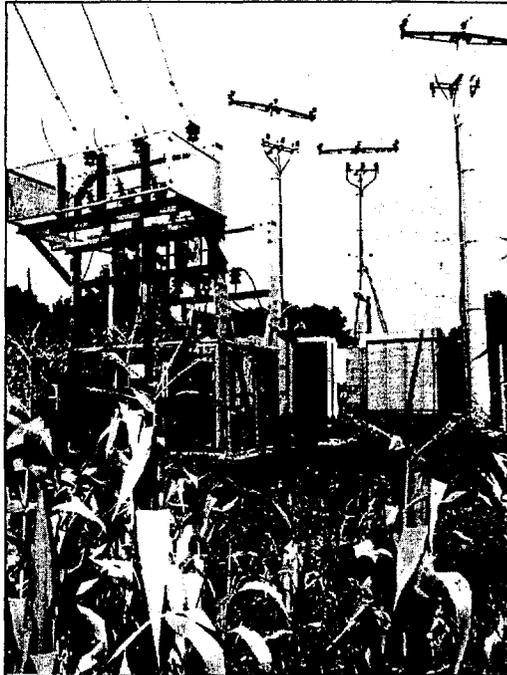
- sanation of TL 220 kV Tuzla-Gradačac and TL 110 kV Lukavac-Srebrenik,
- repair of TL 35kV and later also TL 110 kV Zenica-Zavidovići-Žepče-Maglaj, enabling the power supply of Maglaj, Žepče, Zavidovići and Tešanj,
- placing into function TL 110 kV Zenica-Busovača-Vitez-Bugojno- and TL 110 kV Bugojno-Gornji Vakuf with 10 kV enabled these regions were also supplied,
- sanation of TL 110 kV Zenica-Travnik 1,
- sanation of power transformer and facilities in Travnik 1, Zavidovići, Maglaj, Bugojno, Visoko, Sarajevo 7, Konjic, Mostar 2,
- projecting and preparatory works for the construction of TL 110 kV Maglaj-Tešanj,
- projecting, preparatory works, construction and placing into operation TS 110/35/10 kV Pazarić and connecting line 110 kV, upgrading of TS Sarajevo 14 and Sarajevo 18, sanation of TL 110 kV Jablanica-Sarajevo 2 (up Pazarić).

The assistance of UNPROFOR was significant and they also participated in organizing the agreements with the aggressor side, organizing works at the lines of separation, and secured team assistance and transportation of teams and equipment.

The control of the electric power system was endangered due to insufficient communications. The system was controlled from the Republic dispatching centre and a dislocated part of this centre at the switch gear in Kakanj.

Mutual efforts of Elektroprivreda and PTT resulted in the recovery of basic connections between the Republic dispatching centre and power units on field, and also providing most relevant telemasurings in this dispatching centre. A successful system control was secured, quick sanation of disturbed operation regimes and soon repairs of numerous grid outages and black-outs.

Sector for the information system development has secured functioning of a standard business application set, realizing the adaptation to the current organizing scheme of the Public Enterprise. Then, there are certain minimal assumptions for overcoming new development technologies, including the fourth generation languages and relation data basis. The operation technic with software tools of new generation has been gained with some information system moduli: "Evidence of investment credits", "Technical data base" and "Evidence of war damages".



*TS Toke 35/10 kV,  
izgrađena u ratu*

*TS Toke 35/10 kV,  
constructed in war*

## **DIRECTION FOR THE POWER DISTRIBUTION**

By the end of the first three months, during a cease-fire period, the sanation works could start. The grid had been repaired and the voltage was brought to the regions of: Zavidovići, Žepče, Maglaj and Tešanj, where almost nine months there was no electric power.

Repromaterials necessary for the recovery of the transmission line Zenica-Žepče-Maglaj-Žepče-Zavidovići was secured by demontaging other transmission lines which were not priority lines. The starting quantities of the transmitted energy were very scarce. The works went on and after some 35 kV lines were repaired, some voltage could reach TS 110/35 kV Maglaj. The transformer stations 35/10 kV in Maglaj and Tešanj were sanated, then basic 10 kV lines were repaired and belonging 10/04 kV and low voltage grid were placed into function and a more qualitative power supply was provided. The installation of TL 110/(35) kV Maglaj-Tešanj has begun, providing all necessary conditions for the free territories of the municipalities Doboj and Teslić, Usora region too, to be supplied.

prioritetne potrebe. Tokom godine, sanacijama i novom gradnjom situacija se znatno popravila, a Hrasnica, Butmir i Sokolović kolonija su, nakon 80 dana, napon dobili na koncu godine.

Obavljen je niz značajnih poslova vlastitim snagama, ali i uz pomoć humanitarnih organizacija i fondacija. Izvršena je sanacija većeg broja TS 10/0.4 kV, kablova visokog i niskog napona, te nadzemne mreže. Poseban uspjeh je osposobljavanje tri teže oštećena transformatora 35/10 kV, 8 MVA, čija se popravka prije rata mogla obaviti samo izvan Bosne i Hercegovine. Ovim zahvatima je postignuta normalizacija napajanja područja Kobilje glave, Mojčila, Pazarića i Tarčina. Pazarić i Tarčin su dobili dovoljne količine električne energije izgradnjom transformacije i izvora 10 kV napona u Pazariću.

Još uvijek su van elektroenergetskog sistema područja Bihaća, Goražda, Srebrenice i Žepe, koja se snabdijevaju minimalnim količinama električne energije iz malih, uglavnom improviziranih elektrana. Svi napori da se dovede napon u ova područja ostali su bez rezultata.

Neadekvatna izgrađenost elektroenergetskih objekata, neodgovarajući presjeci vodova, preopterećenost transformatora, neočitan ili neprijavljeni potrošači, uvjetovali su da

procenat gubitaka u distributivnoj mreži bude velik (između 15 i 25 procenata). Sa poboljšanjem navedenih uvjeta i iznos gubitaka će se smanjiti.

Aprila/travnja 1994. godine donesena je nova "Odluka o prioritetima u snabdijevanju električnom energijom". Ovom odlukom raspoložive količine električne energije namijenjene za potrebe prioritetnih korisnika raspoređuju se u procentualnim iznosima prema utvrđenim listama. Ostao je prisutan problem prekoračenja zadate potrošnje kod prioriteta, što je direktno utjecalo na raspodjelu električne energije ostalim potrošačima. Tokom cijele godine, osim u maju/svibnju i dijelom junu/lipnju, morala su se provoditi oštra ograničenja u potrošnji, a posebno u opskrbi domaćinstava, koja su dobijala električnu energiju svaki četvrti, šesti, pa i osamnaesti dan.

Eksperimentalno je na području Breze i Vareša uvedeno ograničenje potrošnje svakog domaćinstva uz stalno prisustvo napona. Vršile su se pripreme za primjenu tog načina na cijelom području koje snabdijeva Elektroprivreda BiH, jer su se stekli uvjeti u proizvodnji, koja se ustalila na 3500 do 4000 MWh na dan. Pretpostavka je da će se za oko 420 hiljada domaćinstava na slobodnom teritoriju moći osigurati po 100 kWh mjesečno, mada će problem predstavljati i oko 40 hiljada oštećenih i neupotrebljivih brojila.

Direkcija za distribuciju je u prvoj polovini godine radila sa tri radnika, a nakon juna je svedena na svega dvoje zaposlenih, koji su uz velike teškoće uspjeli da zadovolje potreban kvalitet u radu.

## STOLJEĆE SARAJEVSKE "ELEKTRODISTRIBUCIJE"

Godina 1994. je protekla u znaku obilježavanja stogodišnjice od prvih početaka elektrodistributivne djelatnosti u Sarajevu.

Nepunih trinaest godina nakon podizanja prve električne centrale u svijetu --dana je i elektrana u glavnom gradu R BiH. Izgradnja je počela 1893. na Hisetima uz rijeku Miljacku, a u arhivskim dokumentima se u 1894. godini prvi put pominje preduzeće za proizvodnju električne energije i njenu dostavu građanima.

Elektranu je gradila firma "Halske" iz Beča, a na montiranju mašina su radili i "Simons"-ovi stručnjaci. Sastojala se od centralne stanice (kotlovnica i strojaranice) sa zgradom za direktnu, a instalisana snaga je bila 60 hiljada vati.

30. decembra/prosinca 1894. godine Zemaljska vlada je utvrdila prve opće uvjete za isporuku i tarifni sistem za distribuciju električne energije pod nazivom " Privremeni propisi za davanje električne struje od strane električne radnje (preduzeća) u Sarajevu".

Probne uključivanje električnog osvjetljenja je izvršeno u noć između 3. i 4. aprila/travnja 1895. godine. Električni fenjeri su zasijali u Keševskoj, Čemaljevi de Ferhadžić i Čekrkinići ulici.

Sarajevska elektrana je proizvela električnu energiju nepunih šest decenija. Danas je potpuno uništena požarom izazvanim agresorskim granatiranjem.

Trebalo bi mnogo više prostora da bi se nabrojali važniji datumi iz historijata "Elektrodistribucije" Sarajeva, jer se ova infrastrukturna djelatnost razvijala ubrzano, u skladu sa potrebama glavnog grada i Republike BiH.

Sarajevo je prije agresije spadalo u gradove koji su na savremen način riješili elektroenergetske probleme. Ratna razaranja oštetila su zračnu i kablovsku mrežu, transformatorske stanice, svjetiljke, stubove, prigušnice. Preliminarna procjena ukupne štete iznosi preko 135 miliona DEM.

Iako se u skladištima raspolagali oskudnim materijalima, radnici "Elektrodistribucije" tokom protekle tri ratne godine nisu dozvolili da distribucija električne energije bude kočnica u elektroprivrednom lancu. Mnogo su pomogli i vlastiti stručnjaci koji su radili na izradi sanacionih programa, ali i kolege iz IRCE- Energieinvesta, Instituta za elektroprivredu i Elektrotehničkog fakulteta, uz saradnju sa Direkcijom za obnovu i razvoj grada i Timom specijalnog koordinatora UN za Sarajevo.

In April and May, the electric power was supplied to the areas of Gornji Vakuf, Fojnica, Stari Vitez and Novi Travnik. Due to the damages at almost all TS 20/0,4 kV, there are only four operating transformer regions at the area of Gornji Vakuf. In all eleven months when Fojnica was without any voltage, no more than 200 kW could be sent. The possibilities for the power supply of Bugojno have been improved after the 110 kV voltage was brought.

There have been eliminated all bottle necks of the power supply in Srebrenik, Gračanica, Gradačac, Čelić and partly the municipality Brčko after the sanitation and installation of TS 35/10 kV in Gornji Rahić and TL 35 kV leading to the station. There is also a new transformer station 35/10 kV Toke and TL 35 kV Gornji Rahić-Čelić.

In May 1994, first limited power quantities reached the east bank of Mostar over three 10 kV lines stretched across the river Neretva, capable to place mostly 4-5, or maximally 9 MW. After the lines from the Jablanica direction were joined, the region of Bijelo Polje was supplied, averagely with 1,5 MW. The actual severe restrictive measures of the power consumption at the region Mostar will remain unchanged till the 110 kV voltage is brought to TS Mostar 2.

The region of Sarajevo is faced with the problem of supplying Olovo, Pazarić, Butmir, Kobilja Glava, Mojmilo, Sokolović-kolonija, Stari grad and Centre, since the main feeders have been destroyed. These areas had lived without any voltage or they were supplied by minimal power quantities, intended only for the priority demands. During the year, the situation was improved after the sanitation and new installation of some power units, and Hrasnica, Butmir and Sokolović-kolonija after the 80 day dead period, finally got the voltage by the end of the year. A number of works have been successfully carried out with our own labour means and manpower, together with the help from humanitarian organizations and foundations. Many TS 10/0,4 kV, high voltage and low voltage cables, and overhead grid, they were also repaired. A great success is the repair of all three seriously damaged transformers 35/10 kV, 8 MVA, whose before the war planned revitalization could be done out of Bosnia and Herzegovina. All these above works contributed to the stable power supply of the regions: Kobilja Glava, Mojmilo, Pazarić and Tarčin. These two last places could have enough power quantities after a transform and 10 kV voltage resource had been installed in Pazarić.

Still, the electric power system is not including the regions of Bihać, Goražde, Srebrenica and Žepa, which are supplied by some poor power quantities from weak, mostly improvised power

## CENTURY OF SARAJEVO ELEKTRODISTRIBUCIJA

In 1994, the electric power distribution in Sarajevo celebrated its 100th anniversary of its first pioneer steps.

Only thirteen years after the first world power plant had been erected, the capital of the Republic of B&H had its power plant constructed. The construction began in 1893 at Hise, by the river Miljacka. In 1894, for the first time, the archive documents mentioned the name of the enterprise for the generation and distribution of the electric power.

The power plant was constructed by the firm "HALSKE" from Vienna, and the equipment montage was carried out by the "SIEMENS" experts. There was a central unit (boiler room and engine room) with its administration building. Its installed capacity was 60 thousand Watts.

In December 30, 1894, the Regional government issued the first general conditions for the power delivery and the tariff system for the power distribution, titled "Temporary regulations for the power distribution by the electric power workshop (enterprise) in Sarajevo".

First trial switching of the electric lighting was done in the night between April 3. and 4. 1895. The electric lanterns lit the streets of Ke ova, Čemalova te Ferhadija and Čokrnica.

The Sarajevo power plant used to generate the electric power during next six decades, and now, being a target of the aggressor's bomb shelling, the power plant is totally destroyed. in fire.

Some more paper would be required all dates relevant for the Elektrodistribucija Sarajevo history to be listed, since this infrastructure activity had developed fast, in accord with demands of the capital and the Republic of B&H.

Before the aggression, Sarajevo was among the towns which solved the electric power problems on an up-to-date way. But, these war casualties have destroyed both overhead and cable grids, transformer stations, public lighting, towers, coils. The preliminary estimate of the total damage amounts over 135 million DEM.

Although the stores have missed many necessary materials, in these last three war years, the workers of Elektrodistribucija never allowed the electric power distribution become an obstruction to the electric power chain. Our experts were significantly engaged at the realization of the sanitation programs. Our colleagues from IRCE Energoinvest, Institute for electric power industry, and Electrotechnic faculty were also very helpful to us. There was a very successful cooperation with Direction for reconstruction and development of the town and the Team of the special UN coordinator for Sarajevo.

**UPRAVNI ODBOR**

**GENERALNI DIREKTOR**

**KABINET  
GENERALNOG DIREKTORA**

**TIM ZA KONSALTING**

Služba za međunarodnu saradnju

Služba za odnose s javnošću

Služba za odbrambene pripreme

Služba za zajednička poslova

**DIREKCIJA ZA  
PROIZVODNJU**

**DIREKCIJA ZA  
PRIJENOS I UPRAVLJANJE**

**DIREKCIJA ZA  
DISTRIBUCIJU**

**DIREKCIJA ZA  
NAUČNO-ISTRAŽIVAČKI RAD**

**DIREKCIJA ZA  
EKONOMSKE POSLOVE**

**DIREKCIJA ZA PRAVNE,  
KADROVSKE I OPĆE POSLOVE**

Sektor za razvoj i studije

Sektor za upravljanje

Služba za razvoj i eksploataciju  
distributivne mreže

Služba za elektroenergetiku

Sektor finansijskih poslova

Služba za  
pravna poslova

Služba za eksploataciju  
proizvodnih objekata

Služba za  
operativno upravljanje

Služba za  
male hidroelektrane

Služba za  
elektroenergetsko izvoru

Služba za finansiranje  
proste i proširene reprodukcije

Sektor  
za kadrovska poslova

Služba za  
elektroenergetiku

Služba  
elektroprivredne inspekcije

Služba za  
ekonomska istraživanja

Služba  
platnog prometa i obračuna

Služba za  
kadrovska poslova

Služba za obračun  
prometa električne energije

Služba za električne  
mreže i postrojenja

Služba  
naplate sredstava

Centar za  
obrazovanje radnika

Služba za razvoj i eksploataciju  
prijenosne mreže

Služba za  
analizu EES

Sektor  
komercijalnih poslova

Služba za  
stambena pitanja

Služba za razvoj i eksploataciju  
telekomunikacija

Opći poslovi

Služba nabavka  
kapitalnih dobara

Sektor  
općih poslova

Sektor za razvoj  
informatičnog sistema

Služba nabavka reprodukcionih  
i drugih materijala

Služba  
općih poslova

Služba za razvoj  
tehničko-informatičnog sistema

Sektor  
poslovnih odnosa

Služba za  
održavanje zgrada

Služba za razvoj  
poslovno-informatičnog sistema

Služba  
cijena i tarifa

Služba za standard  
i socijalnu zaštitu radnika

Služba  
plana i analize

Služba za  
obezbjedjenje

Služba  
književodstva

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**MANAGING BOARD**

**GENERAL MANAGER**

**GENERAL MANAGER OFFICE**

**CONSULTING TEAM**

Service of International Relation

Service of Public Relations

Service of Defence Preparation

Service of Common Affairs

**DIRECTION OF GENERATION**

**DIRECTION OF POWER TRANSMISSION AND CONTROL**

**DIRECTION OF DISTRIBUTION**

**DIRECTION OF SCIENTIFIC-RESEARCH ACTIVITY**

**DIRECTION OF ECONOMIC AFFAIRS**

**DIRECTION OF LAW, PERSONNEL AND COMMON AFFAIRS**

Sector of Development and Studies

Sector of Control

Service of Distribution Grid, Development and Exploitation

Service of Electro Energy

Sector of Financial Affairs

Service of Law Affairs

Service of Generation Units Exploitation

Service of Operative Control

Service of Mini Hydro Power Plants

Service of Electro Energy Resources

Service of Simple and Expanded Regeneration Financing

Sector of Personnel Affairs

Service of Electro Energy

Service of Electric Power Industry Inspection

Service of Economic Researches

Service of Money Circulation and Accounting

Service of Personnel Affairs

Accounting Service of Electric Power

Service of Electric Grids and Installations

Service of Charge Collecting

Centre for Personnel Training

Service of Development and Exploitation of Transmission Grid

Service of EPS Analysis

Sector of Commercial Affairs

Service of Housing Questions

Service of Development and Exploitation of Telecommunications

Common Affairs

Sector of Capitals Purchase

Sector of Common Affairs

Sector of Information System Development

Sector of Repro and Other Materials Purchase

Service of Common Affairs

Service of Technical-Information System Development

Sector of Business Relations

Service of Building Maintenance

Service of Operative-Information System Development

Sector of Prices and Tariffs

Service of Workers Standard and Social Protection

Sector of Planning and Analysis

Security Service

Sector of Book Keeping

**U** 1994. godini Direkcija je nastavila sa radom na projektima sanacije, obnove i razvoja elektroenergetskog sistema; definiranju i razradi saradnje Elektroprivrede BiH sa drugim preduzećima, institucijama ili udruženjima u i izvan zemlje, učestvovala u normativnom uređivanju unutrašnjih odnosa u Javnom preduzeću itd.

U okviru "Programa aktivnosti na sanaciji elektroenergetskih objekata u cilju uspostavljanja rada elektroenergetskog sistema"

- nastavljen je rad kroz razradu i projektiranje na sanaciji i obnovi elektroenergetskih objekata prijenosa i distribucije na užem području grada Sarajeva;
- završeni su elaborati globalnih rješenja sanacije i obnove prijenosne i distributivne funkcije za potrebe lijeve obale Mostara, pod naslovima:  
"Sanacija prijenosne mreže za dovođenje električne energije na lijevu obalu grada Mostara"  
i "Sanacija distributivne mreže za uspostavljanje napajanja električnom energijom osnovnih funkcija na lijevoj obali grada Mostara",
- započeli su radovi na sanaciji i obnovi proizvodnih objekata u skladu sa potrebama Elektroenergetskog bilansa.

Program aktivnosti na sanaciji elektroenergetskih objekata je koncipiran tako da daje pregled objekta ili funkcije prije i za vrijeme agresije, kao i prijedlog sanacije sa pregledom potrebnih radova, opreme, materijala i vremena za realiziranje. U cilju pripreme rada na zadacima razvoja elektroprivredne djelatnosti obavljani su poslovi:

- djelimičnog tj. najnužnijeg obezbjeđenja opreme
- postavljanja, provjere ili testiranja programa i
- ažuriranja potrebnih datoteka, kako o elementima sistema tako i režima rada, posebno za oblast prognoze potrošnje i analize stacionarnih režima rada elektroenergetskog sistema.

U uvjetima u kojima naša zemlja živi već treću godinu, reafirmirana je potreba sagledavanja mogućnosti proizvodnje električne energije iz malih hidroelektrana (MHE).

Rad u ovoj oblasti se odvijao u okviru sagledavanja mogućnosti izgradnje MHE na vodotocima R BiH, uz saradnju svih zainteresiranih (Ministarstvo energetike, Elektroprivreda, Vodoprivreda, Energoinvest itd.). Završen je elaborat - idejno rješenje: "Mala hidroelektrana Bentbaša"

Sanacija i obnova od neposrednih razaranja, ali i uvjeti rada elektroenergetskog sistema u toku rata (odsustvo njege i održavanja postrojenja, nemogućnost adekvatne konzervacije opreme koja nije u funkciji) zahtjevaju udruživanje kadrovskih i materijalnih mogućnosti, kako Elektroprivrede tako i čitave zemlje (industrija, instituti, fakulteti itd.) te pomoć elektroprivreda razvijenih zemalja, stručnih, humanitarnih i drugih organizacija međunarodne zajednice.

**HRONOLOGIJA ZNAČAJNIH DOGAĐAJA  
U 1994. GODINI**

- 21.1. Kotao br. 3 u TE Tuzla teže oštećen i od tada je van pogona.
- 29.1. DV 110 kV Jablanica - EVP Konjic uključen je preko improvizirane mreže, čime je omogućen željeznički saobraćaj na relaciji Konjic - Pazarić.
- 26.3. Popravljen DV 110 kV Sarajevo 10 - Sarajevo 4.
- 16.4. Uključen kabl 10 kV do hotela "Bristol" u Mostaru.
- 14.5. Uključen DV 35 kV Zenica - Žepče - Maglaj.
- 16.5. Prosljeđen napon za Tešanj i M. Šeher.
- 17.5. Uključen je DV 35 Žepče - Zavidovići.
- 6.6. Počelo napajanje istočnog dijela Mostara.
- 7.7. DV 110 kV Bugojno - G. Vakuf uključen pod napon 10 kV.
- 1.7. Završen postupak registracije i od tada JP EP BiH radi kao jedinstven pravni subjekt.
- 19.7. DV 110 kV Jablanica - Prozor uključen pod napon 35 kV.
- 22.7. Počelo napajanje Prozora.
- 28.7. U 19:55 sati desio se najteži od oko 30 "raspada" kada je EES bio totalno bez napona.
- 29.7. U 15:22 sata uspostavljen rad EES-a.
- 14.9. do 27.9. DV 110 kV Sarajevo 4 - Sarajevo 2 u kvaru (u ovom periodu Sarajevo je bilo potpuno bez napajanja).
- 21.9. Popravljen DV 220 kV RP Jablanica - HE Rama.
- 26.9. TS Konjic uključen pod napon 110 kV.
- 12.10. Uključen DV 220 kV Jablanica - Mostar čime su povezani EES BiH i Dalmacije.
- 12.10. HE Rama ušla u pogon nakon završenih radova na vodostanu i agregatima.
- 24.10. DV 110 kV Zenica 1 - Zavidovići i TS Zavidovići pušteni pod napon 110 kV.
- 26.11. DV 110 kV Zenica 1 - Travnik i TS Travnik 1 pušteni pod napon 110 kV.
- 28.12. TS 110/35/10 kV Pazarić priključena na mrežu 110 kV.

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plants. All efforts to bring any voltage to these two regions have failed.

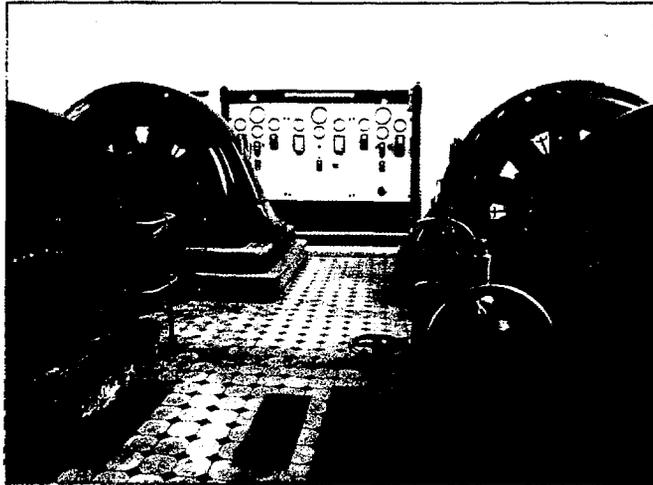
Unsufficient capability of the electric power units, unadequate cross sections of lines, overload of transformers, unregistered and unmetered consumers caused a rather high percentage loss at the distribution grid (between 15 and 25 %). As soon as the mentioned unfavourable conditions are improved, the loss amount will increase.

From April 1994, there is a new "Resolution on priorities of the electric power supply". According to this resolution, all available power quantities intended for the priority consumers demands are to be placed in percentage amounts by the already fixed lists. There is still an unsolved problem of exceeding the allowed consumption by priority consumers, directly harming the power delivery scheme for other consumers. In all last year, except in May and partly in June, there were severe consumption reductions, particularly for households, which were supplied each fourth, sixth and then eighteenth day.

At the region of Breza and Vareš, some experimental consumption reductions were introduced for each household, with a constant voltage presence. Preparations for this way of consumption

to be at the entire area supplied by Elektroprivreda of B&H were carried out after the power generation stabilized to 3500 -4000 MW per day. There is an assumption that each of about 420 thousand households located at the free territory could have 100 kWh per month, although there is a constant problem with some 40 thousand damaged and out of order meter devices.

In the first half of 1994, the Direction for the power distribution used to operate with only three workers, after June there were two workers who could hardly manage to attain a necessary quality of the work.



*Strojara HE  
Hrid, Sarajevo*

*Engine room  
HPP Hrid, Sarajevo*

## **DIRECTION FOR THE SCIENTIFIC-RESEARCH ACTIVITY**

In 1994, the Direction went on with its activity on projecting, sanation, reconstruction and development of the electric power system. It is also engaged in defining and detailing the cooperation of Elektroprivreda of B&H with other firms, institutions and associations in and out of the country. As for the inner organization of the Public Enterprise relations, this Direction took an active role.

Within the frame of "Program sanation activities at the electric power units for the recovery of the power system" there has been done:

- through working out and projecting, there has been continued the activity of the sanation and reconstruction of the transmission and distribution units at the small Sarajevo area,
- elaborates of global solution for the sanation and reconstruction of transmission and distribution functions at the left bank of Mostar demands are ready, titled: "Sanation of the transmission grid for the power supply of the left bank of Mostar" and "Sanation of the distribution grid for the recovery of the power supply of vital services at the left bank of Mostar."
- there have been started sanation and reconstruction works at the generation units in accord with the Power Balance demands.

The program of the sanation activities at the electric power units is conceived to give a clear picture of any unit or service before and during the war, and also the sanation proposal with the list of all works, equipment, materials and time necessary for the realization of the sanation and reconstruction.

For the preparatory works at the task of the electric power activity development, the following

**Prvi konvoj EDF-a  
First EDF convoy**

U Elektroprivredi BiH se zato posebna pažnja pridaje planiranju, uspostavljanju i održavanju kontakata sa naznačenim subjektima direktno ili preko institucije države, kao što je marta/ožujka 1994. godine formirana Agencija za međunarodnu saradnju u obnovi i razvoju Bosne i Hercegovine (A.I.C.R.E.D.). Zadatak Agencije je da na nivou zemlje utvrdi koncept razvoja, okupi projekte i na bazi bilateralne međunarodne saradnje nade odgovarajuća sredstva za obnovu.

Elektroprivreda BiH ima aktivno učešće u radu Direkcije za obnovu i razvoj grada Sarajeva (DRDS), formirane juna/lipnja 1994. godine, sa zadatkom da kao partner timu Specijalnog koordinatora Ujedinjenih naroda za Sarajevo (UNSCS) organizira poslove obnove vitalnih funkcija grada po osnovu Rezolucije "900" usvojene od Savjeta sigurnosti 4.3.1994. godine. Ističemo da Plan obnove i izgradnje Sarajeva nije ni gradski ni republički, već svjetski, predstavljen sa 144 pojedinačna projekta obnavljanja života u Sarajevu. U akcionoj grupi za električnu energiju je 11 projekata čija ukupna vrijednost je procijenjena na 65.000.000 US \$ od čega za urgentnu - šestomjesečnu sanaciju treba 20.700.000 US \$.

Kao rezultat angažiranja stručnih radnika Elektroprivrede BiH, oktobra/listopada 1994. godine je potpisan jedan od prvih ugovora ove vrste u zemlji, Ugovor između Elektroprivrede Francuske i Elektroprivrede Bosne i Hercegovine o isporuci opreme, materijala i usluga u ukupnom iznosu od (19 miliona FF) 3.686.000 US \$. Time se ostvaruje dio Protokola između Vlade Republike Francuske i Vlade Republike Bosne i Hercegovine, potpisanog juna/lipnja 1994. godine.

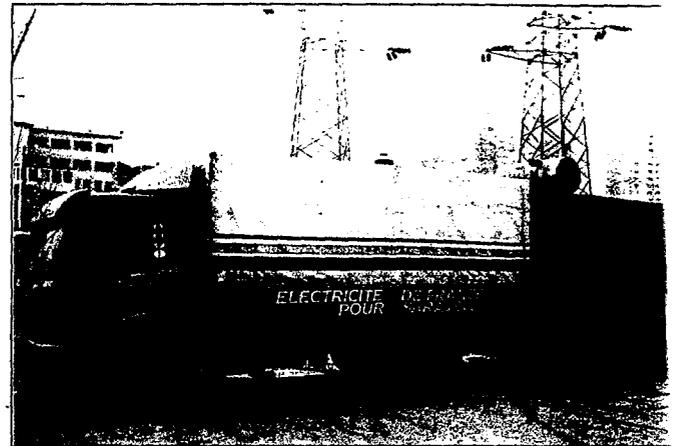
Značaj ulaska prvog konvoja opreme i materijala decembra/prosinca 1994. godine u opkoljeno Sarajevo je puno veći od vrijednosti tog konvoja.

Saradnja sa Overseas Development Administration (ODA) na prostoru cijele Republike daje značajne rezultate u osiguranju repromaterijala za proizvodnju u termoelektranama i za sanaciju prijenosne i distributivne mreže.

Za potrebe distributivne funkcije u gradu Sarajevu preuzeta je obaveza nabavke opreme i materijala u vrijednosti od 600.000 US \$ te realizirana donacija za djelimičnu sanaciju voznog parka, potreba u transformatorskom ulju, materijalu i opremi.

U 1994. godini uspostavljeni su kontakti sa predstavnicima International Management Group Infrastructure for Bosnia and Herzegovina (IMG - GBH) i Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ). Eastern Electricity, Ipswich England, uputila nam je donaciju u opremi i vozilima.

Protjeklu godinu treba vrednovati kao godinu značajnih kontakata i dogovora čije realiziranje se u potpunosti očekuje u narednoj godini.



## **DIREKCIJA ZA EKONOMSKE POSLOVE**

**I**n trećoj godini agresije poslovanje Javnog preduzeća Elektroprivreda BiH odvijalo se u izuzetno teškim uvjetima. Cjelokupna poslovna politika i operativni zadaci za njenu realizaciju bili su usmjereni u pravcu ublažavanja utjecaja negativnih faktora rata na ostvarenje Elektroenergetskog bilansa. Rezultat tih nastojanja je realizacija Bilansa u visini od 71%, čemu su značajan doprinos dale i aktivnosti koje su vođene u ekonomsko-finansijskoj sferi poslovanja Javnog preduzeća i njegovih dijelova.

S obzirom da se finansiranje Javnog preduzeća i u prošloj godini pretežno temeljilo na vlastitim izvorima sredstava koja se ostvaruju prodajom električne energije, početkom godine su, uz saglasnost nadležnih republičkih organa, izvršene određene izmjene u politici cijena električne energije. Tom prilikom utvrđene su cijene električne energije za primjenu u ratnim prilikama, na prosječnom nivou od 0,075 DEM za 1 kWh i uvedene određene izmjene u tarifnoj politici. Utvrđena cijena se primje-

activities have been carried out:

- partial and inevitable equipment procurement, program preparation, checking and testing,
- updating of all necessary data about the system elements and operation regime, particularly for the field of generation forecast and analysis of a stationary operation regime of the electric power system.

Under these three year long war conditions there was reaffirmed a need for discussing any possibility of the power generation from mini hydro power plants (MHPP).

The activity in this field has focussed the possibility of MHPP construction at the catchments in the Republic of B&H in cooperation with the interested bodies (Ministry of energetics, Elektroprivreda, Vodoprivreda, Energoinvest and others). There is a ready elaborate- concept solution: "Mini hydro power plant Bentbaša".

The sanitation and reconstruction of the direct damages, and the electric power system operation under the war conditions (shortage of maintenance and care of the power facilities, impossible adequate conservation of the equipment which is out of function) asked uniting of all personnel and material potentials of Elektroprivreda and the whole country (industry, institutes, faculties and others), as well as the help from the foreign electric power authorities of some developed countries, and professional, humanitarian and other organizations of the international community.

Being aware of this concept, Elektroprivreda pays a special attention to planning, creating and maintaining its contacts with all mentioned bodies, directly or over the country institution. In that sense, in March 1994. there was formed the Agency for international cooperation for the reconstruction and development of Bosnia and Herzegovina (A.I.C.R.E.D.). The primary task of the Agency is to establish, on the state level, the concept of development, gather all projects, and on the basis of an international cooperation, to find all adequate means for reconstruction.

Elektroprivreda of B&H has an active role at the activity of the Direction for the reconstruction and development of Sarajevo (DRDS), formed in June 1994. Being an exclusive partner to the United Nation Special Coordinator team for Sarajevo (UNSCS) it organizes the reconstruction of vital services in the town on the basis of the Resolution "900" adopted by the Security council in

March 4. 1994. The Plan of the reconstruction and rehabilitation of Sarajevo is neither a town nor a republic, but a world project, represented through 144 individual projects of the Sarajevo life renewal. The action group for the electric power contains 11 projects with its total value of 65.000.000 US\$, with the amount of 20.700.000 US\$ necessary for the six month urgent sanitation.

The result of our Elektroprivreda of B&H experts' engagement was signing one of the first such

#### CHRONOLOGY OF RELEVANT EVENTS IN 1994.

- **January 21.** Boiler no.3. at TPP Tuzla was seriously damaged and since then is out of operation
- **January 29.** TL 110 kV Jablanica - Electro facility Konjic was put into operation over an improvised grid, and the railway transport from Konjic-Pazaric started.
- **March 26.** TL 110 kV Sarajevo 10 - Sarajevo 4 repaired.
- **April 16.** Cable 10 kV to the hotel "Bristol" in Mostar placed into function.
- **May 14.** TL 35 kV Zenica-Zepce-Mogljaj placed into operation.
- **May 16.** Voltage for Tešanj and N.Šeher.
- **May 17.** TL 35 kV Zepce-Zavidovića placed into function.
- **June 6.** Electric power supply of the eastern part of Mostar started.
- **July 7.** TL 110 kV Bugojno-G.Vakuf switched under 10 kV voltage.
- **July 1.** Registration procedure was over and since then the Public enterprise EP B&H operates as a unique juristic person.
- **July 19.** TL 110 kV Jablanica-Prozor switched under 35 kV voltage.
- **July 22.** Startup of the power supply of Prozor.
- **July 28.** The most serious of all 30 "black-outs", when the electric power system remained totally dead.
- **July 29.** At 3.22 p.m. the electric power system operation reestablished.
- **Sept 14.-Sept 27.** TL 110 kV Sarajevo 4 - Sarajevo 2 out of operation in this period Sarajevo was without any power supply).
- **Sept.21.** TL 220 kV Switch gear Jablanica-HPP Rama.
- **Sept.26.** TS Konjic placed under 110 kV voltage.
- **Oct. 12.** TL 220 kV Jablanica - Mostar placed into operation, Electric power systems of B&H and Dalmatia connected.
- **Oct. 12.** Works on water state and aggregates over and HPP Rama entered operation.
- **Oct.24.** TL 110 kV Zenica 1-Zavidovića and TS Zavidovića placed under 110 kV voltage.
- **Nov.26.** TL 110 kV Zenica 1-Travnik and TS Travnik 1 placed under 110 kV voltage.
- **Dec.28.** TS 110/35/10 kV Pazaric connected to the 110 kV grid.

njuje u diferenciranom nivou za određene vrste potrošača, vodeći računa o zaštiti standarda potrošača iz kategorije domaćinstva, a u zavisnosti od nivoa potrošnje električne energije.

Ovaj nivo cijene električne energije čini svega 45,7% normalne cijene utvrđene Pravilnikom o obrazovanju cijena električne energije. Zato nisu ni približno osigurana potrebna finansijska sredstva za realiziranje Elektroenergetskog bilansa. Jedan dio sredstava osiguravan je iz republičkog budžeta, u visini od 2.802.000 DEM, što čini svega 25% od ukupnih sredstava koja su bila u funkciji realizacije svih poslovnih aktivnosti Javnog preduzeća.

Teškoće u poslovanju privrede i ostalih pravnih subjekata, te izuzetno teški uvjeti življenja stanovništva i njihova loša platežna mogućnost, značajno su utjecale na priliv sredstava od prodaje električne energije. Sa stepenom naplate od oko 25% od ukupno fakturisane realizacije, ostvaren je priliv sredstava iz ovog osnova od 12.390.000 DEM, što nije bilo ni približno dovoljno da se izvrše sve neophodne nabavke materijala, rezervnih dijelova i opreme.

Iako je mjerama za realizaciju Elektroenergetskog bilansa za 1994. godinu, koje je donijela Vlada R BiH, bilo predviđeno da se naplata električne energije od nekih potrošača vrši putem Ministarstva finansija, to se nije ostvarilo. Po ovom osnovu ostalo je nenaplaćenih potraživanja preko 4 miliona DEM, što je značajno umanjilo finansijsku moć Javnog preduzeća. Posebno se teško ili čak nikako naplaćivala električna energija od potrošača koji se finansiraju iz budžeta (zdravstvo, obrazovanje, kultura, komunalne organizacije i drugo) te je na ovo više puta ukazivano nadležnim organima u općinama, okruzima i u Republici. Istim mjerama Vlade R BiH bilo je predviđeno da se putem Ministarstva finansija izmiruju obaveze prema rudnicima uglja, što nije učinjeno. Po ovom osnovu ostale su neizmirene obaveze za 1994. godinu, u ukupnom iznosu od 27. mil. DEM, što je dovelo rudnike u vrlo tešku situaciju.

Velike teškoće u poslovanju uzrokovane su i lošim funkcioniranjem platnog prometa. To je dovelo do nemogućnosti povezivanja svih dijelova Javnog preduzeća u zajedničke finansijske tokove i značajno usporavalo cirkulaciju novčanih sredstava između Javnog preduzeća i njegovih dijelova.

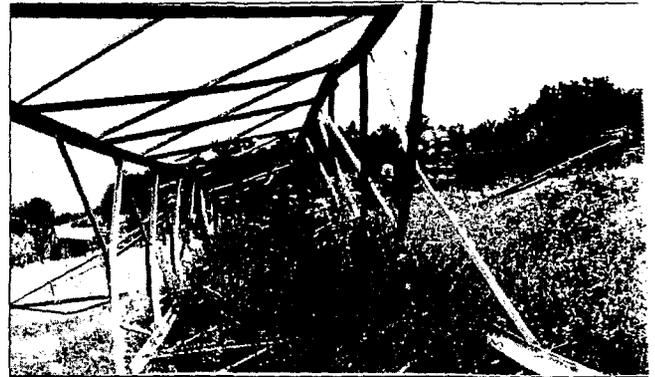
Predmet angažiranja komercijalno-finansijske funkcije

Javnog preduzeća je bila sanacija elektroenergetskih objekata. Osigurana su i uložena značajna finansijska sredstva iz vlastitih, budžetskih i donatorskih izvora.

Uz angažiranje svih funkcija Javnog preduzeća i zaposlenih, u 1994. godini postignuti su i povoljni finansijski rezultati. Ostvaren je ukupan prihod u iznosu od 88 mil. DEM, od prodaje električne enrgije 70 mil. DEM ili 79% i ostatak od ostalih prihoda i to: iz prihoda od finansiranja 2 mil. DEM, prihoda iz republičkog budžeta 3 mil. DEM, prihoda od sporednih i pomoćnih djelatnosti 12 mil.

DV 220 kV  
Zenica 2 - Tuzla

TL 220 kV  
Zenica 2 - Tuzla



### PRVI ZAJEDNIČKI SASTANAK

U Sarajevu je 2. i 3. juna/lipnja 1994. godine održan sastanak koji će ući u historiju JP Elektroprivreda BiH jer je prvi ove vrste od početka rata. Izuzev iz Bihaća i Gorazda, okupili su se čelnici svih direkcija i dijelova JP, naši predstavnici iz Zagreba, članovi Upravnog odbora i predstavnici Ministarstva energetike i industrije.

Uvodno izlaganje dao je gospodin Edhem Bičakčić, generalni direktor JP Elektroprivreda BiH, akcentirajući namjere skupa u nekoliko odrednica. Ključna je završetak pokrenutih integracionih procesa, što se ogleda i u radu RDC-a, koji je na putu potpunog ovladavanja i vođenja elektroenergetskog sistema na cjelokupnom slobodnom području Republike.

Program sanacije i obnova, baziran na unificiranoj sistematizaciji procjene ratnih šteta, također je prioritetni zadatak za JP EP BiH.

Rad se odvija u okviru timova za pojedine oblasti: proizvodnje, prijenos, distribuciju i ekonomiju. Plenarna sjednica je obradila pitanja: upravljanje elektroenergetskim sistemom, informacioni i telekomunikacioni sistem, rad Predstavništva u Zagrebu i ekonomska pitanja.

Razmatrane su i teme: funkcioniranje JP EP BiH, stanje kadrova, elaborat "Pravci obnove i razvoja", sanacija i obnova. Skup je završio rad usvajanjem zaključaka i mjera koje su u neposrednoj funkciji realiziranja Elektroenergetskog bilansa u 1994. godini.

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contracts, in October 1994.: The Contract between the Electric Power Authority of France and Elektroprivreda of B&H referring to the delivery of equipment, materials and services amounting to 3.686.000 US\$ (19 million FF). There was realized the Protocol part between the French government and the Republic of B&H Government signed in June 1994.

The importance of arriving the first convoy with equipment and material into besieged Sarajevo far exceeds the value of the convoy itself.

The cooperation with Overseas Development Administration (ODA) at the whole Republic territory gives very good results in providing re-promaterial inevitable for the thermo power plants generation, and for the sanation of transmission and distribution grid.

The distribution service in the city of Sarajevo needed the equipment and materials to be secured amounting to 600.000 US\$ value; donation for a partial motor pool sanation was realized, as well as our requirements for transformer oil, materials and equipment.

In 1994. we had contacts with the representatives of International Management Group Infrastructure for Bosnia and Herzegovina (IMG - GBH), and Deutsche Gesellschaft fuer Technische Zusammenarbeit (GTZ). The Eastern Electricity, Ipswick, England sent us the donation in equipment and material.

1994. is to be regarded as a year of our significant successful contacts and agreements whose realization is fully expected in next year.

## DIRECTION OF THE ECONOMIC AFFAIRS

In the third aggression year, the operation of the Public Enterprise Elektroprivreda of B&H was carried out under extremely difficult conditions. All business policy and operative tasks for its realization were focussed to a slackened influence of all negative factors harming the realization of the Electric power Balance. The result of such efforts is the Balance realization up to the amount of 71%, with a significant contribution offered by the activities introduced at the economic-financial sphere of the Public Enterprise operation and its divisions.

Since the financings of the Public Enterprise in the last year were based mainly at its own financial resources realized through the electric power sale, at the start of 1994., with agreement of corresponding republic bodies, there were certain changes done at the electric power price policy. There were fixed the electric power prices suitable for the war conditions, at the average level of 0,07 DEM/ 1 kWh. There were also introduced some changes at the tariff policy. The fixed price is applied at a differential level

### FIRST GENERAL ASSEMBLY

In June 2. and 3. there was a meeting of its historical relevance for the Public Enterprise Elektroprivreda of B&H, as it was the first such gathering since the war start. Except our members from Bihać and Gerazdo, heads of the directions and divisions of the Public Enterprise, our men from Zagreb, members of the Administrative Board and representatives of the Ministry for energetics and industry were all present at the meeting.

The decisions and resolutions of this meeting represent the essential standpoint of the most meritorious experts from the field of electronics.

The opening speech was made by Mr Edhem Bićakčić, General Manager of the Public Enterprise Elektroprivreda of B&H, condensing all intentions of this meeting into a few directions.

The key direction is the termination of the already started integrating processes, shown at the operation of the Republic Dispatching Centre (RDC). The Centre is succeeding to master the control and the management of the electric power system at the entire free territory of the Republic.

The program of a unique sanation and rehabilitation, based on a uniform systematization of all war damages, is also a priority task of the Public enterprise Elektroprivreda of B&H.

The activity has been carried out by several teams at the field of the power generation, transmission, distribution and economy. The first plenary session agenda included the following questions of the electric power system control, information and telecommunication system, activity of our Representative Office in Zagreb, and some economic questions.

There were also discussed these topics: Public Enterprise Elektroprivreda of B&H functioning, personnel situation, elaborate "Reconstruction and development directions", and sanation and reconstruction. The meeting was terminated by adopting resolutions and measures directly contributing to the realization of the Electro Energy Balance in 1994.

DEM i ostalih prihoda 1 mil DEM.

Ukupno ostvareni rashodi poslovanja iznose 107 mil. DEM, od čega se odnosi na: amortizaciju sa revalorizacijom 56 mil. DEM ili 52%, a ostalo su razni materijalni i nematerijalni troškovi 50 mil. DEM i bruto plate radnika 1 mil. DEM.

Iz ovih podataka proizilazi negativan finansijski rezultat u iznosu od 18 mil. DEM. Ako se ima u vidu da on proizilazi iz nepokrivenih troškova revalorizacije amortizacije i okolnosti u kojima je realizirana cjelokupna poslovna aktivnost, ovaj se rezultat može kvalificirati zadovoljavajućim.

## DIREKCIJA ZA PRAVNE, KADROVSKE I OPĆE POSLOVE

**B**udući da pojedini dijelovi preduzeća iz objektivnih razloga nisu mogli biti registrirani tokom 1993. godine, saglasno Zakonu o elektroprivredi, u 1994. godini je okončan postupak registracije Javnog preduzeća. Od 1. jula/srpnja Elektroprivreda BiH radi kao jedinstven pravni subjekt. Paralelno sa provođenjem statusne promjene nastavljen je rad na izradi odgovarajućih normativnih akata, u okviru kojeg su donijeti: Pravilnik o radnim odnosima, Pravilnik o radu Predstavništva JP u Republici Hrvatskoj, Pravilnik o rješavanju stambenih pitanja radnika, te odgovarajući akti iz oblasti zaštite na radu i zaštite od požara. Krajem godine je bila u završnoj fazi izrada Pravilnika o sistematizaciji radnih mjesta JP, koji će biti osnova za izradu i donošenje ostalih akata.

Uspostavljanjem Federacije BiH počeo je i rad na izradi nacrtu Zakona o elektroprivredi Federacije.

Tokom godine obavljani su redovni poslovi na izradi ugovora. Značajan ugovor je bio sa EDF-om o sanaciji elektroenergetskog sistema Sarajeva, kao i ugovori za nabavku opreme i repromaterijala za hidro i termo elektrane. Pružane su stručne usluge i konsultacije Upravnom odboru, Stambenoj zadruzi "Elstan", Samostalnom sindikatu elektroprivrednih radnika i BH K CIGRÉ-u.

Posebna pažnja je bila posvećena kadrovskoj problematiki. Rat je prouzrokovao znatno osipanje stručnjaka i pogoršanje kadrovske strukture. Taj problem se nastoji prevazići organizacijom rada u skladu sa raspoloživim stručnim kadrom, angažiranjem radnika koji su došli sa okupiranih područja, demobilizacijom i prijemom novih radnika.

Na kraju 1994. godine na slobodnom teritoriju Republike bilo je 7.635 radnika u radnom odnosu, od čega 3.669 radnika na radnoj obavezi. Prije početka agresije JP Elektroprivreda BiH je imalo 18.029 radnika.

Znatan broj radnika je u toku rata poginuo, a mnogi teže i lakše ranjeni. Kao posljedica ranjavanja je i veći broj invalida, za koje se nastoje naći poslovi koji odgovaraju njihovoj preostaloj radnoj sposobnosti.

Do organizacione promjene direkcija JP, izvršene u oktobru/listopadu 1994. godine, u nadležnosti Direkcije su bili i poslovi odbrambenih priprema, kojima je u uvjetima ratnog stanja posvećena posebna pažnja. Svi dijelovi JP su usaglasili odgovarajuća akta o ratnoj organizaciji. Pomenutim organizacionim promjenama u sklopu Direkcije je formirana Služba za standard i socijalnu zaštitu radnika u cilju stvaranja uvjeta za ostvarenje jedinstvenog socijalnog programa, zbrinjavanju radnika - invalida i porodica poginulih radnika.

Kontinuirano su obavljani poslovi na rješavanju stambenih pitanja radnika, stvaranju baze podataka o raspoloživom stambenom fondu, stepenu uništenosti ratnim djelstvima i mjerama za očuvanje i osposobljavanje stanova. Pristupilo se adaptaciji raspoloživog poslovnog prostora i stavljanja u funkciju. Sa DD "Arhitekt" Sarajevo je nastavljena saradnja na ispitivanju i procjeni stanja poslovno-tehničke zgrade JP uništene u požaru 5. oktobra/listopada 1993. godine.

Nastavljena je saradnja sa međunarodnim humanitarnim organizacijama, što je omogućilo efikasan rad značajnih funkcija JP. Direkcija za pravne, kadrovske i opće poslove je, zahvaljujući boljim komunikacijskim vezama na slobodnom teritoriju R BiH, ostvarila saradnju sa odgovarajućim stručnim službama u dijelovima Javnog preduzeća Elektroprivreda Bosne i Hercegovine.

*Stub javne rasvjete, Bihać*

*Public lighting pole, Bihać*



for certain consumers kinds, taking care about the standard protection for the consumers of the household category, depending of the electric power consumption level.

This level of the electric power price being only 45,77 of the normal price fixed by the Rule of the electric power price forming can hardly secure all financial means necessary for the Electric Power Balance to be realized.

A part of the resources is provided from the republic budget to 2.802.000 DEM, meaning only 25% of total funds which used to be engaged at the realization of all operative activities of the Public Enterprise.

The difficulties of the economy operation and other juristic persons, together with these hard life conditions and a low financial capability of the population, have enormously influenced the money inflow from the electric power sale. With a payment grade of 25% out of total invoiced realization, there has been realized a financial inflow of 12.390.000 DEM. It is far low to be enough for the necessary equipment, materials and spare parts to be paid.

Although the measures for the Electric Power Balance for 1994., issued by the Government of the Republic B&H, anticipated the electric power collection from some consumers through the Ministry of finances, but the idea failed to be realized. The result is a pile of charges amounting to over 4 million DEM, enormously harming the financial power of the Public Enterprise. Some or no money could be collected from the consumers financed from the budget (medical system, education, culture, communal facilities and others). Many times the competitive bodies at municipalities, regions and Republic were drawn attention to this situation. The very same measures of the B&H Government anticipated settling of the financial debts to the coal mines through the Ministry of finances, but this effort had no result. There are unsettled charges for 1994. of 27 million DEM, which has provoked the coal mines are experiencing very hard times.

Some operation difficulties have been caused by the actual money circulation functioning with difficulties, and all divisions of the Public Enterprise could not be merged into common financial streams, slowing down the cash flow between the Public Enterprise and its all parts.

The Public Enterprise commercial-financial activity was focussed to the sanation of the electric power units. There were provided and invested significant financial means from own, budget and donation resources.

After all services of the Public Enterprise and their employees were engaged in 1994., the first favourable results could be attained. The realized revenue of 88 million DEM means 70 million DEM from the electric power sale or 79% and the rest are: revenue from financing of 2 million DEM, revenue from the republic budget of 3 million DEM, revenue from extra and auxiliary activities of 12 million DEM, and other revenues of 1 million DEM.

The total realized operation expenditures amount to 107 million DEM, meaning: amortization with revalorization is 56 million DEM or 52%, and the rest are various substantial and unsubstantial expenses of 50 million DEM, and the workers pays are 1 million DEM.

These data show a negative financial result with the amount of 18 million DEM. The fact stays that it comes out from the uncovered costs of the amortization revalorization and after all circumstances, under which the entire operative activity was realized, are taken into consideration, this same result could be characterized as very favourable.

## **DIRECTION FOR LAW, PERSONNEL AND COMMON AFFAIRS**

Since certain divisions of the Enterprise, due to some objective reasons, could not be registered in 1993. in accord with the Law of the electric power industry, the registration procedure of the Public Enterprise was done in 1994. From July 1. Elektroprivreda of B&H operates as a unique juristic person. The statute change proceeding was simultaneously followed by a continuous activity in preparing normative acts, whose result are:

Rules on labour relations, Rules on Representative Office activity, in Croatia, Rules on the workers housing problems, and other acts dealing with the labour and fire protection. By the end of the year, the rules on the jobs systematization in the Public Enterprise was at its final phase, and it will be a basis for the preparation and passing all next acts.

**RADNICI JP ELEKTROPRIVREDE BiH KOJI SU SMRTNO STRADALI KAO ŽRTVE AGRESIJE NA REPUBLIKU BOSNU I HERCEGOVINU**  
**EMPLOYEES PE ELEKTROPRIVREDA B&H KILLED IN AGGRESSION ON THE REPUBLIC OF BOSNIA AND HERZEGOVINA**

**DIREKCIJA JAVNOG PREDUZEĆA / PUBLIC ENTERPRISE HEAD OFFICE** Avdić Dževad, Deović Hakija,  
**HE NA TREBIŠNJICI / HPP ON TREBIŠNJICA** Busuladžić Vedat,  
**HE NA NERETVI / HPP ON NERETVA** Bajrović Nedžad, Čilić Ibrahim, Čolić Hasan, Kevrić Muharem, Nezirić Emin, Širić Čamil, Taletović Ramiz,  
**HE NA VRBASU / HPP ON VRBAS** Čavar Mato, Čosić Huso, Džukla Senad, Širkalij Pejo,  
**HE NA DRINI / HPP ON DRINA** Barlov Azem, Hezić Hilmo, Kadrić Fahrudin, Karčić Jusuf, Memišević Ismet  
**TE "TUZLA" / TPP "TUZLA"** Čačković Sead, Čehajić Sadik, Dojčanović Bahrija, Dalić Muhamed, Dugonjić Fahrudin, Dulabić Božo, Hajdarović Sead, Huremović Rasim, Joldić Šahbaz, Kadribašić Nihad, Lalić Hajrudin, Mujkić Zijad, Mutapčić Hajrudin, Pavljasević Ilija, Salkić Miralem, Samardžić Zoran, Šabanović Mersudin, Šimić Rado, Topalović Ivica,  
**TE "KAKANJ" / TPP "KAKANJ"** Alić Fikret, Handžić Fikret, Junuzović Nusret, Kovač Nihad, Kovač Zahid, Mrkonjić Mufid, Nako Vedin, Provalić Jasmin, Sikira Salih,  
**RUDNIK I TE "GACKO" / COAL MINE AND TPP "GACKO"** Bašić Adil, Bašić F. Ahmo, Bašić Ejub, Bašić Miralem, Bašić Mirsad, Bašić Samir, Bašić Šefik, Bašić Ševko, Bašić Šućurija, Bečković Dževad, Čorbo Šućuro, Čatović Amir, Čatović Hajrudin, Čatović Zajko, Čimić Smajo, Čimić Šemsudin, Dilberović Dževad, Džanković Avdo, Džeko Nusret, Džohra Esad, Džubur Čamil, Džubur Fuad, Fazlagić Aziz, Fazlagić Nijaz, Grebović Asim, Grebović Enes, Grebović Irfat, Grebović Irfat, Halilović Latif, Hasanbegović Aziz, Hidović Jusuf, Husić Miralem, Jugo Džemal - Kemo, Kalaba H. Omer, Kažnjić Hasan, Krvavac Ahmet - Hame, Krvavac Amir, Kovačević Šefik, Kurtović Ekrem, Logo Dževad, Memić Mahmut, Memić Nelman, Muhović Edin, Muhović Fehim, Muhović Zijad, Nukić Emir, Nukić Enis, Nuhanović Ramiz, Omerčajić Muamer, Osmanagić Elvedin, Pačo Izet, Pašić Fuad, Pašić Šemsudin, Pošković Edin, Prguda Beđir, Sarić Sead, Šabanović Zijad, Škaljić Menso, Škobalj Irfat, Talović Nusret, Talović Mušo - Huko, Tanović Salih, Temim Elvedin, Tunović Esad, Tunović Zejnil, Zekić Elvedin, Zulović Fehim, Zulović Mirsad, Zulović Šeho, Zvizdić Jusuf,  
**RUDNIK I TE "UGLJEVIK" / COAL MINE AND TPP "UGLJEVIK"** Bačić Mensur, Brlalić Fedahim, Čajlaković Kemal, Čosić Emin, Dedović Ekrem, Dedović Sulejman, Hasanović Husajn, Islamović Benhed, Jusić Ejub, Mahić Safet, Mahić Zijad, Mulaosmanović Fikret, Nakičević Mehmed, Omerović Fadil, Ramić Asim, Salkanović Senad, Spahić Šemsudin  
**"ELEKTROPRENOS" SARAJEVO** Avdićbegović Mirsad, Bačić Admir, Bogučanin Ramiza, Borovac Rešad, Čamdžija Jasmin, Čehić Ernesto, Čorluka Mihajlo, Dumpor Omer, Džebo Mehmed, Hadžović Haris, Hadžić Haso, Krašić Semir, Kukolj Avdića, Latić Bajazit, Milavić Zlata, Odžaković Bosko, Okanović Mavludin, Pušić Nikola, Rupčić Mirko, Saračević Adem, Sarajlija Ibrahim, Šehić Asim, Torlaković Fadil, Vidović Pero, Žuškić Hasan,  
**"ELEKTRODISTRIBUCIJA" BANJA LUKA** Kapetanović Muhamed, Popaja Ahmet,  
**"ELEKTRODISTRIBUCIJA" BIHAĆ** Begić Kasim, Bunić Hasan, Buzimkić Salih, Čehić Fehiz, Karamahović Avdo, Lalić Ahmet, Mešić Rasim, Pozderac Žilmir,  
**"ELEKTRODISTRIBUCIJA" DOBOJ** Alihodžić Fadil, Buljubašić Zekira, Mahmutagić Enver, Omerović Nermin, Terzić Enes,  
**"ELEKTRODISTRIBUCIJA" MOSTAR** Babić Miroslav, Čanan Ramzo, Čimić Šefkija, Droca Šefko, Dumpor Hilmo, Džubur Amir, Elazović Osman, Fink Jadranko, Husić Esad, Husić Himzo, Kevrić Salem, Maksumić Osman, Maslo Admir, Ovnović Esad, Puzić Suad, Rahić Maho, Sadžak Naim, Sordarević Šerifa, Tiro Elvedin, Zlomušica Nerzak  
**"ELEKTRODISTRIBUCIJA" ZENICA** Brlakić Enes, Čelebić Edin, Didak Mato, Dizdarević Sead, Fuka Izet, Fuka Sulejman, Hodžić Faruk, Jusić Nedžad, Lučić Anto, Žepčević Branko,  
**"ELEKTRODISTRIBUCIJA" SARAJEVO** Avdić Nezir, Bešić Senad, Bulbul Ahmed, Čoralić Aljo, Čurevac Zijad, Hadžić Esad, Halilbašić Bakir, Hamzić Dino, Hasanović Avdo, Kadrić Mensud, Kalajdžićsalihović Himzo, Kolar Zaim, Komarića Sulejman, Krivić Sead, Krkalić Irfan, Kumro Mustafa, Lokvančić Zijo, Lojo Taib, Maslo Salko, Marjanović Branko, Masnopita Jasmin, Meco Azra, Medi Ismail, Muharemović Nezir, Omerbegović Vajsil, Omerović Hasib, Pašajić Ljubomir, Pertof Jakub, Poljčić Savo, Počitanin Mustafa, Sadiković Enes, Sinan Rasim, Suljević Amir, Šukurević Asim, Tabaković Hamdija, Torlak Samir, Velička Igor, Vikalo Mišo, Zulić Sado  
**"ELEKTRODISTRIBUCIJA" TUZLA** Alić Mustafa, Bogović Sezahija, Buljubašić Sećerko, Čerimagić Sead, Dalić Smajil, Janjić Srećko, Kikić Beđir, Konkić Nezir, Memić Suad, Mujkić Safeta, Nurkić Safet, Okčić Senaid, Ramić Abaz, Rendić Himzo, Sejdović Sakib, Smajić Edin, Smajić Sead, Taletović Edhem, Topčagić Salih.

**Napomena:** Prema prispjelim podacima, do sada je u Elektroprivredi BiH ranjeno 313 radnika, od čega 214 spada u kategoriju teških ranjavanja.

**Note:** According to the received data, Elektroprivreda of B&H had 313 employees injured until now, among whom 214 belong to the category of serious injuries.

**Godina 1994. je bila puno uspješnija za Elektroprivredu BiH od prethodne, a samim tim lakša za sve građane, zahvaljujući i borcima Armije RBiH, kojima želimo puno ratne sreće u odbrani naše domovine.**

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After the Federation of B&H was formed, there has begun the draft preparation of the Law on the federation electric power industry.

In 1994, our experts were engaged in preparing contracts, among which the most relevant is the Contract with EDF concerning the sanation of the electric power system in the city of Sarajevo.

There is also a contract for the purchase of the equipment and materials necessary for hydro and thermo power plants. Our Administrative board, Housing association "Elstan", Independent syndicate of the electric power workers and B&H k CIGRÉ were offered our professional services and consultations.

By the end of 1994, at the free territory of the Republic, there were 7.635 our employed workers, out of which there were 3.669 workers with the labour obligation. Before the aggression, the Public Enterprise Elektroprivreda of B&H had 18.029 workers.

A great number of our workers were killed in the war, and many of them were slightly or seriously injured. As a consequence of wounding, there are many invalids who will be offered some jobs suitable to their remained labour capability.

Before the organizing changes of the Public Enterprise divisions, done in October 1994., this Direction used to be authorized for the preparations of the defensive activities, which were paid a special attention, since the country was in war. All divisions



*Strojara  
HE Mostar*

*Engine room  
HPP Mostar*

of the Public Enterprise have coordinated their acts dealing with the war organization.

Within the frame of the mentioned organizing changes, inside this Direction, there was formed a Service for standard and social protection of the workers aiming to create the necessary conditions for the realization of a unique social program dealing with the problems of the workers-invalids and the killed workers' families.

The housing problems of our workers were our permanent concern, there were activities in creating data basis for the available housing fund, grade of their destruction due to war casualties and measures for keeping and repairing the flats. All available administrative room was adapted and placed into function. We kept our cooperation with the firm "Arhitekt" Ltd Sarajevo in inspecting and evaluating the situation of the administrative-technical building of the Public Enterprise destroyed at the great fire in October 1993.

Our cooperation with humanitarian organizations has been continued, enabling an efficient operation of the Public enterprise vital functions. The Direction for law, personnel and common affairs, after the communications at the free territory were improved, has realized the cooperation with its experts services from other Public Enterprise of Bosnia and Herzegovina divisions.

**1994. was more successful for Elektroprivreda of B&H than the year before, and it was also bearable for all population, thanks to the soldiers of Army of R B&H whom we wish a good luck in defending our homeland.**

on with creating necessary assumptions for a complete and corresponding control and systematization of war damages. Final solution, and damages at the equipment, due to the difficult labour conditions and others. In future, the commission will go expenses are not included into the provision expenditures, costs of recovery the electric power system functioning without a damages, is carried out proportionally to the participation at the revenue of the electric power sale in 1991. The indirect damages generation for each year, and for the units located at the free territory. The disposition of the missing revenue, as well as indirect the starting element was a planned electric power generation under criteria of balancing a possible generation and a realized in 1992, 1993, and 1994, are appraised to 584.437.250 DEM or 54,95% out of total damages. By estimating these damages, 7,35% are damages at transport means and systems, also labour means. Indirect damages, provided at the electric power units the public lighting; 9.136.745 DEM or 1,90% are damages at the connections and information systems; 35.190.697 DEM or 85.674.349 DEM or 17,88% are damages in transformer stations and switch gears; 19.105.916 DEM or 3,99% are damages at the buildings; 74.707.241 DEM or 15,6% are damages at the equipment; 152.373.988 DEM or 31,81% are damages on lines; 479.049.198 DEM or 45,05% out of all damages. Out of the amount, the sum of 102.860.262 or 21,47% refers to the damages The direct damages at the power units located at the free territory under the Army of R BiH control are estimated to B&H amount to 1.063.448 DEM in December 31, 1994.

According to these preliminary and insufficient data, total damages at the power units of the Public Enterprise Elektroprivreda of commissions. or using the sanction elaborate. Due to the current war casualties a number of the power units still remain unapproachable to the calculation have been carried out on the basis of the expert commissions' reports which were prepared after the inspection in situ the Government commission. In 1994, the preliminary damage estimate at the power units, as well as the indirect damages parting its own software for the computer damage proceeding. There is a significant cooperation with the information system of and grids. Together with the Sector for the information system development, the commission was particularly concerned in pre-The expert commissions are offered some prepared designs of catalogues and materials for distribution and transmission units has been prepared a photo-documentation of damages at our relevant units, and the publication "War damages" was published. concerning the evaluation of the damages provided by war casualties. In cooperation with the Service for Public Relations, there The commission for listing and appraising the war damages in 1994 went on with its activity in gathering and proceeding all data

### WAR DAMAGES

Komisijsa je i u narednoj godini raditi na stvaranju pretpostavki za potpuno i cjelishodno pracenje i sistemiziranje ratnih zjeta. provizorna, troškovi osposobljavanja za funkcioniranje EES bez konacnih rjesenja, zeta na opremi zbog otezanih uvjeta rada itd. straznjernom ucetju u prihodu od prodaje elektricne energije u 1991. godini. U troškove indirektnih zjeta nisu ukljuceni troškovi nije po godinama za objekte koji se nalaze na slobodnom teritoriju. Raspored izostalog prihoda, kao indirektno zeta, izvrstan je zeta postio se od planirane proizvodnje elektricne energije po kriterijima bilansiranja moguće proizvodnje i ostvarene proizvod- laktima u 1992., 1993. i 1994. godini procijenene su na 584.437.250 DEM ili 54,95% od ukupnih zjeta. Kod procjena ovih DEM ili 7,35% se odnosi na transportna sredstva i sisteme, te sredstva rada. Indirektno zeta nastale na elektroenergetskim ob- na zeta javne rasvjetle; 9.136.745 DEM ili 1,90% se odnosi na zeta na sredstvima veze i informacionim sistemima; 35.190.697 85.674.349 DEM ili 17,88% se odnosi na zeta na trafostanicama i razvodnim postrojenjima; 19.105.916 DEM ili 3,99% se odnosi 74.707.241 DEM ili 15,6% se odnosi na zeta na opremi; 152.373.988 DEM ili 31,81% se odnosi na zeta na vodovima; 479.049.198 DEM ili 45,05% od ukupnih zjeta, od čega se 102.860.262 ili 21,47% odnosi na zeta na gradjevinskim objektima; Direktno zeta na objektima koji se nalaze na slobodnom teritoriju pod kontrolom Armije R BiH procijenjene su u iznosu od iznose 1.063.448 DEM.

Prema ovim preliminarnim i nepotpunim podacima, ukupna zeta na objektima JP Elektroprivreda BiH sa 31.12.1994. godine korištenjem sanadonih elaborata. Usjed ratnih djelovanja izvestan broj objekata još uvijek nije dostupan komisijama. procenu indirektnih zjeta uradeni su na osnovi izračuna strukturnih komisija koje su progenu vršile uvidom na terenu ili uskladjivanjem sa informacionim sistemom Vlade komisije. U 1994. godini preliminarna procjena zjeta na objektima kao i posebnu paznju posvetila izradi vlastitog softvera za računarsku obradu zjeta. Ostvaren je visok stepen koordinacije u vezi sa materijala prijenosnih i distributivnih objekata i mreza. Komisija je, zajedno sa Sektorom za razvoj informacionog sistema, znacajnim objektima i izdala publikacija "Ratne zeta". Uradeni su i dostavljeni strukturni komisijama nacrti kataloga opreme i usjed ratnih djelovanja. U skladu sa Službom za odnose s javnoscu nacinjena je foto - dokumentacija zjeta nastalih na Komisija za popis i procenu ratnih zjeta je u 1994. godini nastavila sa prikupljanjem i obradom podataka o zjetama nastalim

### RATNE ZJETA

By the middle of last year, soon after the war casualties had ceased at car-tain regions of the Republic, there were favorable conditions for the realization of the media project "War dam-ages" which had been conceived as a visual support to the documentation collected by the Commission for listing and appraising the Elektroprivreda of R BiH war damages. Starting from the gallery "Collegium Artium" there was organized a project presentation comprising: publication "War damages" photo display by our regularized photographer Mr. Kemal Hadzic and a computer slide show with 40 photographs, giving a real insight into the actual state of the electric power system at the free territory of the Republic, without the enclosures: Gorzde, Zepa and Srebrenica. The presentation was visited by a great number of respectable guests, ambassadors, men of economy, and persons from our public and cultural life. The fact is that Elektroprivreda of R BiH has been the very first in dealing with this field entirely and this material is of a very high artistic quality.

Strukturalnim ratnih djelovanja na pojed- nam podrucljima Republike sredinom godine stvarani su uvjeti za postizanje medijalnog projekta "Ratne zeta", koji je završen kao vizuelna prezentacija projekta koji su uradjeni u Sarajevu odzama je 1994. godine u galeriji "Collegium Artium" u Sarajevu organizirana je prezentacija projekta koji su sadrijavali: publikacija "Ratne zeta", izložba fotografija medunarodnog mjestora fotografije gospodina Kamada Hadzica i računarski slide-show sa 40 fotografija, dajuci istinit uvid u stanje EES na slobodnom teritoriju Republike, bez enkulav: Gorzde, Zepa i Srebren- ica. Prezentacija su prisustvovali brojni ugledni gosti, ambasadori, privrednici, lidost iz javnog i kulturnog zivota, ior se, pored entiteta da je Elektro- privreda BiH prvi put celoshito objavivnja ovu oblast, radi o materijalu znojnog umjetnickog kvaliteta.

**Javno preduzeće Elektroprivreda Bosne i Hercegovine, sa potpunom odgovornošću, Sarajevo**  
**Public Enterprise Elektroprivreda of Bosnia and Herzegovina LTD Sarajevo**  
Address: 71000 Sarajevo, Vilsonovo šetalište 20  
Phone exchange: 071/ 65 17 22

**Generalni direktor Edhem Bičakčić**  
**General Manager**  
Sat. com. phone: 00871 15 17 327  
Sat. com. fax: 00871 15 17 330  
Phone: 071/ 47 24 81

**Direkcija za proizvodnju**  
**Direction of Generation**  
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Telefax: 071/ 65 30 04  
Director Enver Kreso

**Direkcija za prijenos i upravljanje elektroenergetskim sistemom**  
**Direction of Transmission and Control of the Electric Power System**  
Phone: 071/ 52 22 08  
Telefax: 071/ 65 30 04  
Director Franjo Božuta

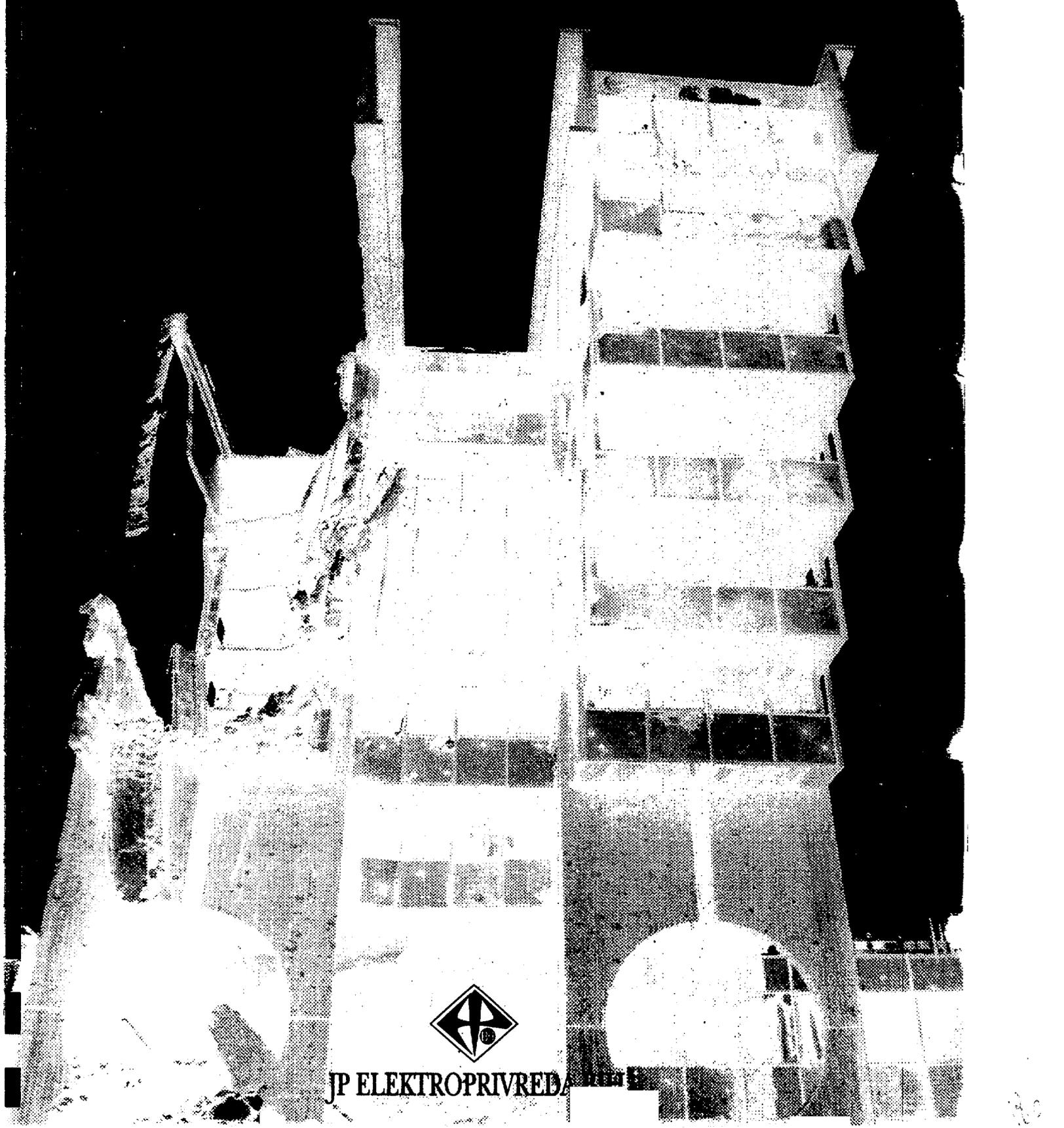
**Direkcija za distribuciju**  
**Direction of Distribution**  
Phone: 071/ 61 33 67  
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Director Zijah Brajlović

**Direkcija za naučno - istraživački rad**  
**Direction of Scientific - Research Activity**  
Phones: 071/ 52 63 96; 61 64 27  
Telefax: 65 30 04  
Director Dubravka Nikolić

**Direkcija za ekonomske poslove**  
**Direction of Economic Affairs**  
Phones: 071/ 65 72 92; 61 13 58; 61 03 62  
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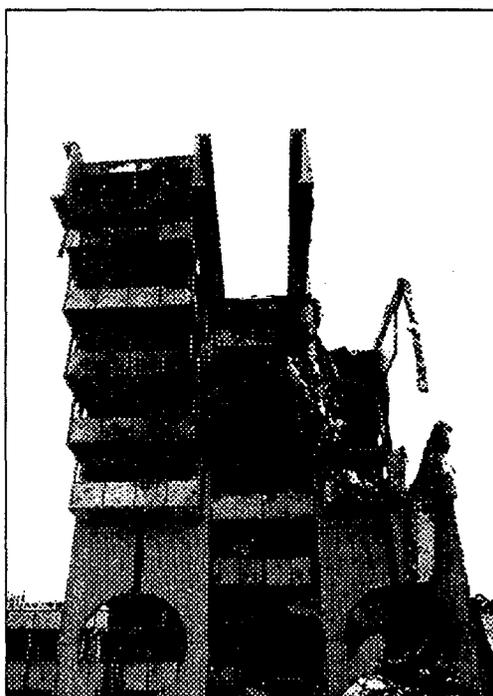
JP ELEKTROPRIVREDA

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**Attachment 9**

1 9 9 4

GODIŠNJI IZVJEŠTAJ  
**TEHNIČKI PODACI**



**TEHNICAL DATA**  
ANNUAL REPORT

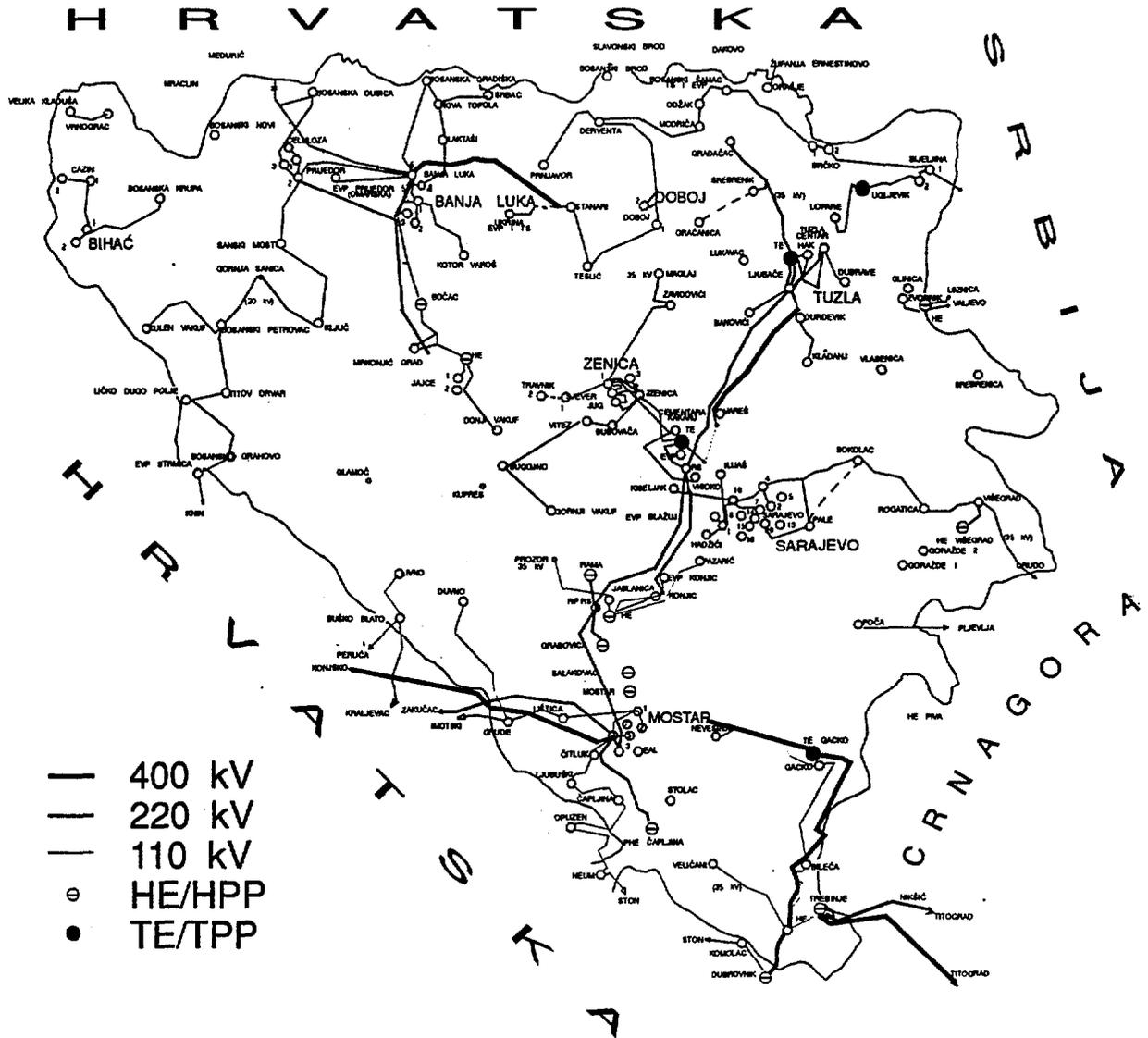


JP ELEKTROPRIVREDA BIH

**1. shema elektroenergetskog sistema BiH**

**1. sheme of the electric power system of B&H**

Već u prvoj ratnoj godini oštećen je veliki broj objekata Elektroprivrede Bosne i Hercegovine, a tokom 1993. godine razaranja su nastavljeni tako da je elektroenergetski sistem funkcionirao uz velike teškoće. U 1994. godini nastavljeno je sa sanacijom prijenosne mreže. 12.10.1994. godine pušten je u pogon DV 220 kV Jablanica - Mostar i DV 220 kV Jablanica - HE Rama. Time su povezani EES BiH i Hrvatske (Dalmacije) i omogućena proizvodnja HE Rama. Na shemi je prikazano stanje elektroenergetskog sistema Bosne i Hercegovine.



**ELEKTROENERGETSKI SISTEM B&H KRAJEM 1994.G.**  
**ELECTRIC POWER SYSTEM OF B&H AT THE END OF 1994.**

During the first year of war large number power system of B&H was exposed to great damages. In 1993. destruction continued so that electric energy system had great operation difficulties. In 1994. the sanitation of the transmission grid was over. In October 12. 1994. TL 220 kV Jablanica - Mostar and TL 220 kV Jablanica - HPP Rama were placed into operation, and the electric power system of B&H and Croatia (Dalmatia) were connected, and the power generation at HPP Rama started. The sheme shows the situation of the electric power system of Bosnia and Herzegovina.

## 2. podaci o proizvodnim kapacitetima

### 2. generation capacity data

#### HIDROELEKTRANE / HYDRO POWER PLANTS

elektrana	rijeka	početak u pogon	tip elektr. postrojenja	tip turbine	korisna zapremina	konstrukt. pod	srednji protok	instalirana snaga	raspoloživa snaga
plant	river	start in operation	plant type	turbine type	usable space	construct. head	mean flow	installed capacity	available capacity
TREBINJE I (100%)	Trebišnjica	1968	PA	Francis	1.100	86,5	81,2	2x54+1x60	180
DUBROVNIK (100%)	Trebišnjica	1965	DA	Francis	9	270,0	93,5	2x108	210
TREBINJE II	Trebišnjica	1981	P	Kaplan		20,0	93,5	1x8	8
CAPLJINA *	Trebišnjica	1979	RHE	Francis	5	220,0	28,9	2x215	430
RAMA *	Rama	1968	DA	Francis	466	285,0	33,1	2x80	160
JABLANICA *	Neretva	1955	DA	Francis	288	93,7	111,8	6x25	150
DRABOVKA *	Neretva	1982	PA	Kaplan	5	34,0	136,0	2x57	114
SALAKOVAC *	Neretva	1982	PA	Kaplan	16	42,0	182,7	3x70	210
MOSTAR *	Neretva	1987	PA	Kaplan	6	21,5	194,0	3x25	75
JAJCE I	Pliva	1957	DP	Francis	2	88,4	40,0	2x24	50
JAJCE II	Vrbas	1954	DP	Francis	2	42,5	71,7	3x10	28
BOČAC	Vrbas	1981	PA	Francis	43	52,0	78,4	2x55	110
VIŠEGRAD	Drina	1989	PA	Kaplan	101	43,0	342,0	3x105	310
<b>UKUPNO/TOTAL</b>					<b>2.042</b>			<b>2.134</b>	<b>2.035</b>

23,8 MW instalirane snage HE Trebinje I i 47,5 MW instalirane snage HE Dubrovnik pripada Elektroprivredi Hrvatske  
23,8 MW installed capacity HP Trebinje I and 47,5 MW installed capacity HP Dubrovnik belong to Electric Power Industry of Croatia

P - protok / run-of-the-river DA - derivacija - akumulacija / derivation - storage

PA - prihrana - akumulacija / storage DP - derivacija-protok / derivation-run-of-the-river

RHE - reverzibilna hidroelektrana / reversible hydro plant

\* slobodni teritorij / Free territory

#### TERMOELEKTRANE / THERMAL POWER PLANTS

elektrana	početak u pogon	broj agregata	vrsta uglja	specifična potrošnja	faktor snage	instalirana snaga	tehnički minimum	raspoloživa snaga
plant	start in operation	units number	coal	specific consumption	capacity factor	installed capacity	technical minimum	available capacity
TUZLA I*	1964	2	LM	14.278	0,80	64	32	32
TUZLA II*	1964	1	LM	13.750	0,80	100	56	77
TUZLA III*	1971	1	LM	12.700	0,85	200	145	182
TUZLA IV*	1974	1	LM	13.150	0,85	200	145	182
TUZLA V*	1978	1	M	12.084	0,85	215	145	198
KAKANJ I*	1956	2	M	15.450	0,80	64	36	50
KAKANJ II*	1960	2	M	15.450	0,80	64	36	48
KAKANJ III*	1969	1	M	12.820	0,80	110	55	84
KAKANJ IV*	1977	1	M	12.349	0,80	110	55	96
KAKANJ V*	1988	1	M	11.769	0,85	230	178	208
GACKO I	1983	1	L	12.420	0,85	300	180	265
UGLJEVK I	1985	1	M	11.403	0,85	300	180	268
<b>UKUPNO/TOTAL</b>		<b>15</b>				<b>1.937</b>	<b>1.224</b>	<b>1.690</b>

200 MW instalirane snage TE Tužla IV, 50 MW instalirane snage TE Kakanj IV i 100 MW TE Gacko proizvedili su prije rata električnu energiju za sistem elektroprivreda Hrvatske, a 100 MW instalirane snage TE Ugljevik za sistem elektroprivreda Slovenije, na osnovu ugovora o kupoprodaji električne energije i učešću u zajedničkom finansiranju izgradnje termoelektričnog objekta ELEKTROPRIVREDE BH

TEP Tužla with 200 MW installed capacity, TEP Kakanj with 50 MW installed capacity and TEP Gacko with 100 MW installed capacity generated before the war the electric power for the power system of Croatia, and TEP Ugljevik with 100 MW installed capacity generated the electric power for the system of Slovenia on the basis of the purchase-deed contract and the share of the joint construction investments for the thermal power plants of the Elektroprivreda BH

M - mrki ugalj / brown coal L - lignit / lignite LM - lignit i mrki ugalj / lignite and brown coal

\* slobodni teritorij / Free territory

### 3. visokonaponska mreža

#### 3. high voltage network

DALEKOVODI (km)  
TRANSMISSION LINES (km)

	1990	1991	1992	1993*	1994*
400 kV	838	828	838	142	223
220 kV	1424	1424	1424	295	582
110 kV	3110	3172	3172	526	980
UKUPNO/TOTAL	5372	5424	5434	963	1785

TRANSFORMATORSKE STANICE  
TRANSFORMER STATIONS (MVA)

	1990	1991	1992	1993*	1994*
400/220/110 kV	4500	4500	4500	288	800
220/110 kV	1800	1800	1800	900	900
110/35 kV	4172	4366	4366	1523	1445
UKUPNO/TOTAL	10472	10666	10666	2723	3145

\* slobodni teritorij / Free territory

### 4. distributivna mreža

#### 4. distribution network

VODOVI (km)  
LINES (km)

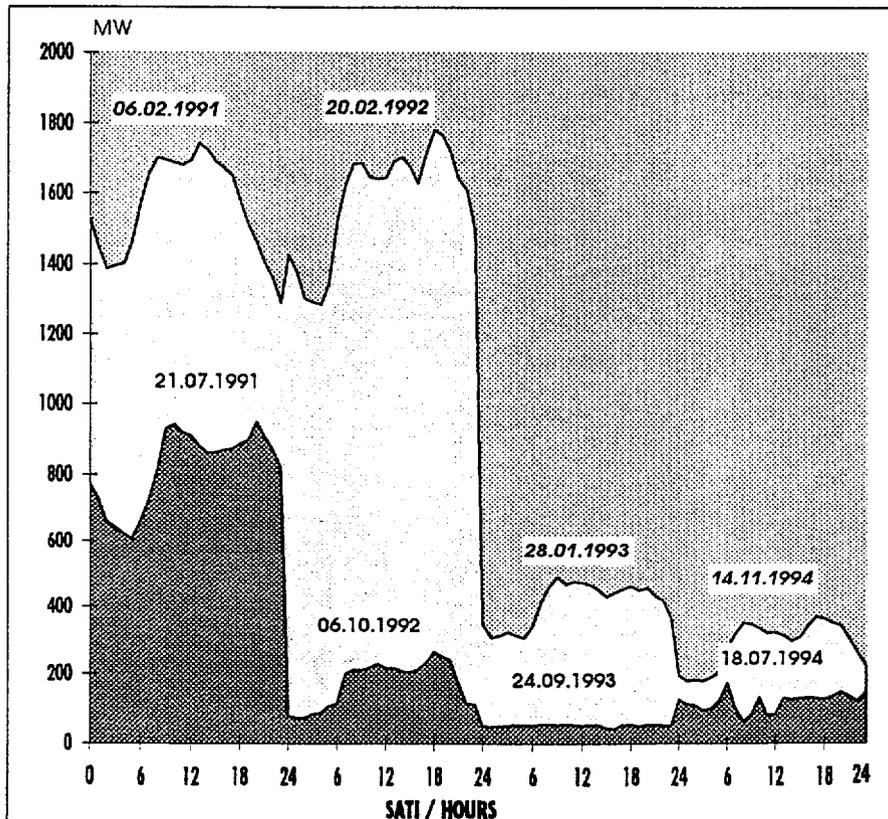
	1990	1991	1992	1993*	1994*
35 kV	2513	2290	767	496	733
10(20) kV	21110	21313	6525	3960	5869
0.4 kV	67892	68495	19513	13443	18091
UKUPNO/TOTAL	91515	92198	26805	17899	24693

TRANSFORMATORSKE STANICE  
TRANSFORMER STATIONS (MVA)

	1990	1991	1992	1993*	1994*
35/kV	1442	1413	508	368	480
20(10)/0.4 kV	3558	3704	1701	1454	1612
UKUPNO/TOTAL	5000	5117	2209	1822	2092

### Dijagrami maksimalnog i minimalnog dnevnog opterećenja

#### Diagrams of maximum and minimum daily load



## 5. distributivne hidroelektrane

### 5. distribution hydro power plants

naziv name	rijeka river	instalirana snaga installed capacity MW	raspoloživa snaga available capacity MW	proizvodnja (GWh) generation (GWh)				
				1990	1991	1992	1993	1994
VLAŠENICA	Jadar	2x0,45	0,80	3,8	5,0		-	
SLAPOVI NA UNI*	Una	4x1,76	7,00	32,2	38,5		35,8	37,5
BOGATICI	Željeznica	2x4,00	8,00	24,5	38,7		-	
MESICI	Prača	2x1,54	3,10	12,1	19,3		-	
HRID*	dovod Sarajevo	2x0,20	0,20	0,2	0,4		-	0
DELIBAŠINO SELO	Vrbas	0+1x0,22	0,60	0	0	0	0	0
BASTASIĆA	Bastašica	1x0,12	0,12	-	-		-	
TIŠĆA	Tišća	2x1,06	2,12	3,2	7,6		-	
<b>UKUPNO/TOTAL</b>			<b>21,94</b>	<b>76,0</b>	<b>110</b>	<b>80</b>	<b>36</b>	<b>38</b>

\*slobodni teritorij / Free territory

## 6. industrijske termoelektrane

### 6. industrial thermal power plants

naziv name	gorivo fuel	broj agregata units number	instalirana snaga installed capacity MW	proizvodnja (GWh) generation (GWh)				
				1990	1991	1992	1993	1994
INCEL Banja Luka	ugalj	4	64,30	240,5	188,7		-	
ZELJEZARA Zenica*	ugalj+v.pp.	5	54,00	149,0	140,3		-	
RAFINERIJA Bos.Brod	mazut	3	25,00	50,8	32,5		-	
RAFINERIJA Modriča	mazut	1	3,00	2,5	8,2		-	
NATRON Maglaj*	ugalj+lož-ulje	3	51,00	195,2	165,2		-	
KHK Lukavac *	ugalj+koks.plin	2	16,50	38,7	22,7		-	
CELPAK Prijedor	mazut	2	17,00	39,5	21,9		-	
PAPIR Drvar	ugalj	2	8,50	15,2	4,3		-	
FABRIKA SODE Lukavac*	ugalj	1	7,80	45,8	37,8		-	
TVORNICA GLINICE Mostar*	ugalj	1	4,00	20,2	17,4		-	
TVORNICA GLINICE Birač	plin+ugalj	2	25,00	106,0	82,2		-	
TVORNICA SECERA Bijeljina	ugalj	1	8,00	13,7	10,0		-	
INCEL Cazin*	lož ulje	1	5,80	10,2	0,2		-	
KRIVAJA Zavidovići*	ugalj+drvo	1	4,50	17,3	15,6		-	
MAGLIĆ Foča	ugalj	1	n.p.	0	0		-	
<b>UKUPNO/TOTAL</b>			<b>233,80</b>	<b>944,6</b>	<b>777</b>			

\* slobodni teritorij / Free territory

ugalj / coal; v.p.p. / furnace; plin / gas; mazut / fuel oil; koks.plin / coke gas; lož ulje / oil; drvo / wood

**7. proizvodnja hidroelektrana**  
**7. hydro power plant production**

hidroelektrana	prosječna proizvodnja average production	PROIZVODNJA NA GENERATORU (GWh)				
hydro power plant	GWh	PRODUCTION AT THE GENERATOR (GWh)				
		1990	1991	1992	1993	1994*
TREBINJE I (100%)	448	154	292	282	310	-
DUBROVNIK (100%)	1.473	608	647	35	360	-
TREBINJE II	11	7	22	44	30	-
CAPLJINA*	451	405	482	526	353*	232
RAMA*	712	429	540	681	206*	254
JABLANICA*	757	414	695	528	344*	565
GRABOVICA*	327	174	288	259	85*	161
SAKOVAC*	563	250	452	302	75*	0
MOSTAR*	300	156	239	99	0*	0
JAJCE I	259	140	251	102	159	-
JAJCE II	181	110	176	85	115	-
BOČAC	309	167	346	244	200	-
VIŠEGRAD	1.131	575	982	320	90	-
<b>UKUPNO/TOTAL</b>	<b>6.392</b>	<b>3.339</b>	<b>5.412</b>	<b>3.509</b>	<b>2.396</b>	<b>1.212</b>

\* slobodni teritorij / Free territory

**8. proizvodnja termoelektrana**  
**8. thermo power plant production**

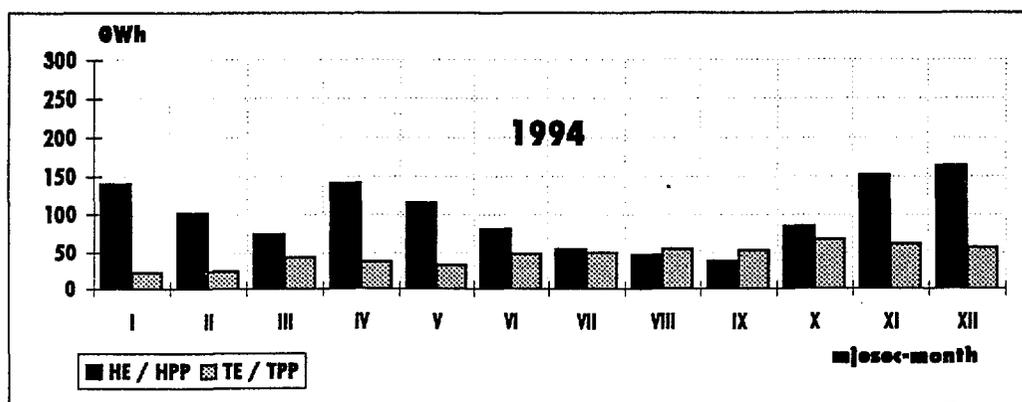
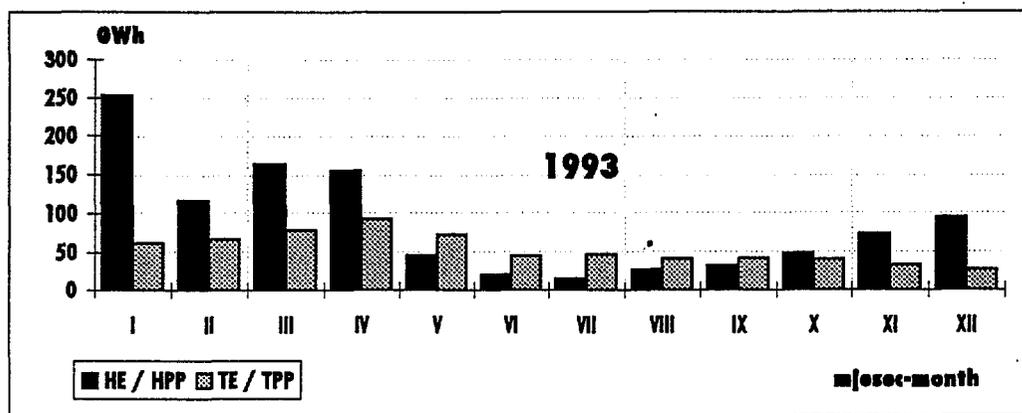
termoelektrana	raspoloživa snaga available capacity	PROIZVODNJA NA GENERATORU (GWh)				
thermo power plant	MW	PRODUCTION AT THE GENERATOR (GWh)				
		1990	1991	1992	1993	1994*
TUZLA I-II*	109	746	671	545	544	374
TUZLA III*	182	1.045	946	390	0	0
TUZLA IV*	182	1.222	1.003	290	0	0
TUZLA V*	198	1.214	1.201	264	0	0
KAKANJ I-II*	98	643	568	250	231	297
KAKANJ III*	84	465	487	143	0	0
KAKANJ IV*	96	584	459	78	0	0
KAKANJ V*	208	1.450	1.351	487	0	0
GACKO I	265	1.509	1.256	273	0	0
UGLJEVIK I	268	1.797	1.490	605	0	0
<b>UKUPNO/TOTAL</b>	<b>1.690</b>	<b>10.675</b>	<b>9.432</b>	<b>3.315</b>	<b>775</b>	<b>671</b>

\*slobodni teritorij / Free territory

## 9. dinamika proizvodnje (prag elektrane)

### 9. production dynamics (plant gate)

	godina year	mjesec-month												GWh UKUPNO TOTAL	
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
HE/HPP	1991	382	436	418	406	534	412	363	350	319	346	509	583	6138	
	1992	448	454	444	380	217	151	192	215	217	190	257	277	3442	
	1993	253	117	163	155	46	20	13	27	92	49	74	95	1046	
	1994	140	102	74	141	115	81	55	46	38	85	152	164	1194	
TE/TPP	1991	865	775	856	844	686	616	608	669	742	704	470	702	8337	
	1992	779	654	666	382	150	46	56	50	45	36	35	70	2969	
	1993	62	67	79	95	73	45	47	41	42	40	33	27	650	
	1994	23	24	43	37	33	48	50	55	53	67	61	56	550	

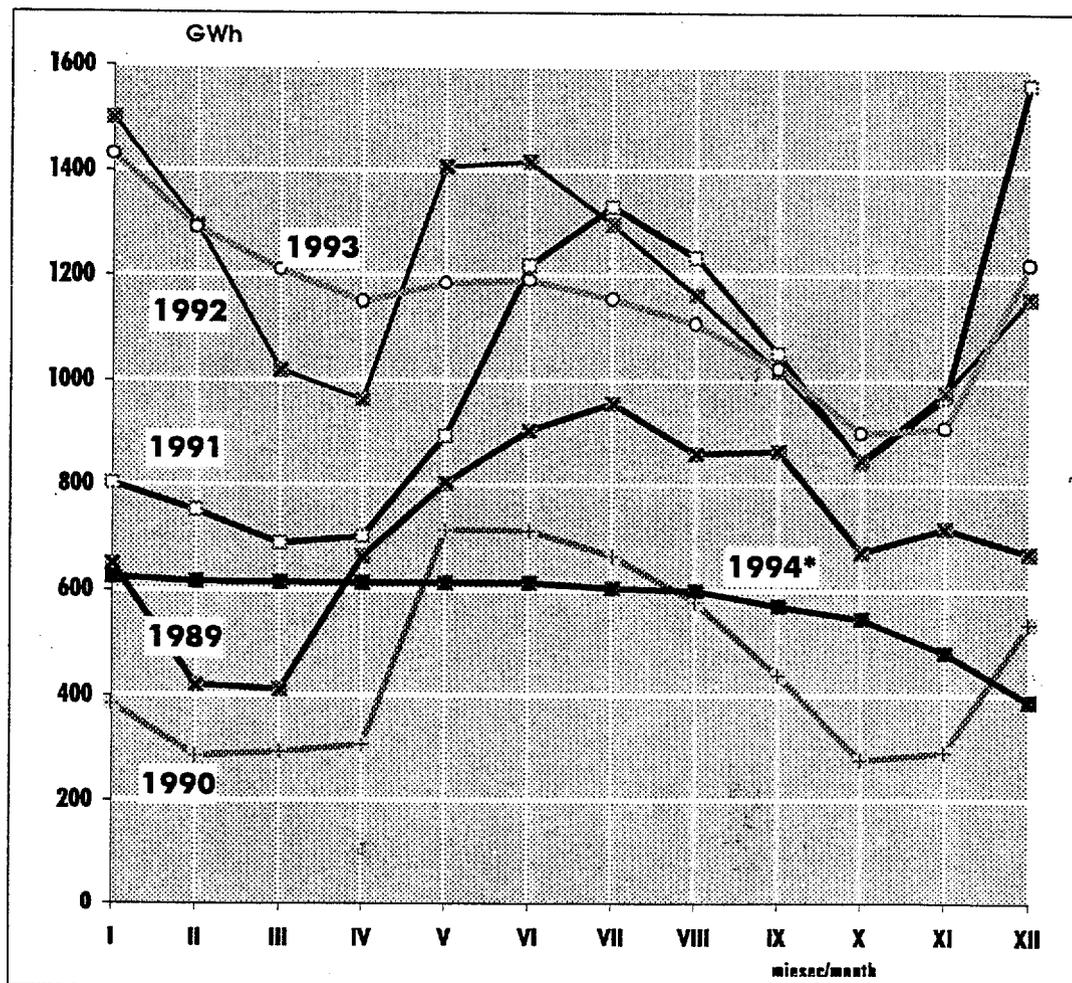


### 10. stanje zaliha energije u akumulacijama

### 10. state of energy storage reservoirs

godina year	mjesec/moonth											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1989	650	420	411	664	803	905	957	860	864	672	717	670
1990	384	287	294	307	714	712	665	578	438	278	293	536
1991	803	751	689	702	893	1217	1331	1233	1052	841	967	1565
1992	1499	1294	1021	964	1407	1417	1296	1163	1020	847	979	1157
1993	1430	1289	1209	1150	1185	1190	1154	1108	1023	899	909	1220
1994*	625	617	616	614	611	614	601	600	571	546	462	368

\* slobodni teritorij / Free territory



## 11. elektroenergetski bilans Bosne i Hercegovine

### 11. electric energy balance in Bosnia and Herzegovina

	GWh					
GODIŠNJE/ANNUAL	1990	1991	1992	1993	1993*	1994*
PROIZVODNJA HE HPP GENERATION	3.412	5.248	3.522	2.328	1.082	1.194
PROIZVODNJA TE TPP GENERATION	9.678	8.537	2.968	650	650	550
UKUPNA PROIZVODNJA TOTAL GENERATION	13.090	13.785	6.491	2.978	1.732	1.744
UKUPNE NABAVKE TOTAL SUPPLIES	2.096	682	234	298	209	572
RASPOLOŽIVA ENERGIJA AVAILABLE ENERGY	15.186	14.467	6.725	3.276	1.941	2.316
DISTRIBUTIVNA POTROŠNJA DISTRIBUTION CONSUMPTION	7.989	8.124	4.737	2.823	1.750	1.819
DIREKTI POTROŠAČI DIRECT CONSUMERS	3.192	2.669	869	47	47	43
UKUPNA POTROŠNJA U BiH TOTAL CONSUMPTION IN BiH	11.181	10.793	5.606	2.870	1.797	1.862
UKUPAN IZVOZ TOTAL EXPORT	3.364	3.152	940	318	88	412
POTROŠNJA ZA PUMPANJE PUMPING CONSUMPTION	287	141	0	0	0	0
GUBICI PRIJENOSA TRANSMISSION LOSSES	354	381	178	88	56	42
UKUPNA POTROŠNJA TOTAL CONSUMPTION	15.186	14.467	6.724	3.276	1.941	2.316

\* slobodni teritorij / Free territory

## 12. razmjena električne energije

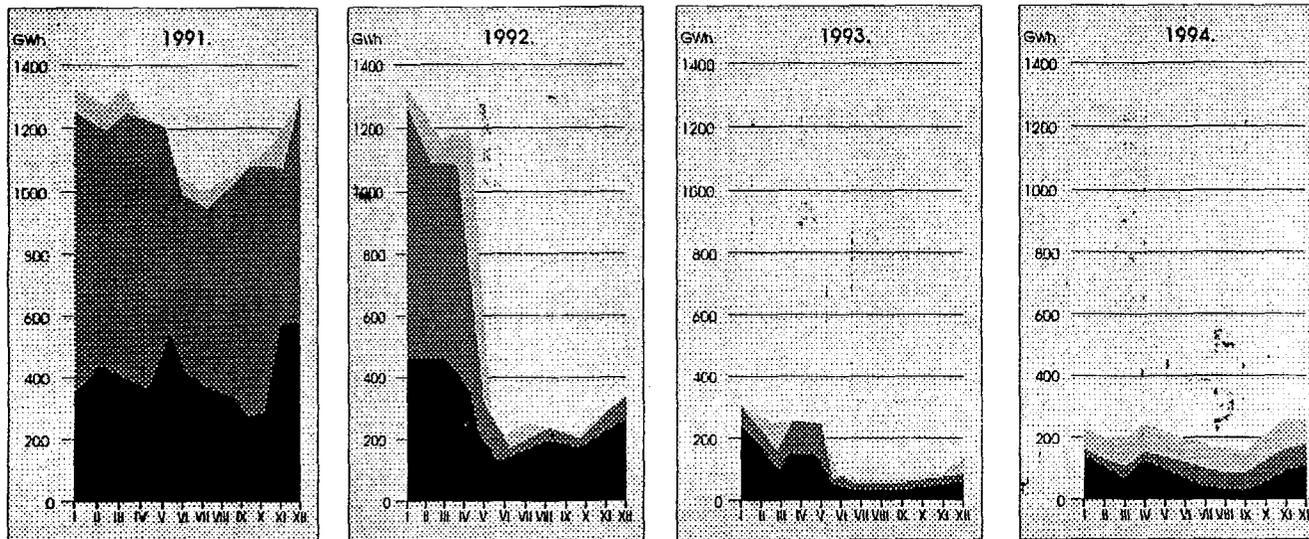
### 12. electric power exchange

	GWh					
godina/year	1990	1991	1992	1993	1993*	1994*
primljeno/received	2.020	593	206	298	209	572
predato/delivered	3.365	3.151	941	318	88	412
BILANS/BALANCE	1.345	2.558	735	20	-121	160

\* slobodni teritorij / Free territory

**13. proizvodnja i nabavka električne energije**

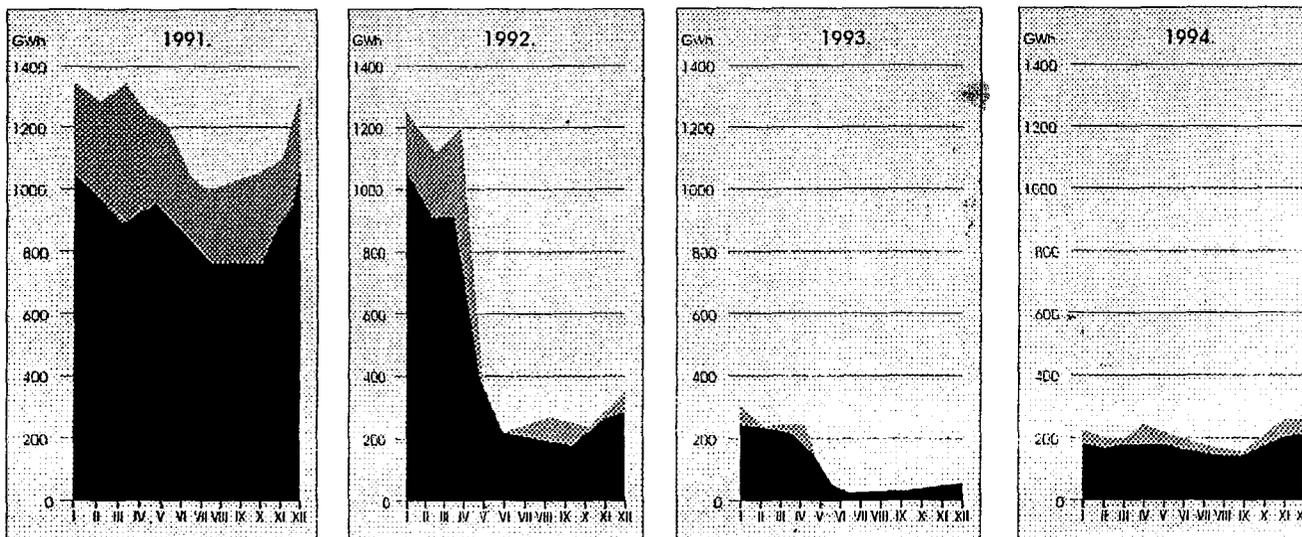
**13. power generation and supplies**



▨ NABAVKE / PROCUREMENT ▨ TE/TPP ■ HE/HPP

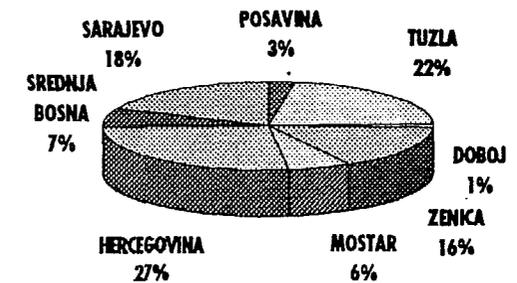
**14. potrošnja i isporuka električne energije**

**14. power consumption and deliveries**



**15. potrošnja električne energije po područjima**

**15. electric power consumption for each region**



**TABELARNI PREGLED**

preliminarne procjene šteta nastalih usljed ratnih dejstava na objektima  
JP Elektroprivreda BiH do 31.12.1994. godine

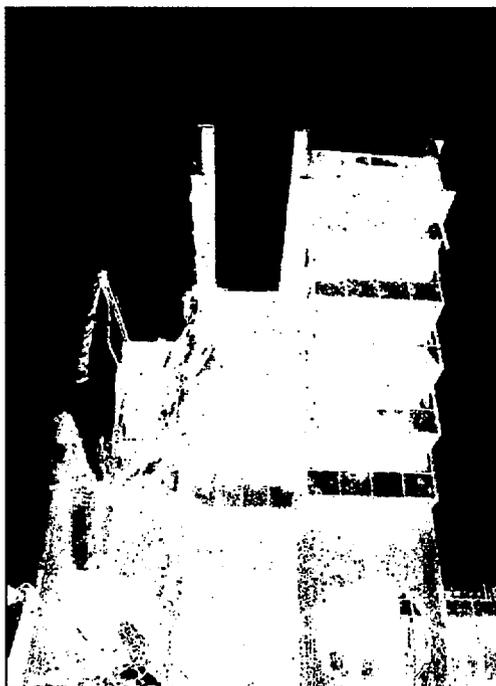
**TABULAR REVIEW**

of preliminary estimate of damages resulting war activities on facilities  
belonging to PE Elektroprivreda B&H by December 31 st. 1994.

DEM

red. br.	NAZIV ORGANIZACIJE	izvor podataka	Elektroenergetski objekti/Power plant facilities					javna rasvjeta	sredstva veze i informacionih sistema	transportna sredstva i sistemi, sredstva rada	direktne štete ukupno	indirektne štete	ukupna šteta	udio u ukupnoj šteti
			građevinski objekti	oprema	vodovi	trafosubstanca/razvodno postrojenje								
broj	ORGANIZATION NAME	source of data	buildings	equipment	lines	T.S./distribution plant	public lighting	communication lines and information system	transportation means and system, work means	direct damages total	indirect damages	total damages	part in total damage %	
1	HE na Trebišnjici/HPP on Trebišnjica	NEMA								0		0	0,00	
2	HE na Neretvi/HPP on Neretva	DOPIS I/95	13.377.885	44.158.260	758	2.180.800	161	1.776.000	1.910.000	64.321.945	51.372.034	115.693.979	10,88	
3	HE na Vrbasu/HPP on Vrbas	NEMA								0		0	0,00	
4	HE Višegrad/HPP Višegrad	NEMA								0		0	0,00	
<b>UKUPNO HE/TOTAL HPP</b>			<b>13.337.885</b>	<b>44.158.260</b>	<b>758</b>	<b>2.180.800</b>	<b>161</b>	<b>1.776.000</b>	<b>1.910.000</b>	<b>64.321.945</b>	<b>51.372.034</b>	<b>115.693.979</b>	<b>10,88</b>	
5	TE "Kakanj"/TPP "Kakanj"	FAX II/95	69	640	0	0	0	0	104	813	177.201.375	178.014.078	16,74	
6	TE "Tuzla"/TPP "Tuzla"	FAX II/96	13.971.000	3.582.052	0	1.020.000	0	750	550	19.873.052	204.669.925	224.542.977	21,11	
7	RITE "Gacko"/ Mine and TPP "Gacko"	NEMA	0	0	0	0	0	0	0	0	0	0	0,00	
8	RITE "Ugljevik"/Mine and TPP "Ugljevik"	NEMA	0	0	0	0	0	0	0	0	0	0	0,00	
<b>UKUPNO TE/TOTAL TPP</b>			<b>14.039.529</b>	<b>4.222.344</b>	<b>0</b>	<b>1.020.000</b>	<b>0</b>	<b>750</b>	<b>654</b>	<b>20.685.755</b>	<b>381.871.300</b>	<b>402.557.055</b>	<b>37,35</b>	
9	"Elektroprivreda" Sarajevo	DOPIS II/95	6.422.000	3.500.000	29.113.000	25.406.000	0	980	3.641.200	69.062.200	42.780.807	111.843.007	10,52	
10	"Elektrodistribucija" Banja Luka	NEMA	0	0	0	0	0	0	0	0	0	0	0,00	
11	"Elektrodistribucija" Bihac	ST.GR.30.6.94	4.223.700	135	21.038.480	12.970.090	0	260	1.200.000	39.827.470	0	39.827.470	3,74	
12	"Elektrodistribucija" Doboj	FAX I/95	1.500.000	1.170.000	1.450.000	1.520.000	80	15	200	5.935.000	0	5.935.000	0,56	
13	"Elektrodistribucija" Mostar	FAX I/96	4.607.173	1.996.757	32.728.428	5.686.286	12.564.916	825	10.413.549	68.822.077	20.922.853	89.744.930	8,44	
14	"Elektrodistribucija" Sarajevo	FAX I/97	36.602.273	4.556.000	27.480.000	16.570.000	6.300.000	1.316.200	9.460.516	102.288.989	32.903.817	135.192.806	12,71	
15	"Elektrodistribucija" Tuzla	FAX I/98	3.237.851	7.044.680	28.956.080	13.321.173	0	654	2.641.550	55.815.334	39.040.408	94.855.742	8,92	
16	"Elektrodistribucija" Zenica	FAX I/99	300	7.500.000	10.850.000	7.000.000	0	1.000.000	5.000.000	31.650.000	15.546.031	47.196.031	4,43	
<b>UKUPNO DISTRIBUCIJA / TOTAL DISTRIBUTION</b>			<b>50.470.997</b>	<b>22.366.637</b>	<b>122.502.988</b>	<b>57.067.549</b>	<b>18.944.916</b>	<b>4.070.168</b>	<b>28.915.615</b>	<b>304.338.870</b>	<b>108.413.109</b>	<b>412.751.979</b>	<b>38,31</b>	
17	Direkcija JP/PE Head office	DOPIS 6/94	18.549.851	460	0	0	0	1.560.577	70	20.640.428	0	20.640.428	1,94	
<b>SVE UKUPNO/GRAND TOTAL</b>			<b>102.860.262</b>	<b>74.707.241</b>	<b>152.373.988</b>	<b>85.674.349</b>	<b>19.105.916</b>	<b>9.136.745</b>	<b>35.190.697</b>	<b>479.049.198</b>	<b>584.437.250</b>	<b>1.063.486.448</b>	<b>100,00</b>	
19	UDIO U DIREKTOJ SITI % PART IN DIRECT DAMAGE %		21,47	15,60	31,81	17,88	3,99	1,90	7,35	100,00				

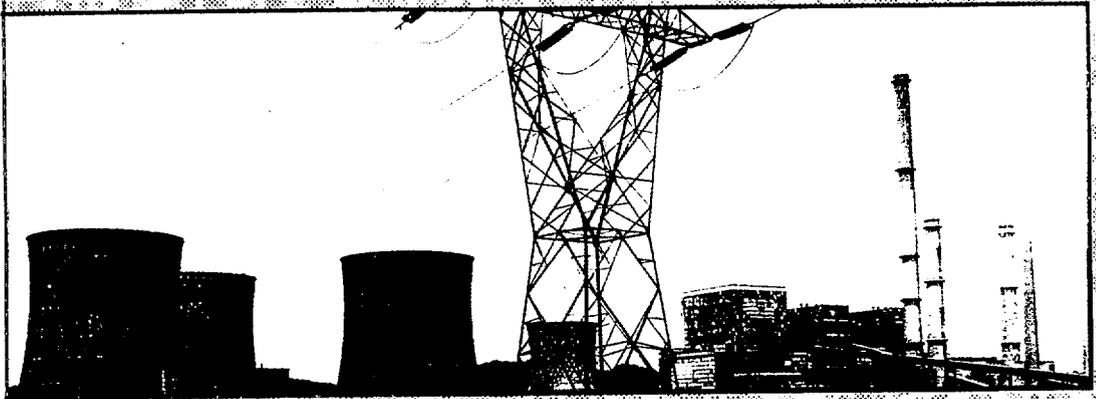
1 9 9 4



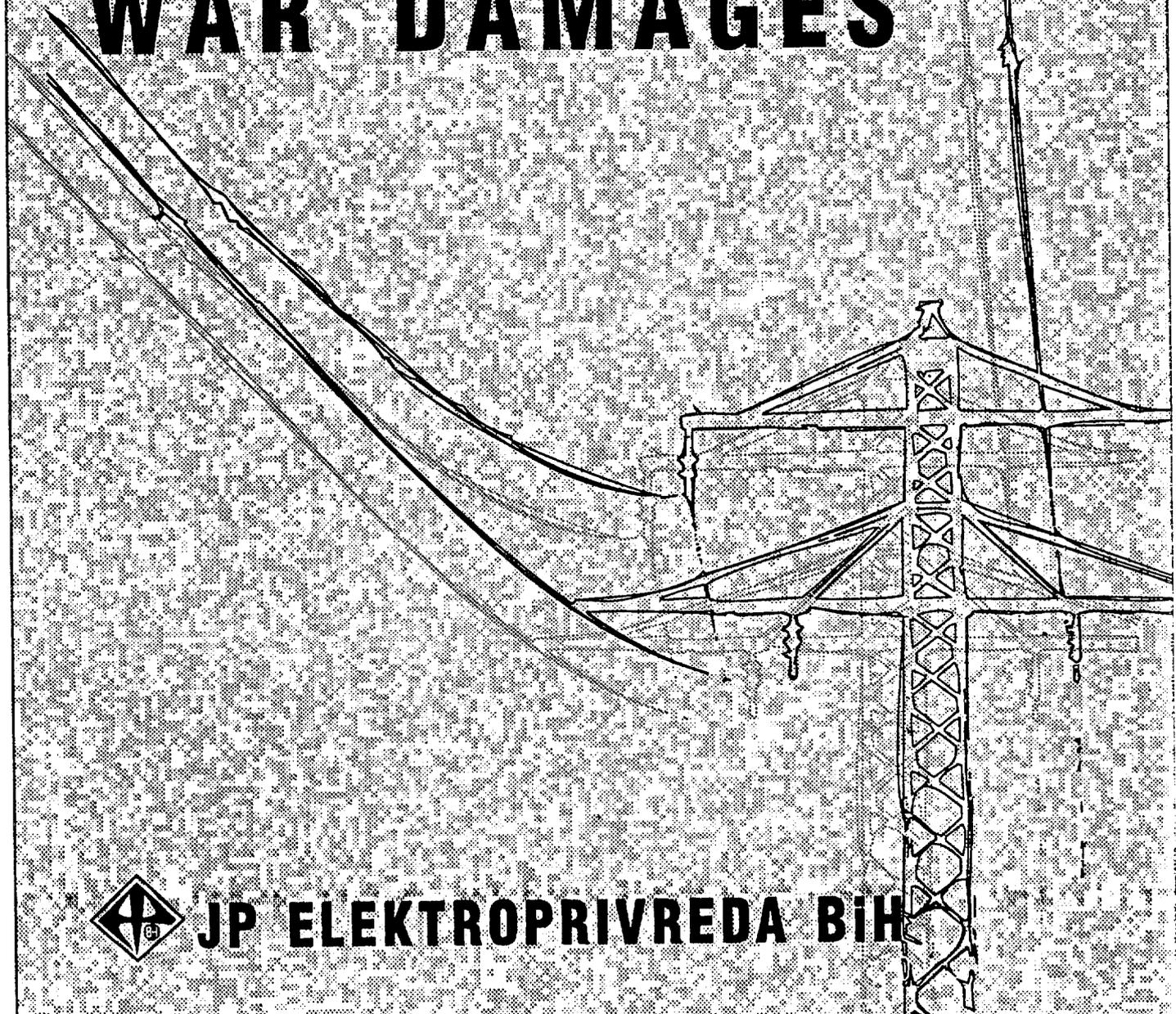
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**Attachment 10**

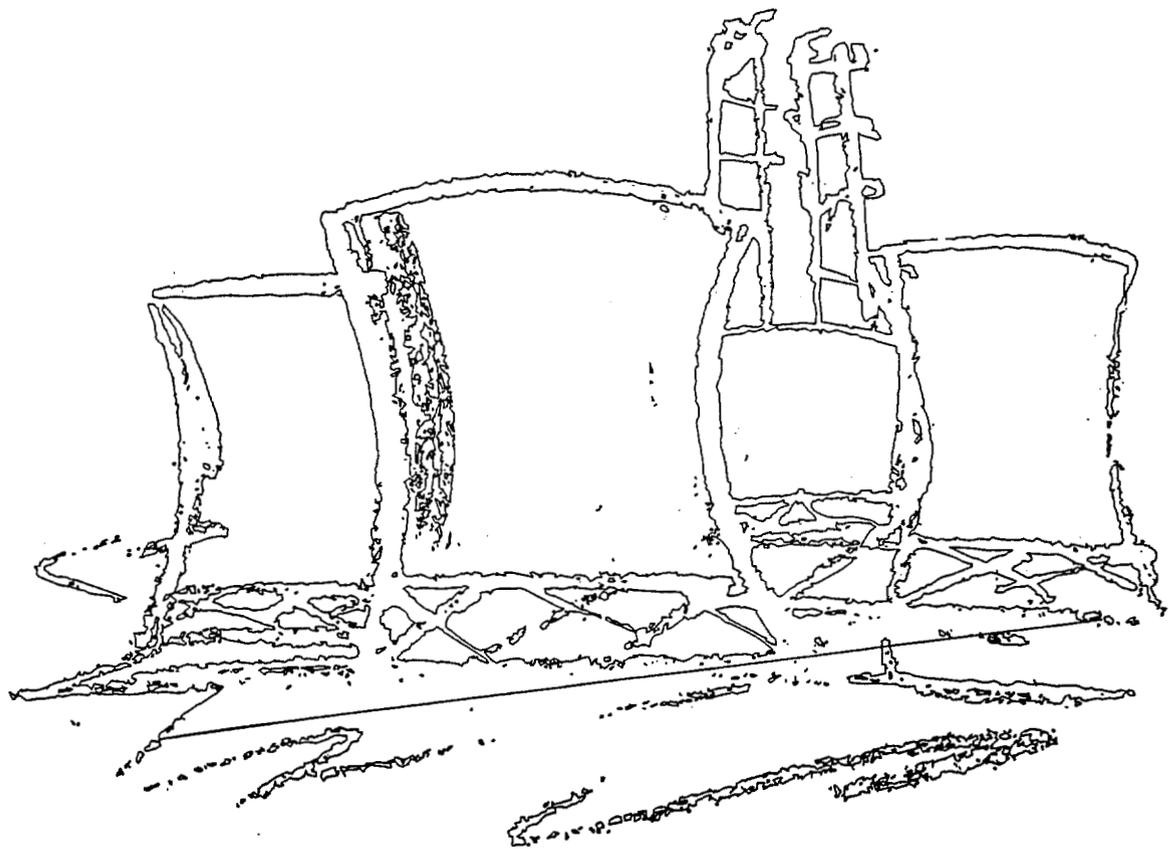
# RATNE ŠTETE



# WAR DAMAGES



**JP ELEKTROPRIVREDA BIH**



## DIO UKUPNOG ZLOČINA PROTIV BOSNE

Bosna - što je historijsko ime za kulturnu i državnu zasebnost i cjelovitost koje traju preko tisuću godina, a koji svoj suvremeni izraz imaju u Republici Bosni i Hercegovini - jest jedinstvo religijskih i nacionalnih različitosti razvijeno u dugom razdoblju. To je jedinstvo izloženo, tijekom cijelog svog trajanja, pokušajima razaranja i nasilnog rastavljanja na proste činioce, kako bi dijelovi ili cjelina, stvoreni tim razaranjem, bili potčinjeni volji hegemonističkih nacrtu razvijanih i održavanih u bosanskom susjedstvu. Kada je Bosna, nakon disolucije Jugoslavije, uzrokovane nacionalističkim pohlepama za vladavinom jednih nad drugim, istakla, na osnovi demokratski izražene volje većine svojih građana, zahtjev za međunarodno priznanje njezine državne neovisnosti, Srbija i Crna Gora napale su je svim raspoloživim sredstvima. Njihova je namjera potpuno uništenje kulturne i političke zasebnosti Bosne. U toku te agresije provoden je zločin protiv međunarodnog prava i čovječnosti, koji je usporediv samo s najgorim iz historije zločina. Agresor je, koristeći sva uzurpirana vojna sredstva bivše Jugoslavenske narodne armije, započeo zločinačko razaranje svega što mu je stajalo na putu. Bosanskohercegovačko stanovništvo je na najsvirepiji način ubijano i progonjeno, a svo njegovo naslijeđe uništavano. Formirani su brojni koncentracijski logori za Bošnjake, u kojima su velikosrpski agresori primjenjivali nezamislive metode mučenja i ubijanja. U stotinama kolektivnih grobnica sahranjene su desetine tisuća ubijenih, mnogi su bacani u rijeke i prirodne jame, s namjerom da zločin bude sakriven. Kulturno naslijeđe, nastalo kroz razdoblje dulje od tisuću godina, uništavano je s ciljem da se izbriše svaki znamen bosanske kulture i samobitnosti. Uz sve to, vješto smišljenim i provedenim metodama činjeno je sve da se rat protiv Bosne prikaže kao unutarnji sukob, iako je on u cijelosti smišljen, vođen i održavan u centrima izvan Republike Bosne i Hercegovine. U uvjetima potpune zapriječenoši mlade države, koja se bori za preživljenje, agresoru je uspijevalo da krivotvorenjem istine o njegovim zločinima u Bosni vara dio svjetske javnosti. Međutim, na patriotskim snagama Bosne stoji obaveza da i sebi i svijetu vjerno predstave činjenice o zločinu koji su u Bosni počinili srpski i crnogorski agresori, a potom i njihovi saveznici iz ekstremističkih redova hrvatskog naroda.

Agresija protiv Republike Bosne i Hercegovine je i po svojim ciljevima i po svojim metodama potpun zločin. Njen cilj je potpuno uništenje Bosne kao posebnosti, pri čemu za taj cilj, smatraju zločinci, mogu biti korišćena sva sredstva. Opskrba energijom bila je, zato, od samog početka jedan od stratejskih ciljeva agresora. Onemogućavanjem te opskrbe trebalo je proizvesti gušenje života na svim vojnički nezauzetim područjima, što bi, zajedno s ostalim zločinačkim djelovanjima, proizvelo masovna iseljavanja ili umiranja. Ništa dostojno ljudskog poštovanja nije bilo pošteđeno, pa ni elektroenergetski sistem. Raznovrsnim sredstvima ratne tehnike

## ONE SEGMENT OF THE TOTAL CRIME AGAINST BOSNIA

Bosnia - the historical name for the cultural and state entity lasting for more than a thousand years, finding its contemporary expression in the Republic of Bosnia and Herzegovina - is a unity of religious and national differences developed through centuries-long era. During its long existence, the Bosnian unity in diversity has been exposed to the trials of the destruction and force-splitting into the basic components in order to subordinate the results of the destruction - regardless of their being merely the organic components of the unity - to the hegemonistic plans. All these hegemonistic plans have been made and carried out in Bosnian neighborhood. After the dissolution of the former Yugoslavia, caused by the nationalistic greediness for governing one over the other, on the basis of the democratically stated good will of its citizens, Bosnia proclaimed the request for the international recognition of its independence. Immediately Serbia and Montenegro attacked Bosnia with their all available forces. Their intention was the complete destruction of the cultural and political independence of Bosnia. During the aggression, the crime perpetrated against all international rights and humanity, can be compared with the worst crime in the history. Using all looted military means of the former Yugoslav People's Army, the aggressors started their criminal activities, destroying everything in their way. The Bosnian and Herzegovinian population was murdered and expelled and persecuted in the cruelest way, its heritage being equally destroyed. The Serbian aggressor established numerous concentration camps for torturing and killing. Hundreds of the collective graves hide thousands of the murdered. Many innocent victims have been thrown into rivers or natural holes, with the only intention to hide the crime. The cultural inheritance, the result of the thousand year long tradition, was destroyed with the aim of erasing any traces of the Bosnian culture and its existence. Beside all this, through elaborate methods and shemes methods, everything was done as to present the war against Bosnia as an internal conflict, although it was completely designed, led and kept in the centers outside the Republic of Bosnia and Herzegovina and supported by their allies. In the conditions of the total blockade when our young state struggled for its survival, the aggressor succeeded in forging the truth about his crimes in Bosnia, cheating the world public. But, the patriotic forces of Bosnia are left with the commitment of showing themselves and the world all true facts about the crime performed in Bosnia by Serbian and Montenegrin aggressors followed by their allies from the extremist ranks of Croat people. The aggression against the Republic of Bosnia and Herzegovina is, by its aims and methods, the pure crime. Its purpose is the total destruction of Bosnia as a unity, where all means available are permitted. From the very beginning of the war, the electric power supply was one of the strategic aggressors aims. Cutting off the power supplies should have strangled all the vital activities in the military

agresor je nastojao ili zauzeti vitalne dijelove elektroenergetskog sistema ili ih razoriti, kada ih nije uspijevao zauzeti. Napadi na elektroenergetske objekte danas su vidljivi diljem Bosne i Hercegovine i oni su jedno od svjedočanstava prave naravi zločina protiv Bosne i njezinih ljudi. Stanovništvo na slobodnim teritorijama svjedoči kroz svo ratno razdoblje užas proizveden agresorovim zapriječavanjem tokova električne energije u opsjednute gradove i sela. Mnogi od njih - Goražde, Žepa, Srebrenica, Mostar, itd. - bili su, a neki su to još uvijek, bez ikakve opskrbe električnom energijom u razdoblju nerijetko dužim od dvije godine. Mnogi smatraju da je razborito potražiti pouzdan odgovor na pitanje: je li ikada električna energija tako intenzivno korišćena za realiziranje jednog zločinačkog nacrta protiv jedne države i njezinih naroda, i je li ikada elektroenergetski sistem jedne države bio izložen takvim razaranjima?

U dramatičnoj borbi ljudi Bosne i Hercegovine za opstanak nezidovjivu dimenziju čini i borba za opskrbu električnom energijom. Ona je nekad sličila Sizifovom poslu, budući da je agresor u jednom trenu mogao, koristeći modernu ratnu tehniku, razoriti i ono za što je marljivim graditeljima trebalo i više godina. Odlučnost i upornost bosanskih inženjera i tehničara, kao i njihova stručna dovrtljivost, bili su, uz ostalo, pouzdano jamstvo da zlo, oličeno u agresiji i terorizmu protiv njih i njihove zemlje, neće pobijediti. Kroz svo vrijeme rata očuvan je i podstican duh graditeljstva. Uz eksplozije granata i razaranja osnovan je Bosanskohercegovački komitet CIGRE, sačuvan je integritet bosanskohercegovačke Elektroprivrede. Svemu tome doprinosilo je uvjerenje da su snage dobra u cijelome svijetu uz nas i da zločin ne može niti prevladati niti ostati nekažnjen.

Ovom knjižicom želimo našim prijateljima u zemlji i inozemstvu dati sažet prikaz zločinačkih razaranja na elektroenergetskom sistemu. Tim prikazom nije moguće obuhvatiti opsežnost i raznovrsnost razaranja. To zahtijeva duga i ustrajna istraživanja i dokumentiranje. Ljudske patnje i stradanja, povezane s razaranjem elektroenergetskog sistema ne mogu biti obuhvaćeni nikakvim prikazom.

Ovim prikazom želimo još jednom potvrditi našu opredjeljenost i spremnost da se ratu i razaranju suprotstavimo građenjem. Također nastojimo iskazati i naše uvjerenje da u suvremenom svijetu imamo i razumijevanje i podršku za naše građenje bosanske budućnosti, koja nije zamisliva bez energetske privrede, kao dijela suvremenih energetskih tokova u svijetu.

unoccupied areas. Together with other criminal activities, this caused the mass emigration and dying. Nothing worth human attention was spared, not even the electric power system. Using all means of the martial techniques, the aggressor wanted either to occupy the vital parts of the electric power system, or to destroy them when failing to capture them. Numerous are damaged electric power units, visible all over Bosnia and Herzegovina, witnessing of the real dimensions of the crimes against Bosnia and its people. The population at the free territories witness about the terror provoked by the aggressors blockade of the electric power supplies to the besieged towns and villages. Many of them - Goražde, Žepa, Srebrenica, Mostar and others were, some of them are still, without any power supply for the period of more than two years. The clever judgement is searching for an answer to the question: has ever before the electric power so intensively been used for the realization of a criminal project against one state and its people? Has ever before an electric power system of any country been exposed to such an enormous devastation?

Within the dramatical efforts of the people from Republic of Bosnia and Herzegovina for its survival, there is an incomparable dimension belonging to the struggle for the electric power. Many times it resembled the Sisyphus, labor since the aggressor, at one moment, could, using up-to-date martial techniques, destroy even the results of the years long engineers activities. Resolution and persistency of the Bosnian engineers and technicians with their professional invention were with all other virtues the safe guarantee that the evil, represented by the aggressor and terrorism against them and their county, will never win. The spirit of construction has been kept and initiated all along the war. Followed by bomb-shell explosions and shootings, Bosnian and Herzegovinian Committee of CIGRE, was founded and the integrity of Elektroprivreda of Bosnia and Herzegovina has been saved. The great contribution came from the conviction that the forces of good will from the whole world are with us and the crime can neither overrule, nor stay unpunished.

The present, followed by the wishes to our dear friends in the country and abroad, gives a concise survey of the criminal destruction of the electric power system. Such a short survey cannot comprise all enormity and variety of the destroying. It asks a long-term and permanent investigation and documentation. Human sufferings and tragedies connected with the destruction of the electric power system can never be included into such a brief survey.

This paper once again confirms our decision and readiness to oppose to this war and destruction. We also try to declare our belief that we are understood and supported all over the world for the building option of our Bosnian future, unimaginable without the energy economics as a part of the actual energy flows in the world.

Dr Rusmir Mahmutćehajić, President of BH CIGRE

Sarajevo, August 9, 1994

*Rusmir Mahmutćehajić*



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## ELEKTROPRIVREDA BOSNE I HERCEGOVINE U RATU

Javno preduzeće Elektroprivreda Bosne i Hercegovine funkcioniše kao jedinstveno državno preduzeće za proizvodnju, prijenos, distribuciju električne energije i upravljanje elektroenergetskim sistemom u Republici Bosni i Hercegovini.

Organizirana je kao preduzeće sa šest direkcija u čijem sastavu su i dijelovi preduzeća koji obavljaju poslove proizvodnje uglja i električne energije na području jednog ili više ugljenih bazena, proizvodnje električne energije na riječnim slivovima, prijenosa električne energije na cijelom teritoriju Republike BiH i distribucije električne energije na odgovarajućim distributivnim područjima.

Prije raspada bivše Jugoslavije elektroenergetski sistem Bosne i Hercegovine je funkcionirao u okviru mreže većeg dijela evropskih zemalja UCPTA kao dio bivšeg jugoslavenskog elektroenergetskog sistema. Neposredno pred agresiju elektroenergetski sistem Bosne i Hercegovine raspolagao je proizvodnim kapacitetima ukupne instalirane snage 3991 MW, od čega je 2034 MW u hidroelektranama i 1957 MW u termoelektranama, sa ukupnom prosječno ostvarenom godišnjom proizvodnjom od 14.657 GWh. Bruto potrošnja u 1991. godini iznosila je 11.174 GWh sa vršnim opterećenjem od 1961 MW. U vlastitim rudnicima proizvedeno je 4.196.000 t uglja. Ukupan broj potrošača iznosio je 1.389.481.

Prenosna mreža se sastojala od 5.374 km vodova od čega 838 km su vodovi 400 kV, 1424 km su vodovi 220 kV i 3172 km su vodovi 110 kV. Instalirana snaga u transformatorskim stanicama iznosila je 10216 MVA od čega 4500 MVA se odnosi na 400/220/110 kV, 1350 MVA na 220/110 kV i 4366 MVA na 110/X kV.

Distributivna mreža se sastojala od 2390 km vodova 35 kV sa 1413 MVA instalirane snage u transformatorskim stanicama 35/X kV, 21313 km vodova 10 (20) kV sa 3704 MVA instalirane snage u transformatorskim stanicama 20 (10)/0,4 kV i 68.495 km vodova 0,4 kV.

Po obimu izgrađenosti i tehničke opremljenosti elektroenergetski sistem Bosne i Hercegovine spadao je u red modernih sistema i raspolagao je sa značajnom materijalnom osnovom. Vrijednost osnovnih sredstava sa stanjem 31.12.1991. godine iznosila je 11.774 miliona DEM, ukupni prihod je iznosio 2083 miliona DEM. Ukupan broj zaposlenih iznosio je 18.029 radnika. Potrošnja električne energije po stanovniku u 1990. godini iznosila je 2700 kWh.

Krajem 1991., a naročito u 1992. godini kada počinje i otvorena agresija na Republiku Bosnu i Hercegovinu sistematski se ruši i uništava elektroenergetski sistem i svi njegovi dijelovi koji u ratnim uvjetima, zbog velikog značaja za život i egzistenciju ljudi, postaju važan strateški cilj. Njegova specifičnost i ranjivost, naročito prenosne i

## ELEKTROPRIVREDA OF BOSNIA AND HERZEGOVINA IN WAR

Public Enterprise Elektroprivreda of Bosnia and Herzegovina functions as a state enterprise for the electric power generation, transmission and distribution, and for the management of the electric power system in the Republic of Bosnia and Herzegovina.

Its organization includes six departments comprising: coal and electric power generation in the region of one or more mines; the electric power generation at the river catchments; the electric power transmission on the whole Republic territory and the electric power distribution at the respective distribution areas.

Before the former Yugoslavia split, the Bosnia and Herzegovina electric power system functioned within the network of the major part of the European countries UCPTA, as a part of the former Yugoslav electric power system. Immediately before the war start, the Bosnia and Herzegovina electric power system had the generating facilities with the total installed capacity of 3991 MW: 2034 MW at HPP and 1957 MW at TPP. The total approximate yearly realized generation was 14.657 GWh. Its gross consumption in 1991. was 11.174 GWh, with the peak load of 1961 MW. Our own coal mines produced 4.196.000 tons of coal. Total number of the consumers was 1.389.481.

The transmission network had 5.374 km of lines: 838 km of 400 kV; 1424 km of 220 kV and 3172 km of 110 kV. The installed capacity at the transformer stations was 10216 MVA: 4500 MVA of 400/220/110 kV; 1350 MVA of 220/110 kV and 4366 MVA of 110/X kV.

The distribution network had 2390 km of 35 kV lines with the installed capacity of 1413 MVA at the transformer stations 35/X kV; 21313 km of 10(20) kV lines with the installed capacity of 3704 MVA at the transformer stations 20(10)/0,4 kV and 68.495 km of 0,4 kV lines.

By the grade of the development and technical equipment, the Bosnia and Herzegovina electric power system belonged to the up-to-date systems and it had a considerable financial basis. By December 31. 1991. Elektroprivreda had the fixed assets in the sum of 11.774 million DEM, while the total income was 2083 million DEM. The number of its employees was 18.029. The electric power consumption per capita was 2700 kWh in 1990:

At the end of 1991, particularly in 1992. the open aggression against the Republic Bosnia and Herzegovina started and the electric power system was systematically attacked. The whole system and all its sections, due to their important role for the life and existence of people, became a significant strategic target in the conditions of war. The special characteristics of the system and the vulnerability of its transmission and distribution networks, transformer facilities and the electric power resources are seriously damaged by the war. The consequences are frequent cut offs of the power supply for most

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distributivne dalekovodne mreže, transformatorskih postrojenja i izvora električne energije za vrijeme ratnih djelovanja rezultiraju velikim oštećenjima i prekidima napajanja većeg dijela potrošača, a ponekad i cjelokupnih regija što pretvara urbana naselja u logore bez osnovnih uvjeta za život.

Od početka rata do 30.06.1994.godine zbog direktnih posljedica ratnih djelovanja oštećene su hidroelektrane čija je instalirana snaga 579 MW ili 14,5% ukupnih proizvodnih kapaciteta, od čega su od objekata na slobodnoj teritoriji najveća oštećenja u HE Mostar (75 MW) i HE Salakovac (210 MW). Do velikih oštećenja došlo je i u TE Tuzla (779 MW) koja je više puta granatirana, a gađana je i raketama.

Stepen oštećenja prenosne mreže najbolje ilustriraju podaci u odnosu na stanje prije rata. Od 14 dalekovoda 400 kV nijedan nije u pogonu. Od 32 dalekovoda 220 kV u pogonu je 12 dalekovoda. Od 181 dalekovoda 110 kV u pogonu je 93. Svih 8 transformatorskih stanica 400/220/110 kV su van pogona i koriste se samo kao rasklopna postrojenja za niži naponski nivo. Od 9 transformatorskih stanica 220/110 kV u pogonu su samo 4. Od 116 transformatorskih stanica 110/X kV u pogonu je oko 70, od kojih su neke nakon oštećenja privremeno sanirane.

Podaci pokazuju da su oštećenja prenosne mreže velika na cijelom području Republike, a najveća razaranja su na područjima Sarajeva i Mostara. Posebno teška situacija je u gradovima Goražde, Srebrenica i Žepa, koji nemaju električnu energiju preko 25 mjeseci.

Distributivna mreža u opkoljenim gradovima, pogotovo nadzemna mreža je skoro potpuno uništena, dok je kablovska djelimično stradala. Uništena je javna rasvjeta, uništen i oštećen je veliki broj transformatorskih stanica, ne rade električna telemjerenja i telekomande, radio-veze su svedene na minimum, oštećen ili u potpunosti uništen radni prostor, a od specifičnog voznog parka ostalo je u voznom stanju samo nekoliko vozila.

Uništena je i moderna poslovna zgrada Elektroprivrede BiH sagrađena 1980. godine i tom prilikom stradali su radio-relejni uređaji, stručna literatura i drugi inventar.

Procjena direktnih ratnih šteta na objektima i postrojenjima koja su pod nadzorom Elektroprivrede Bosne i Hercegovine, s obzirom da su ratna djelovanja na širem području Republike još uvijek u toku, vrši se na osnovu raspoloživih informacija i grubih podataka za svaki pojedinačni objekat. Prema ovim preliminarnim i nepotpunim podacima direktne štete iznose oko 424 miliona DEM, od čega 23,6% se odnosi na štete na građevinskim objektima, 16% su štete na opremi, 30% su štete na vodovima, 19,4% su štete na transformatorskim stanicama i razvodnim postrojenjima, 11% se odnosi na štete javne rasvjete, sredstva veze, informacione sisteme i transportna sredstva.

Po pojedinim elektroprivrednim djelatnostima direktna šteta je:

1. Proizvodnja	87,6 miliona DEM
2. Prijenos	60,8 miliona DEM
3. Distribucija	254,9 miliona DEM
4. Ostalo	20,7 miliona DEM
U K U P N O:	424,0 miliona DEM

Indirektno štete su procijenjene u iznosu od 454 miliona DEM i obuhvataju štete zbog neostvarene proizvodnje i isporuka električne energije, troškova provizorija, odnosno troškova osposobljavanja funkcioniranja elektroenergetskog sistema bez konačnih rješenja, kao i troškova kod potrošača zbog nestabilnog napajanja i lošeg kvaliteta električne energije.

Pored ovih troškova indirektno štete obuhvataju i štete koje su

consumers. Sometimes the whole regions are cut off from the power supply, turning the urban settlements into the camps deprived of the existential minimum.

Since the beginning of the war to June 30, 1994., due to the direct war consequences, there are serious damages at HPP with their installed capacity of 579 MW or 14,5% of the total generating facilities. Out of all units located at the free territory, the serious damages are on HPP Mostar (75 MW) and HPP Salakovac (210 MW). TPP Tuzla (779 MW)<sup>a</sup> is also seriously damaged due to frequent shelling and it even missiles.

The scope of the damage of the transmission network can be illustrated by the data referring to the state before the war. Out of all 14 transmission lines of 400 kV, none is operating; out of all 32 transmission lines of 220 kV just 12 are in function; and out of all 181 transmission lines of 110 kV, just 93 are in their operative state. All 8 transformer stations of 400/220/110 kV are out of operation at the moment they are used just as switching substations for lower voltage level. There are 9 transformer stations of 220/110 kV and only four of them are in function. There are 116 transformer stations of 110/X kV and 70 of them are now placed into operation; after their damages were provisory and temporary sanated.

The data shows that the damage of the transmission network is substantial at the whole territory of the Republic, the regions of Sarajevo and Mostar being most seriously damaged. The towns Goražde, Srebrenica and Žepa are faced with unbearable situation, having no electric power supply for more than 25 months.

The distribution network in the besieged towns, particularly the overhead lines, is almost completely destroyed, and the cable network is partially damaged. The public lighting is destroyed; a great number of the transformer stations is either damaged or destroyed; the electric teleinstruments and telecommand are out of operation; radio connections are to the minimum; working premises are totally destroyed and our complete specific motor pool is left with only a few operative vehicles.

The new administration building of Elektroprivreda of Bosnia and Herzegovina, build in 1980, is destroyed and its radio-relay devices, professional literature and other inventory are damaged.

The estimation of the direct war damage of the units and installations under the supervision of Elektroprivreda of Bosnia and Herzegovina, considering the fact that the war casualties are still on at the widerpublic area, is made on the basis of all available data and uncertain information for each unit separately. According to these preliminary and incomplete data, the direct damage amounts to some 424 million DEM; 23,6% of this sum refers to the damage of the buildings; 16% are the damage of equipment; 30% are the damage of lines; 19,4% are the damage of transformer stations and distribution installations; 11% are the damage of public lighting, connection equipment, information system and transport means.

The electric power industry activities has been exposed to the following damages:

1. Generation	87,6 million DEM
2. Transmission	60,8 million DEM
3. Distribution	254,9 million DEM
4. Others	20,7 million DEM
TOTAL:	424,0 million DEM

Indirect damage is estimated to some 454 million DEM, including also the damage due to: the unrealized power generation and supply,

nastale na opremi naročito kod termoenergetskih postrojenja zbog dugotrajnih zastoja u nekontroliranoj atmosferi i korozivnih procesa na vitalnim dijelovima postrojenja. Osim toga, postrojenja koja su u pogonu rade u otežanim uvjetima, izložena su brojnim termičkim i dinamičkim naprezanjima znatno većim nego u normalnom pogonu.

Utvrdjivanje ovih šteta biti će predmet posebnog elaboriranja na čijoj realizaciji očekujemo pomoć i angažiranje stranih eksperata i specijalističkih insitucija putem tehničke pomoći i stručnih konsultacija u vezi:

- sagledavanja problematike dugotrajnog zastoja i posljedica na opremu termoenergetskog postrojenja,
- definiranja neophodnih mjera konzervacije,
- definiranja programa praćenja stanja opreme u periodu zastoja,
- predlaganja metoda za utvrđivanje stanja materijala i opreme u fazi priprema za pokretanje pogona,
- određivanja iskustvene prognoze obima zamjene i popravke elemenata opreme postrojenja i drugih tehnoloških postupaka, nakon dugotrajnog zastoja.

Znatan broj neophodnih ispitivanja nismo u mogućnosti realizirati zbog nedostatka odgovarajućih mjernih uređaja i instrumenata potrebnih za praćenje stanja materijala i opreme tokom zastoja i u fazi pripreme za pogon. U tom smislu očekujemo pomoć elektroprivrednih preduzeća, proizvođača opreme i strukovnih udruženja.

Sigurno je da dosadašnja saznanja o visini ukupnih šteta u iznosu od 878 miliona DEM nisu konačna i ona će se mijenjati kada se prikupe preciznija saznanja i pristupi neposrednoj sanaciji. Te promjene će biti značajne s obzirom da se velikom broju objekata ne može prići jer se nalaze u zoni ratnih djelovanja.

Elektroprivreda Bosne i Hercegovine pretrpila je štetu koja se ne može vrednovati novcem. To je gubitak 212 radnika, dok ih je 312 povrijeđeno od kojih je 206 teže ranjeno. Mnogi od njih su poginuli ili teže ranjeni popravljajući postrojenja i mreže u zonama neposrednih ratnih djelovanja.

Zahvaljujući takvim hrabrim ljudima proizvodnja električne energije u toku rata ni u jednom momentu nije u potpunosti prestala.

provisorium costs, (namely the costs of the improvisations for the power system operation without any final solutions), and the consumer costs due to the unstable power supply and the bad electric power quality.

Beside the above costs, the indirect damage comprise the damage off the equipment of the thermo energy installations caused by a very long stoppage at the uncontrolled atmosphere and the corrosion processes at the vital installation parts. Then, the operating installations function under difficult conditions, exposed to various thermic and dynamic tensions higher than at normal operation.

The estimation of the damage will be a subject of an extra elaborate, whose realization will be, hopefully, assisted by the engaged foreign experts and special institutions through technical assistance and professional consultations in the following:

- problematics of the long stoppage and the consequences at the equipment of the thermo energy installations,
- definition of the necessary conservation measures,
- defined program of follow-up of the equipment state during the stoppage period,
- proposition of the proper methods for the material and equipment state estimation at the preparation phase for the operation startup.
- determining of the forecast, based on the experience, of the scope of the necessary replacement and repairs of the installation and other technological activities after the long stoppage.

A considerable number of the inevitable tests cannot be realized due to the lack of appropriate measuring devices and instruments necessary for the material and equipment state follow-up in the stoppage period and at the function preparation phase. We expect the assistance of the electric power industries, equipment producers and professional associations in this field.

It is certain that actual information on the total damage amounting to 878 million DEM is not final and it is to be changed after the precise details are obtained and the direct rehabilitation started. The changes will be significant regarding a very great number of the units located in the war zones.

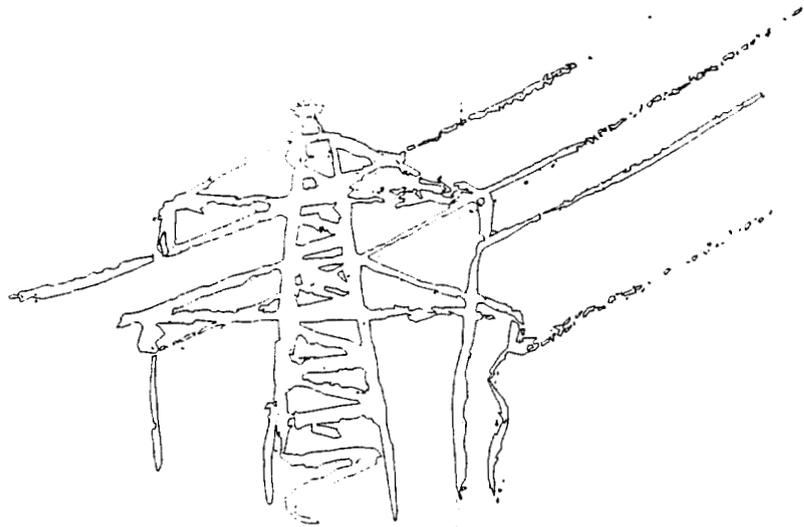
Elektroprivreda of Bosnia and Herzegovina suffered the damage that cannot be expressed in terms of many alone. That is the lost of 212 workers, and out of 312 wounded workers, 206 of them being heavily injured. A considerable number of our workers have been either killed or wounded while repairing the installations and networks located in the zones of the direct war activities.

Thanks to our brave workers, the electric power generation has not been completely stopped for single moment.

**Sabaheta Sadiković**

President of the War Damage Evaluation  
Commission at the level of EP B&H

# RATNE ŠTETE

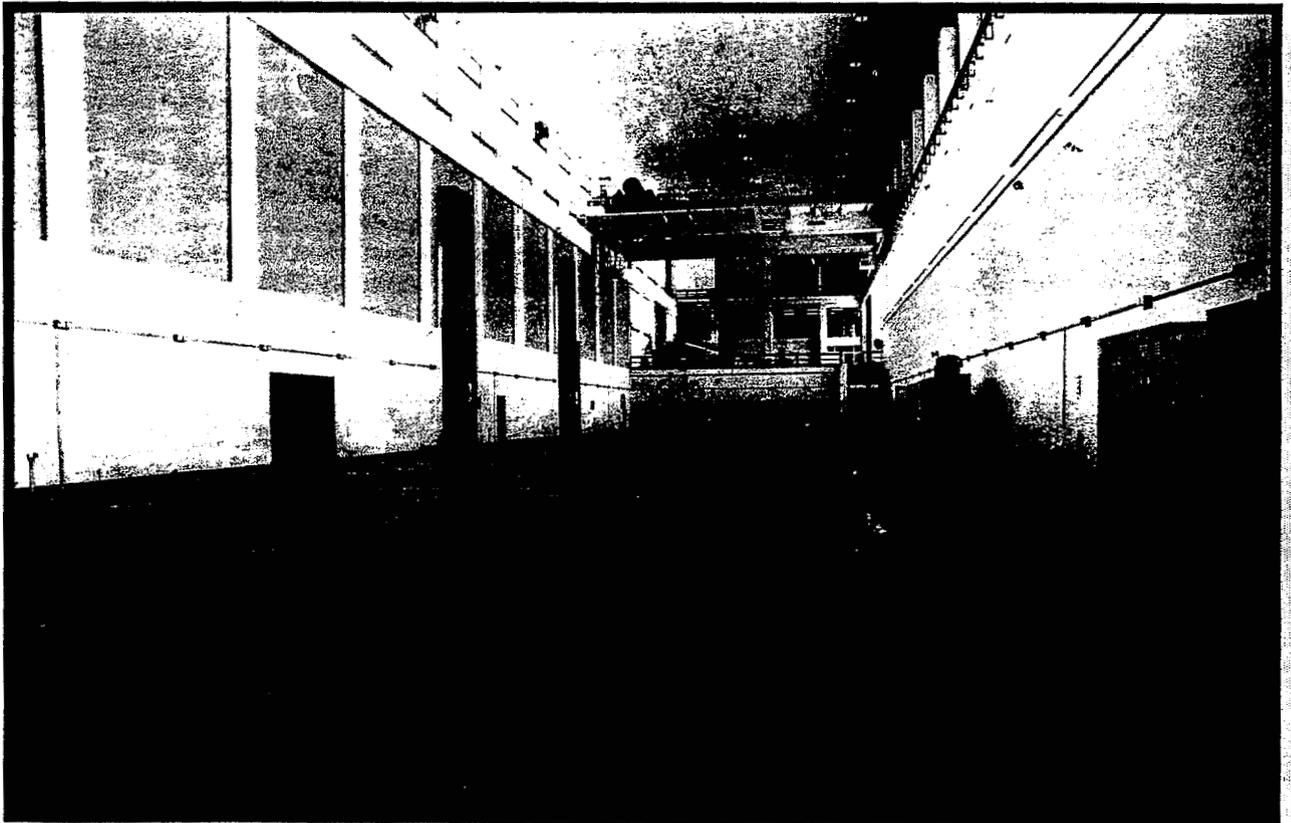


**HE SALAKOVAC** Puštena u pogon 1980. godine, instalisana snaga 210 MW sa prosječnom godišnjom proizvodnjom 563 GWh.

- Elektrana se nalazila duže vrijeme u zoni ratnih dještava i zbog nemogućnosti napajanja vlastite potrošnje 24.10.1993. godine je potopljena i cjelokupna glavna oprema elektrane je pod vodom koja je pomiješana sa regulacionim uljima, uljem za podmazivanje i hlađenje ležajeva.

- Direktna šteta na objektu se procjenjuje na oko 28,8 miliona DEM.  
- Očekuje se pomoć na sanaciji kao i uključivanje eksperata u cilju razmjene iskustava kod sličnih oštećenja.

Na slici se vide tragovi najvećeg nivoa vode u strojaru koji je iznosio 83,5 mntv, odnosno 3 m iznad kote generatora.



**WAR DAMAGES**

*HPP SALAKOVAC Placed into operation in 1980., installed capacity 210 MW with the approximate yearly generation of 563 GWh.*

*For a long period the hydro power plant was at the zone of the direct war casualties and as its auxiliary consumption was not supplied, and since October 24. 1993. the plant with its main equipment is under the water, mixed with the oils for regulation, greasing and bearing cooling.*

*- Direct damages are estimated to some 28,8 million DEM.*

*- The help of the engaged foreign experts is expected for the exchange of the the experience after the similar damages,*

*The pictures have the traces of the highest water level at the engine room of 83,5 msl, namely 3m over the generator point.*



## RATNE ŠTETE

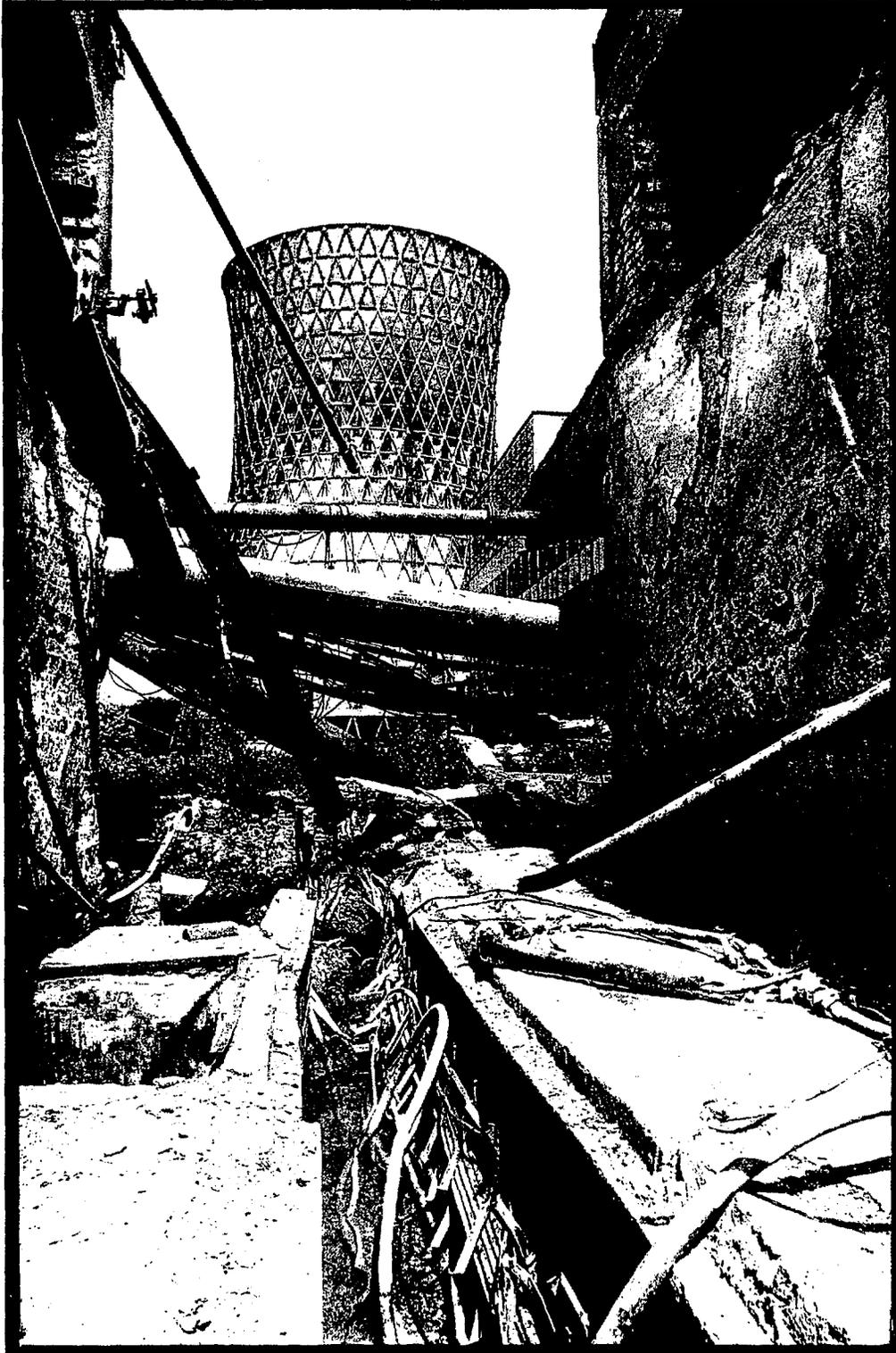


TE TUZLA je ukupne instalisane snage 779 MW.

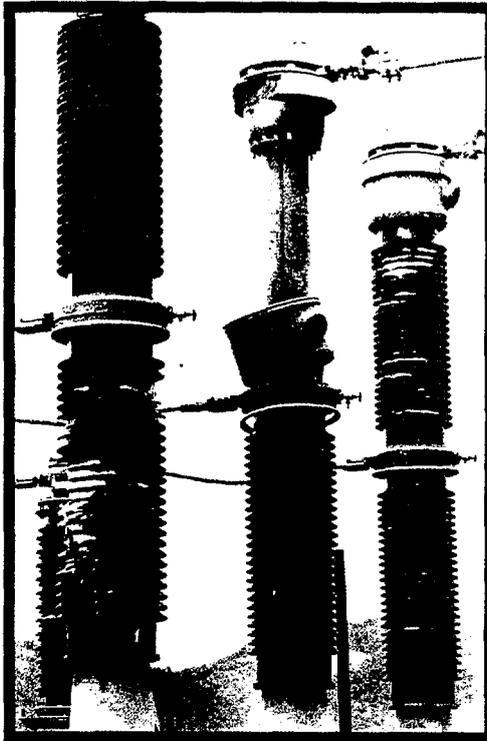
- Elektrana je više puta raketirana projektilima velike razorne moći zbog čega su nastale velike materijalne štete na građevinskim objektima, postrojenjima i opremi na mjestu i u pravcima djelovanja eksplozije.
- Oštećen objekat dekarbonizacije 2x700 m<sup>3</sup>/h.
- Oštećen objekat demineralizacije 5x90 m<sup>3</sup>/h.
- Na pogonskim objektima bloka IV (200 MW) i bloka V (215 MW) oštećeno je preko 95% fasadnog stakla i hidroizolacija objekata.
- Direktno štete na objektima se procjenjuju na oko 20 miliona DEM.
- Očekuje se pomoć na sanaciji objekata kao i uključivanje eksperata u cilju razmjene iskustava i sagledavanja problematike dugotrajnih zastoja i posljedica na opremu termoelektrana, posebno u uvjetima nedostatka neophodnih repromaterijala za vršenje kvalitetne konzervacije.

TPP TUZLA with its total installed capacity of 779 MW.

- The thermo power plant is shot by heavy projectiles many times, and the result are serious material damages at the buildings, installations and equipment on the spot and at the directions of the weapon explosion.
- Decarbonization unit 2x700 m<sup>3</sup>/h is damaged.
- Demineralization unit 5x90 m<sup>3</sup>/h is damaged.
- At the operating installations of Block IV (200 MW) and Block V (215 MW), more than 95% of the facade glasses and the unit hydroinsulation are damaged.
- Direct damages at the units are estimated to some 20 million DEM.
- The help of the engaged foreign experts is expected for the experience exchange and for the solution of the long stoppage problematics and consequences at the TPP equipment, particularly under the conditions with no repromaterials necessary for the qualitative conservation.



## RATNE ŠTETE



### TRANSFORMATORSKA STANICA 110/35/10 kV Maglaj

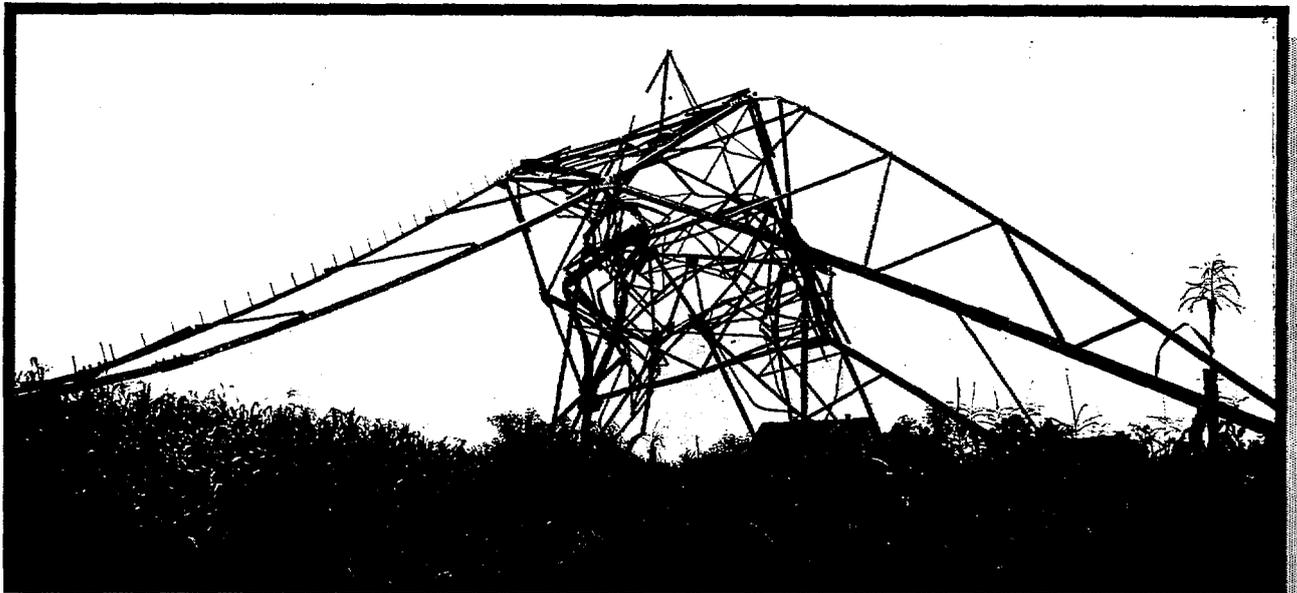
Opcina Maglaj  
Odvodno polje 110 kV za Doboj

Procenat oštećenja transformatorske stanice je 10%.  
Direktna šteta se procjenjuje u iznosu od 200.000 DEM.  
Od ukupno 31 transformatorske stanice 110/X kV instalisane snage 1385 MVA koje se nalaze na slobodnom teritoriju i pod kontrolom Armije Republike Bosne i Hercegovine van pogona je 858 MVA instalisane snage ili 62%.  
Prema nepotpunim podacima direktne štete na transformatorskim stanicama ovog naponskog nivoa uključujući i razvodna postrojenja procjenjuju se na oko 17,5 miliona DEM.

### TRANSFORMER STATION 110/35/10 kV Maglaj

The area of the town Maglaj  
Switchgear bay 110 kV Doboj

Percentage of the damages at the transformer station is 10%.  
The estimated direct damages are some 200.000 DEM.  
Out of all 31 transformer stations of 110/X kV with the installed capacity of 1385 MVA, located at the free territory and under the control of the Republic B&H Army, there is 858 MVA out of operation, or 62%.  
The insufficient information speak about the damages at TS of this voltage level, including the switchgears to some estimation of 17,5 million DEM.



### DELEKOVOD 400 kV Tuzla-Banja Luka

Mjesto Miljanovci (Lončari) - šire područje općine Tešanj  
Dalekovod oštećen u dužini od 10 km, srušeno je 20t čelične konstrukcije i 4 tona Al-Fe užeta.

Direktna šteta se procjenjuje u iznosu od 3 miliona DEM.  
Od 196 km dalekovoda 400 kV koji se nalaze na slobodnom teritoriju i pod kontrolom Armije Republike Bosne i Hercegovine nijedan nije u pogonu. Uništeno je 25 km, oštećeno je 50 km i srušeno je 79 tona čelične konstrukcije sa 100 t Al-Fe užeta. Prema nepotpunim podacima direktne šteta se procjenjuje na 7,5 miliona DEM.

### TRANSMISSION LINE 400 kV Tuzla-Banja Luka

Section Miljanovci (Lončari) - Wider area of the town Tešanj.  
TL is damaged at the length of 10 km, 20 tons of the steel construction are knocked and 4 tons of ACSR ropes are fallen.  
Direct damages are estimated to some 3 million DEM.

Out of 196 km of TL 400 kV placed at the free territory and under the control of the B&H Army none is in operation. There are 25 km destroyed, 50 km damaged and 79 tons of steel constructions with 100 tons of ACSR ropes are knocked. According to the insufficient information, the direct damages are estimated to 7,5 million DEM.

**DALEKOVOD 110 kV Zenica 1 - Zavidovići**

Mjesto Križ, brdo Biljačići - šire područje općine Zavidovići

Dalekovod oštećen na 12 mjesta u dužini od 3 km, srušeno je 15 tona čelične konstrukcije i 9 tona AL-Fe užeta. Direktna šteta na ovom dalekovodu se procjenjuje u iznosu od 360.000 DEM.

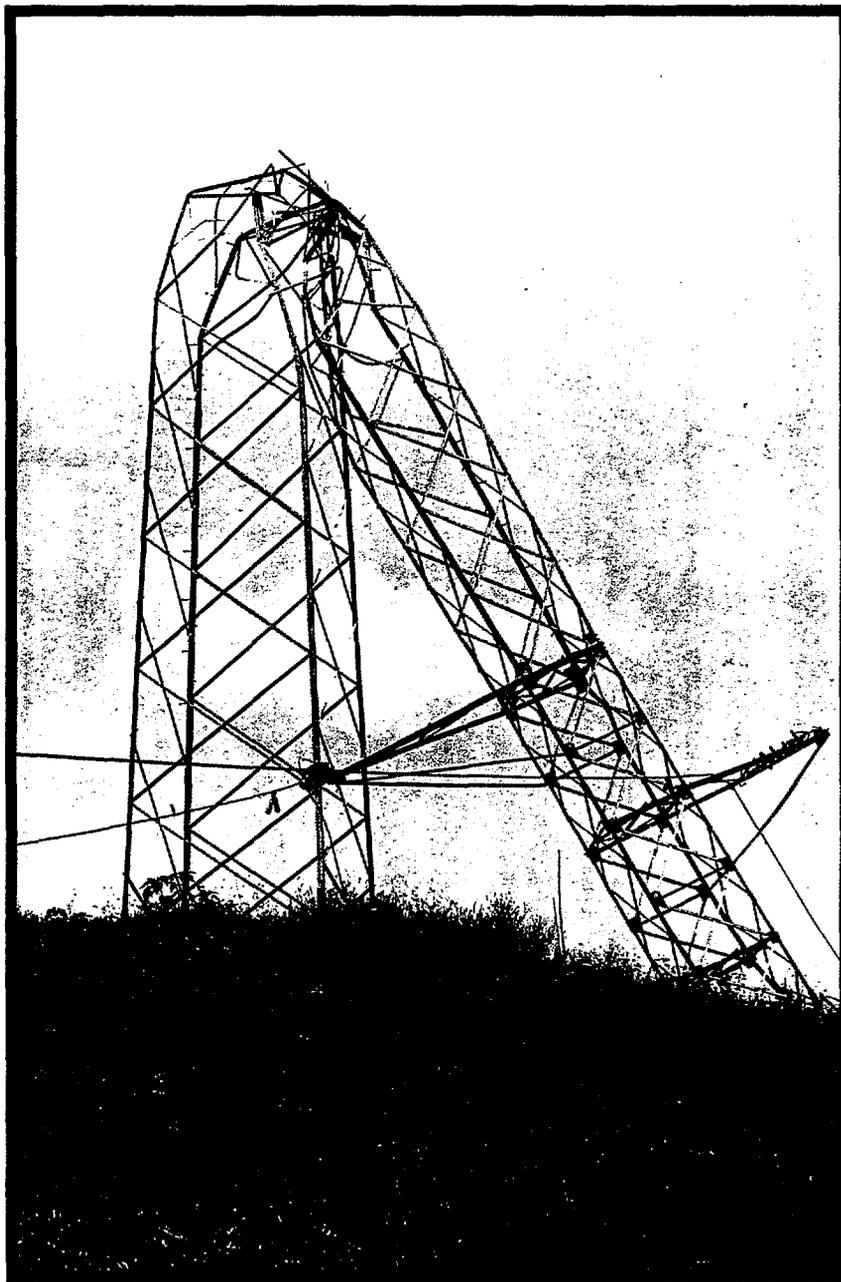
Od ukupno 651 km, odnosno 73 dalekovoda 110 kV, koji se nalazi na slobodnoj teritoriji u pogonu je 35. Uništeno je 105 km, oštećeno je 250 km, srušeno je 189t čelične konstrukcije sa 200 tona Al-Fe užeta. Prema nepotpunim podacima direktna šteta na vodovima 110 kV se procjenjuje u iznosu od 13,47 DEM.

**TRANSMISSION LINE 110 kV Zenica 1 - Zavidovići**

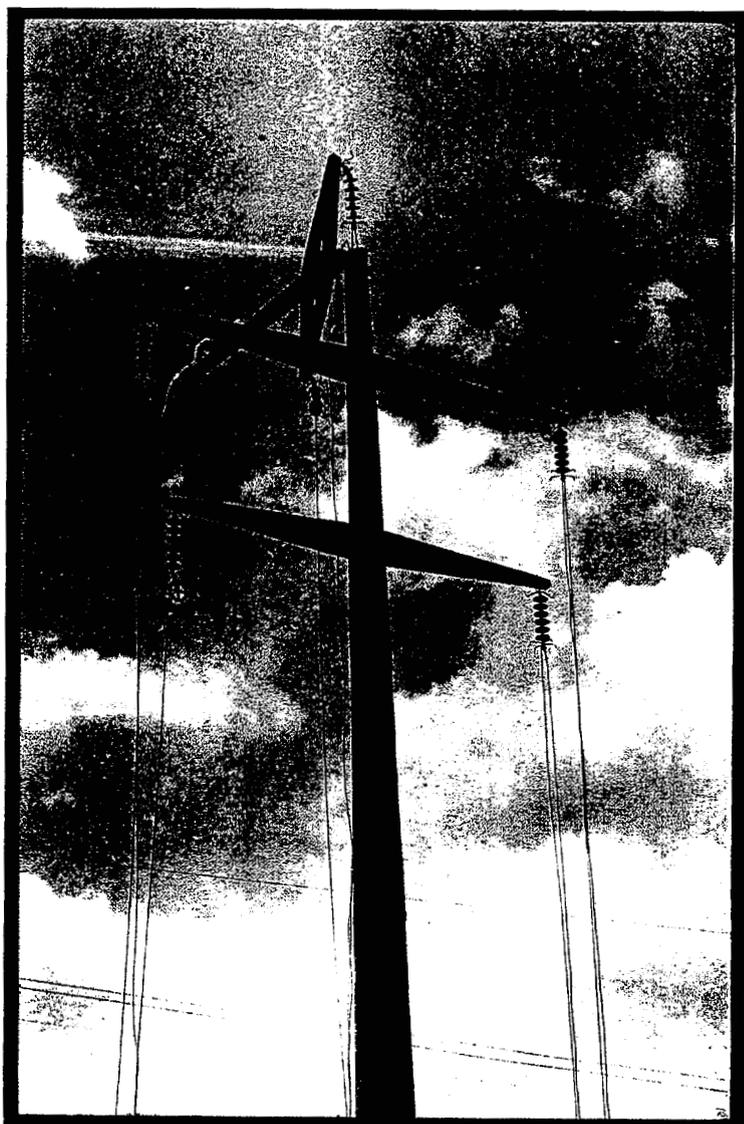
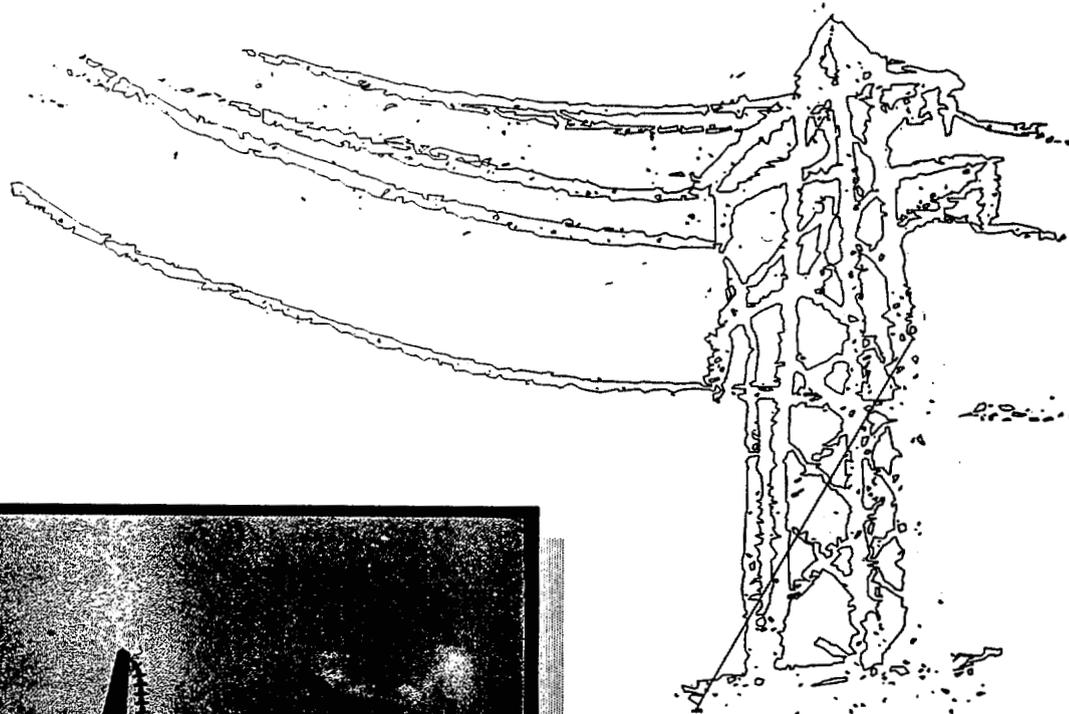
Place Križ, hill Biljačići - wider area of the town Zavidovići

TL is damaged at 12 points at the length of 3 km, 15 tons of the steel construction are knocked and 9 tons of ACSR conductors are fallen. Direct damages at this TL are estimated to the amount of 360.000 DEM.

Out of total 651 km, namely 73 TL of 110 kV located at the free territory, just 36 TL are in function. 105 km of TL is destroyed, 250 km is damaged, 189 tons of the steel construction are knocked with 200 tons of broken ACSR ropes. According to the insufficient information, direct damages at the 110 kV lines are estimated to 13,47 million DEM.



# RATNE ŠTETE



**DALEKOVOD 2x110 kV HE Jablanica - Mostar 1**  
Mjesto Prigradani - šire područje grada Mostara  
Dužina oštećenja 12 km, srušeno je 10 tona čelične  
konstrukcije i 50 tona Al-Fe užeta. Direktna šteta na ovom  
dalekovodu se procjenjuje u iznosu od 1,8 miliona DEM.

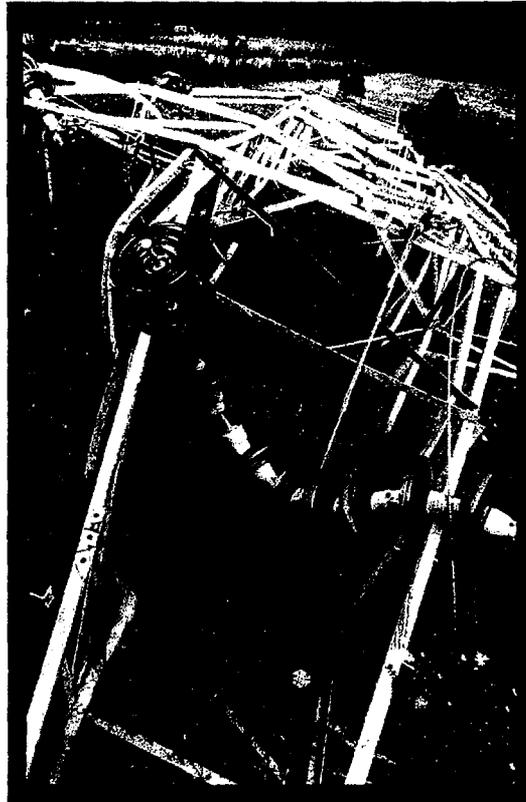
**TRANSMISSION LINE 2x110 kV Jablanica - Mostar 1**  
Place Prigradani - Wider area of the town Mostar  
The length of the damages at TL is 12 km, 10 tons of the  
steel construction and 50 tons of ACSR ropes are knocked.  
Direct damages at this TL are estimated to the amount of  
1,8 million DEM.

**DALEKOVOD 220 kV Tuzla - Zenica 2**

*Mjesto Pribitovići - šire područje općine Banovići*

*Dalekovod uništen u dužini 4 km, oštećeno je 10 km, srušeno je 80 tona čelične konstrukcije i 20 tona Al - Fe užeta. Direktna šteta na ovom dalekovodu se procjenjuje u iznosu 800.000 DEM.*

*Od ukupno 375 km, odnosno 17 dalekovoda 220 kV koji se nalaze jednim dijelom na slobodnom teritoriju u pogonu je 10, od čega se 4 koriste na nižem naponskom nivou. Uništeno je 19,5 km, oštećeno je 40 km, srušeno je 124 t čelične konstrukcije i 60 tona užeta. Prema nepotpunim podacima direktna šteta na vodovima 220 kV se procjenjuje u iznosu od 3,9 miliona DEM.*

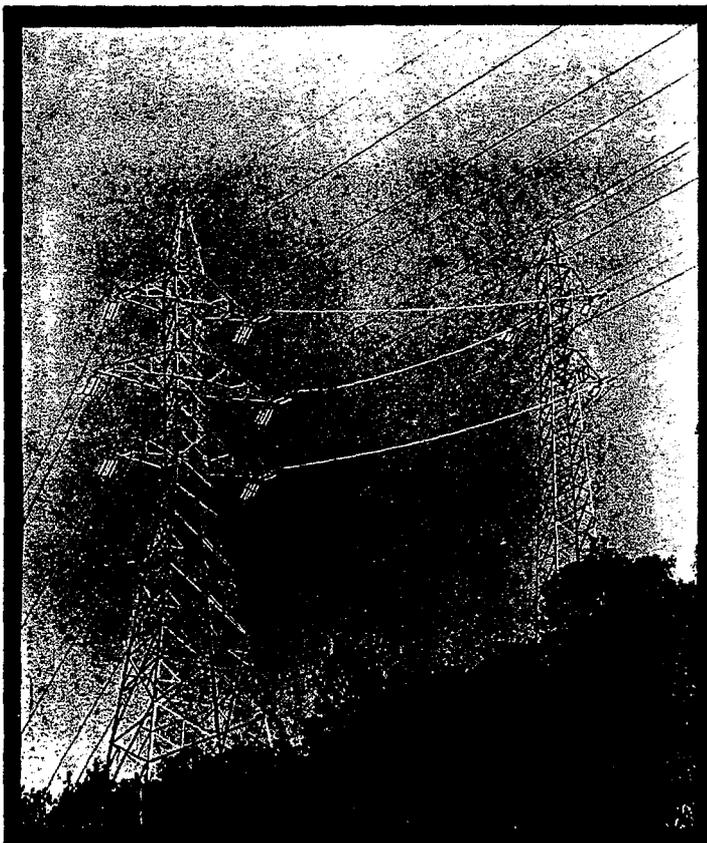


**TRANSMISSION LINE 220 kV Tuzla - Zenica 2**

*Section Pribitovići - Wider area of the town Banovići*

*TL is destroyed at the length of 4 km, damaged at the length of 10 km, 80 tons of the steel construction are knocked and 20 tons of ACSR ropes are fallen. Direct damages at this TL are estimated to 800.000 DEM.*

*Out of total 375 km, namely out of 17 TL of 220 kV partly located at the free territory, just 10 TL are in function, where 4 TL function at the lower voltage level. 19,5 km of TL are destroyed, 40 km are damaged, 124 tons of the steel construction are knocked and 60 tons of the conductors are fallen. According to the insufficient data the direct damages at 220 kV conductors are estimated to 3,9 million DEM.*



**PREMOŠTENJE DV 2x110 kV Jablanica-Mostar i DV 35 kV HE Grabovica - Mostar**

*Za obezbjeđenje minimalnih tj humanitarnih potreba potrošača električnom energijom vršene su razne improvizacije, premoštavanjem neoštećenog dijela mreža višeg naponskog nivoa i njenim povezivanjem sa mrežom nižeg napona.*

*U tu svrhu 70 km vodova 400 kV, 120 km vodova 220 kV i 79 km vodova 110 kV koristi se na nižem naponskom nivou.*

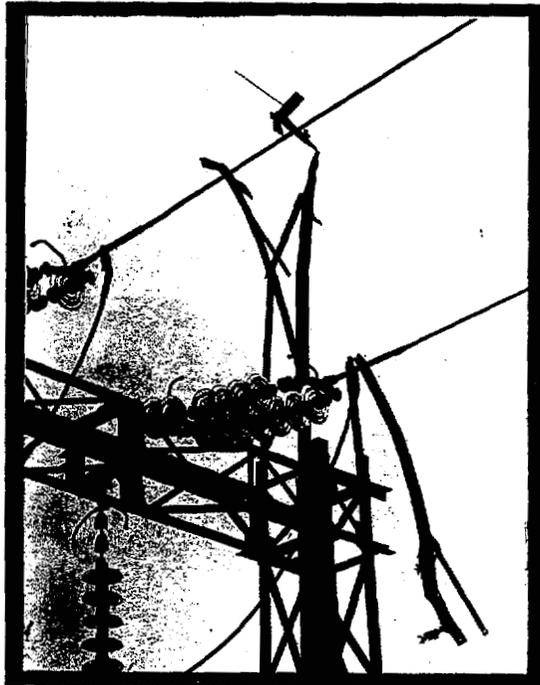
**CONNECTIONS of TL 2x110 kV Jablanica - Mostar and TL 35 kV HPP Grabovica - Mostar**

*Various improvisations, connections of the healthy network sections of the higher voltage level with the network of the lower voltage were performed answering the minimal humanitarian demands of the electric power consumers.*

*At the moment 70 km of 400 kV lines, 120 km of 220 kV and 79 km of 110 kV lines are in operation at the lower voltage level.*

1215

# RATNE ŠTETE



*TRANSFORMATORSKA STANICA 110/35/10 kV Maglaj  
Općina Maglaj  
Izlazni portalni stub 110 kV  
Ođvodno polje Zavidovići*

*TRANSFORMER STATION 110/35/10 kV Maglaj  
The area of the town Maglaj  
Exiting portal tower 110 kV  
Switchgear bay Zavidovići*

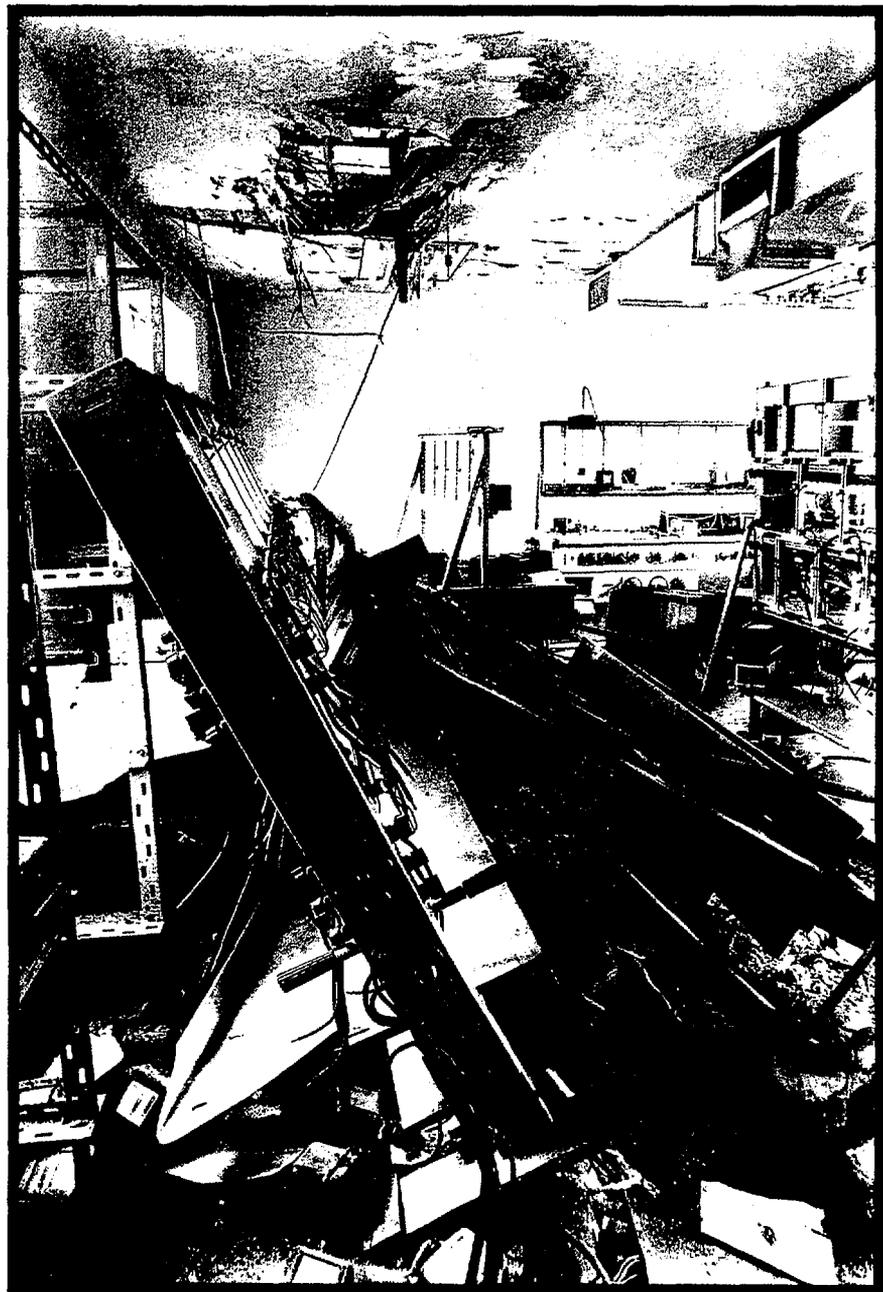


*OPĆINA GORNJI VAKUF - stub javne rasvjete  
Srednjenaponska i niskonaponska mreža su potpuno  
uništene.*

*Direktne štete na objektima "Elektrodistribucije" Zenica  
kojim pripadaju i objekti na općini Gornji Vakuf  
procjenjuju se u iznosu 31,65 miliona DEM.*

*Area of GORNJI VAKUF - public lighting pole  
MV and LV networks are totally destroyed.*

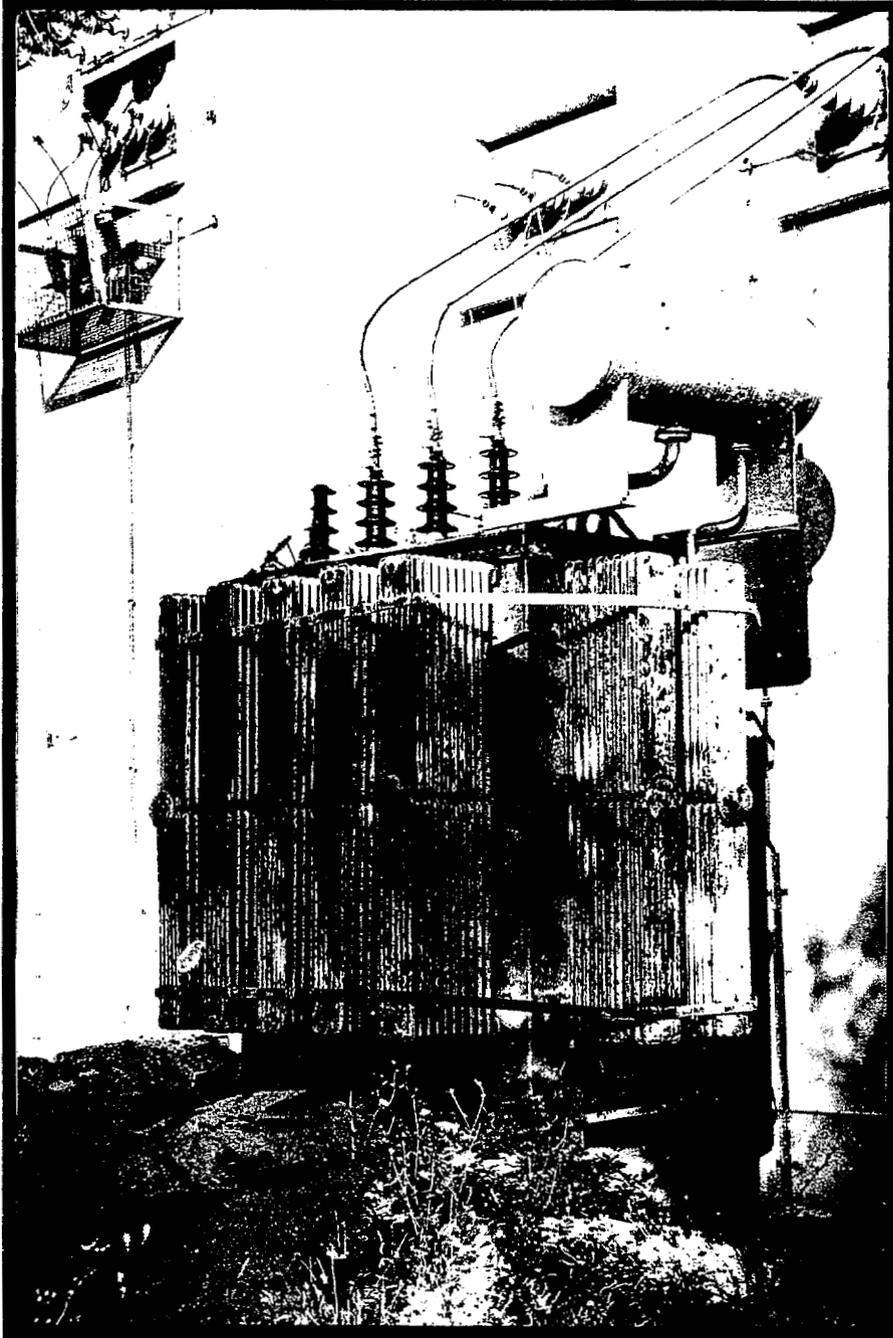
*Direct damages at the units of the electric power  
distribution in Zenica, together with the units  
located at the Gornji Vakuf area are estimated to the  
amount of 31,65 million DEM.*



**POSLOVNA ZGRADA  
"ELEKTRODISTRIBUCIJE" MOSTAR**  
Baždarnica  
Procjena ratne štete je u toku.

**ADMINISTRATION BUILDING OF  
"ELEKTRODISTRIBUCIJA" MOSTAR**  
Calibratation room  
The war damage estimations are under way.

# RATNE ŠTETE

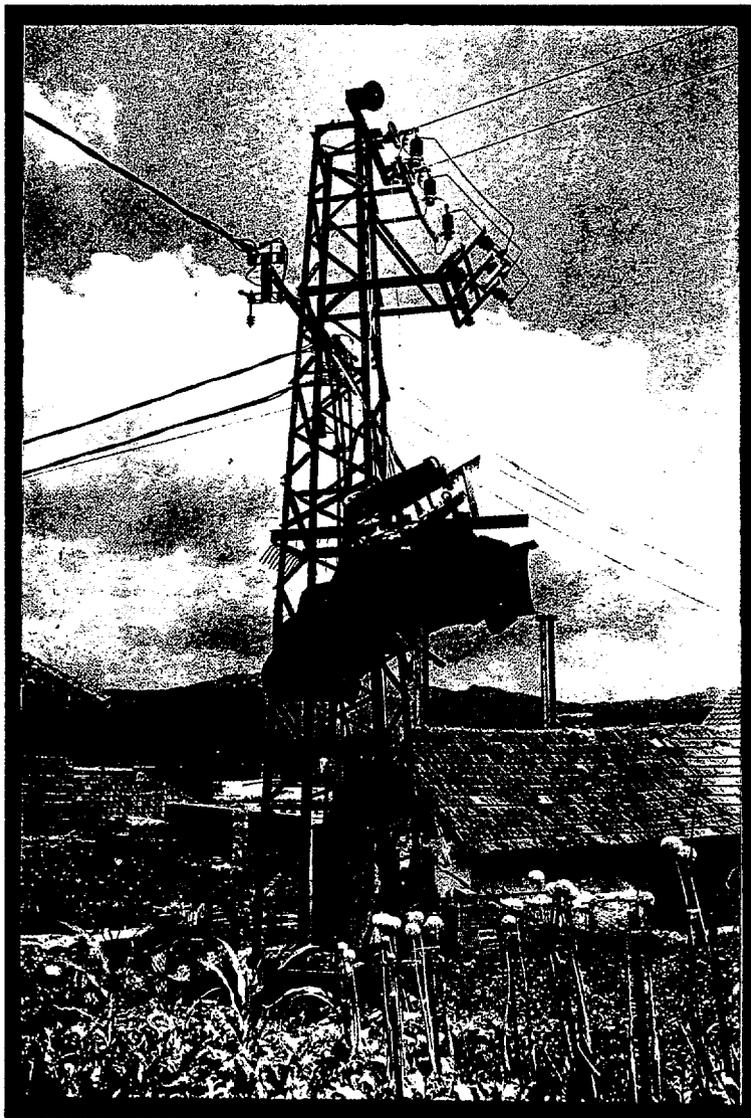
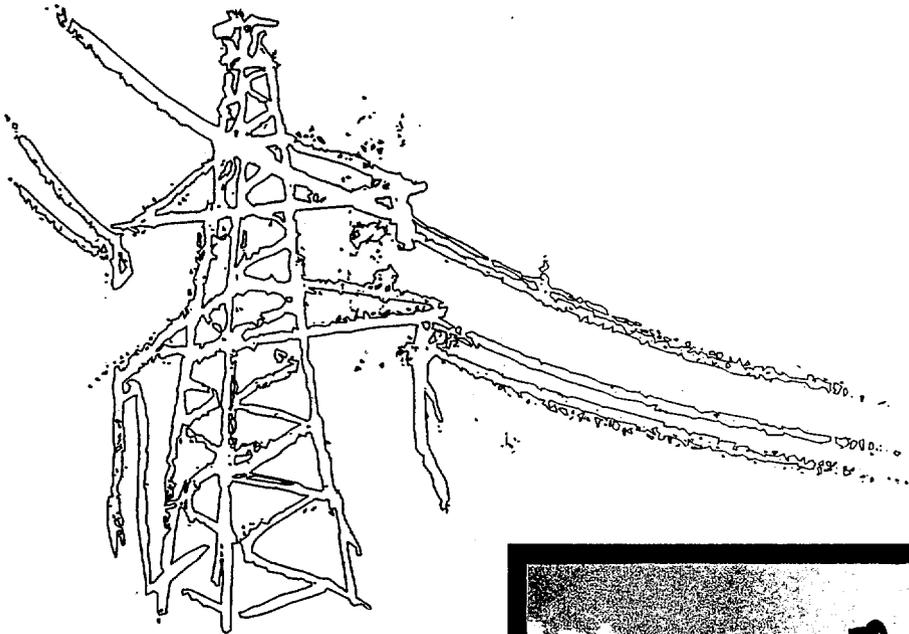


**TRANSFORMATORSKA STANICA 35/10  
kV Bijelo polje**

*Mjesto Bijelo polje - šire područje općine Mostar  
U Mostaru na lijevoj obali Neretve skoro u  
potpunosti je uništena srednjenaponska i  
niskonaponska mreža. Procjena štete je u toku.*

**TRANSFORMER STATION 35/10 kV Bijelo  
polje**

*Place Bijelo polje - Wider area of the town Mostar  
In Mostar, at the left bank of the river Neretva,  
MV and LV networks are almost  
completely destroyed. The damage estimations are  
under the way.*



**TRANSFORMATORSKA STANICA 10/0,4 kV, 250 KVA,**

*Mjesto Hrasnica - šire područje grada Sarajeva*

*U gradu Sarajevu oštećeno je preko 300 transformatorskih stanica 10/0,4 kV.*

*Direktna šteta na transformatorskim stanicama srednjeg i niskog napona u Sarajevu se procjenjuje u iznosu 16,5 miliona DEM.*

**TRANSFORMER STATION 10/0,4 kV, 250 KVA**

*Place Hrasnica - Wider area of the town Sarajevo*

*In Sarajevo over 300 transformer stations of 10/0,4 kV are damaged.*

*Direct damages at TS of MV and LV located in Sarajevo are estimated to the amount of 16,5 million DEM.*

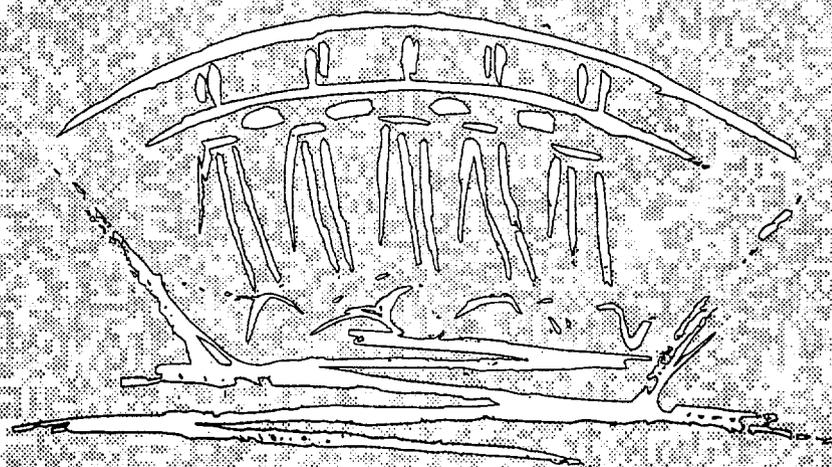


Public Enterprise Elektroprivreda of  
Bosnia and Herzegovina LTD Sarajevo

Address: B&H, 71000 Sarajevo, Omladinsko šetalište 20  
Phone exchange: 071 65 17 22

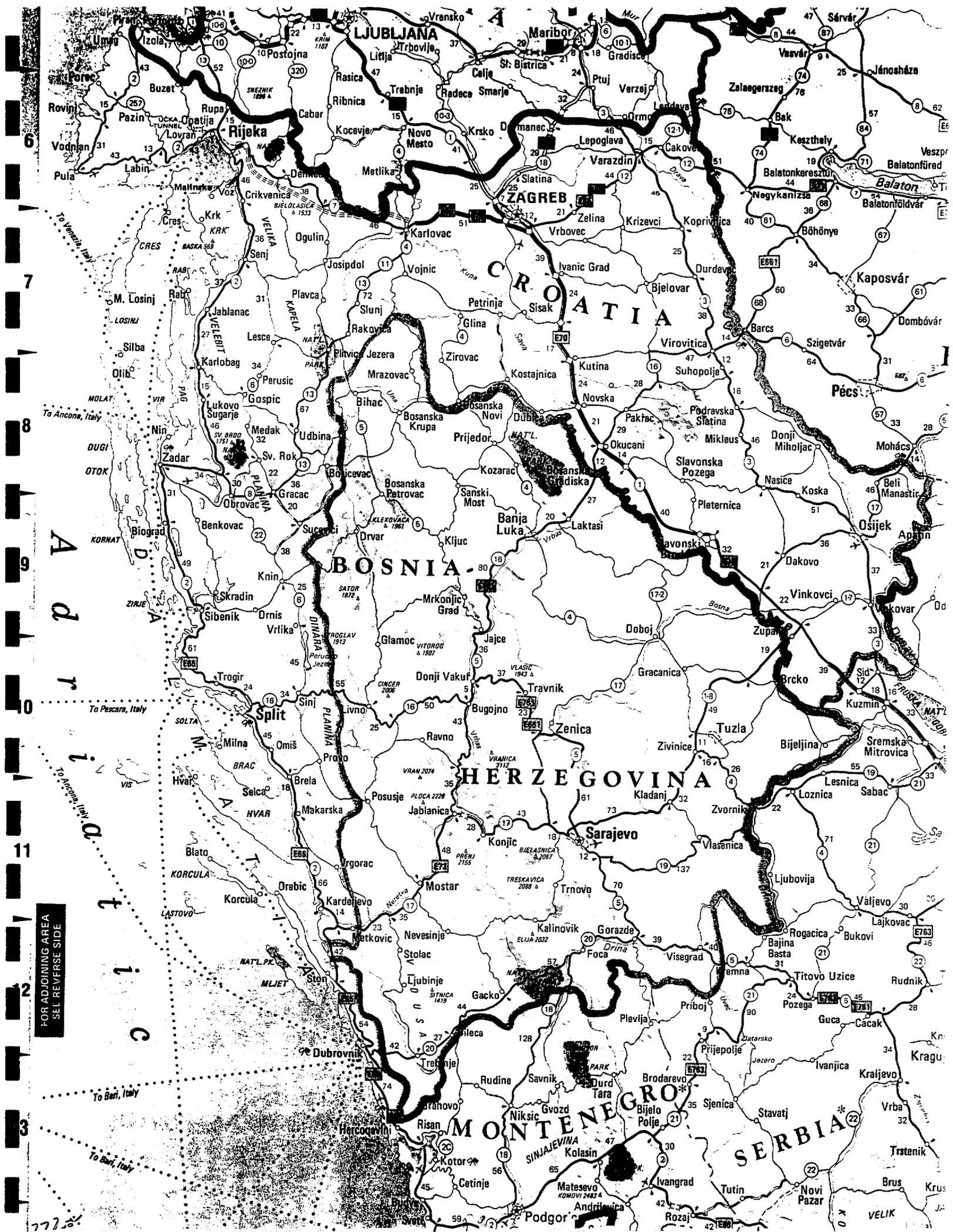
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August, 1994.



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**Attachment 11**



FOR ADJOINING AREA  
SEE REVERSE SIDE

6  
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**Attachment 12**

## **Proposed USAID-Funded Energy Assistance to the Republic of Bosnia-Herzegovina**

### **Summary**

USAID's energy assistance to Bosnia will be designed to meet the following objectives:

- 1) Contribute to the urgent task of restoring electric power to communities and businesses as soon as possible, by providing financial support and equipment for reconstruction of municipal energy infrastructure;
- 2) Assist the Bosnian electric power sector to identify least-cost solutions to supplying the energy needs of a modern market economy;
- 3) Promote reunification and reconciliation within Bosnia as well as economic efficiency through reintegration of the component parts of the Bosnian electrical system and its organizations;
- 4) Assist local government organizations to establish transparent and participatory community development procedures through development and implementation of reconstruction projects.

The program will have three major components:

- 1) Support for repairs and equipment for local and regional electricity distribution systems in selected regions (\$5-10 million from the budget for municipal rehabilitation);
- 2) A comprehensive Joint Electric Power Alternatives Study covering all parts of the Republic of Bosnia & Herzegovina, to include alternative demand scenarios, least-cost supply options, strategies for restructuring/ privatization, environmental improvement, promotion of investment in private power, linkages to other systems in the Balkan region, as well as pre-feasibility analyses of the most promising supply projects (\$1 million); and
- 3) Targeted technical assistance, training, exchanges and partnerships to strengthen electric power institutions and personnel, and to develop legal and regulatory reforms (\$2 million).

### **Program Description**

1. **Repairs and Equipment** (\$5-10 million funded under the Municipal Rehabilitation Program)

The Bosnian electric power system has suffered extensive damage during the war, due both to deliberate destruction and to interruption of maintenance. The World Bank and the European

Bank for Reconstruction and Development have identified repair and reconstruction needs of the Federation amounting to \$330 million over three years, of which nearly half is needed in the first year to restore minimum levels of service to the Bosnian people. Officials of the Bosnian electric company serving predominantly Bosniak areas (one of three companies formed through the regional disaggregation of the national electric utility during the war) believes this estimate to be significantly too low. Estimates for the Republic of Srpska have not been developed.

The major capital requirements for overall reconstruction of the electric power sector are expected to be met primarily by the Banks, but USAID assistance is needed to help jump-start the program at key points through the provision of commodities and assistance with repair of local system components. USAID will concentrate on the transmission and distribution systems, particularly the latter, in selected cantons coinciding with the regional focus of our municipal rehabilitation program. Repairs to the overall distribution system will require nearly half the total system investment, but USAID's contribution, mostly in equipment, will amount to only \$5-10 million, depending on the availability of funds.

Candidate regions include the following:

Tuzla: Predominantly Bosniak, but close to Serb demarcation line; site of major thermal power plant and coal mine, and location of the major concentration of U.S. troops;

Zenica/Kakanj: Predominantly Bosniak, site of major thermal power plant and coal mine, and location of U.S. troops;

Sarajevo: Multi-ethnic population center and site of major damages in distribution system;

Middle Bosnia: Several multi-ethnic communities and site of major damage and initial USAID-sponsored reconciliation efforts;

Mostar: Divided city of Croat and Bosniak communities, but also site of significant EU-funded infrastructure reconstruction activities and U.K. troop deployment;

A Srpska area to be determined (possibly Banja Luca), if feasible and consistent with U.S. policy.

It should be noted that the above areas are currently served by three different electric utilities, as a result of the breakup of the nationwide company, Elektroprivreda Bosnia & Herzegovina (EPBiH), along ethnic lines. EPBiH now serves predominantly Bosniak (Muslim) areas, while Elektroprivreda Herzeg-Bosna covers Croat areas and a third entity, Elektroprenos, covers the Republic of Srpska.

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For emergency distribution repairs, it is likely that for the most part donors will need to work with these entities separately, although every effort should be made to promote their early reintegration. It is clear that least-cost solutions to electric supply needs for the future require reintegration of the nationwide system.

Lack of sufficient generating capacity and fuel during the war led to widespread electricity outages, unreliable supply and rationing by rolling blackout, which require repeated switching of circuits in and out of service. This excessive switching has led to damage and failure of much of the medium voltage switching equipment (10 kv circuit breakers), as well as cable failure due to intermittent overvoltages caused by the switching. Transmission line towers were also the frequent target of shelling, since their destruction could take a whole line out of service and cut electricity supply to targeted populations.

Following is a list of typical projects needed to restore essential service to both household and industrial consumers:

Tuzla-Zenica 220 kv Transmission Line: This line links two important population centers and power plants. It must be completed early to allow improved system reliability in the Zenica area and to enable stable system operation with both Tuzla and Zenica coal-fired power plants on line.

Tuzla Distribution System: The 10 kv overhead system in this area has been extensively destroyed. While the 10 kv cable network in town is relatively intact, the overhead lines are needed to restore service to the outlying villages in the area.

Zenica Distribution System: The situation in Zenica is similar to Tuzla. The 10 kv overhead system must be restored to bring service to the surrounding villages.

Sarajevo Distribution System: The Sarajevo system received more damage (and more publicity) than any other major population center in Bosnia. Eight of the nine lines serving the city were cut off, with the one remaining line operating unreliably. The complete lack of maintenance, direct wartime damage to facilities, and severe stress on the equipment in service due to extreme operating conditions have left the city vulnerable to massive system failure. The 10 kv and 400 volt facilities in the city, and the 110 kv lines feeding the city, are in urgent need of replacement or repair.

Banja Luca: In the event that community rehabilitation becomes possible in Serb areas, Banja Luca is a candidate for high-priority attention. This area of Bosnia was underdeveloped before the war, and had only a sparse electrical network to begin with. The damaged facilities here provide an opportunity both to restore essential service and to rationalize line routes and service territory.

## USAID's Role

USAID's primary role in the reconstruction of these key distribution facilities will be to help selected cantons to import the necessary equipment. The Bosnian utilities enjoy a high level of technical competence and should be able to carry out the necessary repairs themselves. Ordinary labor should not be a problem, particularly as the Bosnian Army demobilizes. Loss of technical staff due to the conflict has been a significant problem, however. The value of the equipment will be enhanced with a modest level of technical assistance in the areas of distribution system design, construction and equipment standards, and some funds will be reserved for that purpose. In general, however, it is expected that the Bosnians will carry on with the direct repairs on receipt of the equipment.

## Equipment

Before the war, Bosnia supplied most transmission and distribution equipment from factories in Bosnia and other parts of Yugoslavia. It has not yet been possible to determine if or when these factories can resume their production of electrical equipment. Because of this, emergency imports of equipment should be provided immediately. Because the needed equipment is standard throughout the system, it is not necessary to wait for firm decisions about the location at which it will be used before beginning procurement, although every effort should be made to complete such decisions before the equipment arrives in country.

The required equipment includes:

- \* 10 kv and 400 volt overhead line and cable;
- \* 220 and 110 kv circuit breakers;
- \* 220 and 110 kv line conductor and towers;
- \* instrument transformers;
- \* 110 kv/10 kv substation transformers;
- \* 400 volt distribution transformers;
- \* station and line insulators;
- \* disconnect switches and fused disconnects;
- \* 220 and 110 kv and 10 kv surge arresters; and
- \* bus work, tools and vehicles.

Financing for these items would be provided from the balance-of-payments support to the central government envisioned for the municipal rehabilitation program. The municipalities responsible for the local distribution systems will receive block grants from the central government for these reconstruction projects, as for those in other sectors of municipal infrastructure. Host-country procurement would be used, with normal oversight and audit requirements. U.S. source and origin requirements would apply unless waived.

## 2. Bosnian Joint Electric Power Alternatives Study (\$1 million)

USAID is well-equipped with immediate access to the expertise needed to undertake an analysis of Bosnia's future electric power supply options, a prerequisite to decision-making on major investment projects. This study, while focused on the medium term, is an urgent priority because it is closely tied to current decisions about renovation of existing power plants, modernization or closure of related coal mines, negotiation of long-term gas supply contracts with Russia and other potential suppliers, and restarting or closure of major industries that comprise a major share of electricity demand in normal times.

It is very clear that technical and economic efficiency and full power access for all communities can best be achieved through reintegration of the three electric power entities into a unified grid under a single control center capable of accessing all fuel sources, generating capacity and transmission lines in Bosnia & Herzegovina. Thus this study has the potential to foster early technical cooperation among the three ethnic communities, if staff of all three utilities can be included in the work of the study with a view toward eventual institutional and system reintegration.

Experience with a comparable study in Russia demonstrates the value of a fully collaborative approach, using joint U.S.-client country teams at every step. By gaining hands-on experience supported by technical assistance and training in methodologies such as least-cost analysis and optimization modelling, the users of the study will "own" both the process and the results far more readily than if presented with a turnkey study.

### Terms of reference

The study would include analyses of the following:

- \* Alternative demand scenarios;
- \* Alternative fuel sources and generation technologies for new capacity investments;
- \* Import and export of power;
- \* Potential supply contribution of private power producers;
- \* Development of restructuring plan for Elektroprivreda;
- \* Pre-feasibility analyses of leading projects appropriate for foreign investment (to be conducted under auspices of TDA);
- \* Cost-effective strategies for environmental improvement.

Work on this study could begin immediately, using ENI/EEUD's existing contracts and budget for energy assistance in Eastern Europe, with further allocation of funds from the Large Infrastructure line item of the Bosnia assistance budget.

3. Institution-building and Legal/Regulatory Reform (\$2 million)

Training and Exchanges: To become an economically efficient supplier of electric power to a modern market economy, the Bosnian utility needs to build a cadre of staff who are well-versed in such methodologies as:

- \* Pricing theory and practice (tariff design);
- \* Load forecasting;
- \* Private power purchase;
- \* Investment project preparation;
- \* Legal/regulatory requirements for electric power in a competitive environment;
- \* Accounting, billing and collection;
- \* Environmental regulation and market approaches to pollution reduction.

Most such training should take place within Bosnia. Initial reconnaissance indicates that the Institute of Electroenergetics might be a suitable institution to provide such training with technical assistance in the development of curriculum, initial training of trainers and one or two initial cycles of the training programs.

It would also be very useful to provide Bosnian utility and energy ministry staff -- particularly those who will be involved in the Bosnian Joint Electric Power Alternatives Study (BJEPAS) - - with exposure to the operations of U.S. electric utilities, through either the Utility Partnerships program of USEA or through utility consultancies under ENI's energy contracts. These mechanisms can support short-term study tours, technical training programs and internships in the U.S. It may also be appropriate to offer study tours on specific topics in other Central European countries with more market-oriented electric power operations, such as Poland, Czech Republic or Hungary.

Institutional Development: Bosnia will require an independent regulatory commission for electric power. The commission would assume responsibility for setting rates instead of the Ministry of Energy, using economic principles including long-range marginal cost, moving fairly rapidly to a tariff structure that would place Elektroprivreda on a sound financial footing and make provision for future investment. USAID will provide technical assistance in drafting the enabling law for the commission and in making the commission operational.

Assistance will also be provided in drafting additional energy legislation such as provision to authorize purchase power from private producers or direct private foreign investment in electric power.

Pamela Baldwin and Charles Smith  
Sarajevo  
December 11, 1995

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**Attachment 13**



**U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT  
AMERICAN EMBASSY SARAJEVO  
BOSNIA AND HERZEGOVINA**

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**Mission Director:** Craig Buck (Actg)

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**USAID Address:** American Embassy Sarajevo  
Alipašina 43

**Embassy Telephone Numbers:** 659-969, 659-743, 445-700

**Embassy Address:** Alipašina 43  
Sarajevo

**Doctors (English speaking):** There is no private medical practice in Sarajevo. However, Srđan Gornjaković, MD, can be contacted for assistance at any time [REDACTED] but he can also be contacted at Clinical Center "Koševo" phone 663-611, ext. 758.

**Hospitals:** Medical Center "Koševo"  
telephone: 663-611

General Hospital "Državna bolnica"  
telephone: 664-724

Hospital for Pulmonary Diseases  
"Podhrastovi"  
telephone: 535-344

UN Hospital  
telephone: 460-611, ext. 5521

**Dentists:**

Mirsad Tokić  
La Benevolencija 14  
telephone: 643-182  
home: 445-815

**First Aid:**

telephone: 611-111

**UN Airport:**

telephone: 460-611, ext. 5802

**Hotels:**

Holiday Inn  
telephone: 664-273  
telefax: 663-862  
Address: Zmaja od Bosne 6A

Bosnia  
telephone: 471-251  
Address: Kulovića 9

**Taxis:**

No radio taxi service is available in Sarajevo but hotel receptionists can be asked to call a taxi

**Banks:**

Banks that are recommended for exchange of US Dollars to German Marks are:

- BH Banka
- SAAB Banka

behind events to try and destabilise the oil deal.

Aliyev reacted quickly to the threat to his year-old regime and by Azeri standards the "coup" was a small affair. Importantly Aliyev has declined to blame Moscow instead citing "dirty forces" within the Azeri regime. Indeed one theory was that Aliyev had orchestrated the whole affair in order to clamp down on internal opposition and ensure the deal with the consortium is ratified by parliament.

While all this was going on Russia was trying to clarify exactly where it stood on the signing following the negative response from the foreign ministry last month. The foreign ministry refused to recognise the deal but has not indicated that it will try and block it. One Azeri official described events as a game which will not affect the deal. Indeed the Russians have begun to focus on future events and officials have indicated that Russia backed the idea of setting up a committee to monitor the development of natural resources around the Caspian.

Speaking as talks on joint development of resources around the sea started in Moscow, Peshkov said the idea of a committee was proposed two years ago by Iran, which until the collapse of the Soviet Union in 1991 shared the sea only with Russia. However, the new states suspect Moscow's proposal for a regional committee masks a desire for more control of the sea itself.

They want to delay discussing questions of cooperation until they have mapped out each country's legal share of the sea and safeguarded their own rights. "Before talking of any collaboration in resource development, we have to determine what the Caspian Sea really is," Azerbaijan's deputy foreign minister Araz Azimov said. "This is a delicate issue and we must be careful not to force the pace," he added.

He stressed that Azerbaijan was not opposed to collaboration altogether, but ruled out giving Russia any new leverage in economic decision-making. "For the moment it must be limited to such fields as environment policy," he said. Russia's view is that each country should claim fishing rights only over a 10-mile-deep stretch of the Caspian rim, but that the whole central sector should be commonly held.

This would give Russia more access to the sea's fishing, caviar and mineral wealth. Other states prefer the idea of dividing the sea into wedges called "closed water reservoirs" which each country would administer individually. Azimov said setting up the regional body would lead to dividing the sea in the way Russia wants. Whatever the outcome it is clear that it will be some time before another mega-Caspian deal will be signed and when it is, it is equally clear that Russia expects to have more than the 10% stake held by Lukoil in the Azeri fields.

## ***Bosnia begins assessing damage with EU help***

A mere 5-10 km cuts off the Tuzla region, Bosnia-Herzegovina's (BH) most important industrial basin, from direct access to free Croatian territory to the north and the rest of the world. But this stretch, the 'rcko corridor' is also strategically vital to the Serbian side for supplying its forces and people in northern and western BH and most of the occupied areas of Croatia.

It has consequently been hotly-contested unrelentingly for the past two years and more. Military strategists on all sides see it as potentially the site of the biggest conflict in the war in BH, and its most deadly in view of the highly sensitive chlorine-based industries in the hinterland.

So when a 60-man delegation headed out of Tuzla in mid-September on its first major economic mission since the war started in 1992 it packed into buses and travelled south to the Adriatic coast, and then swung back up north to reach the Croatian capital Zagreb and then Ljubljana in Slovenia. Instead of the prewar 3-4 hours, the trip to Ljubljana took an exhausting 24 hours, the President of the Tuzla Chamber of Commerce Imsir Imsirovic, told *EEE* in Ljubljana.

Before the war started Tuzla generated an estimated 25% of BH GDP. Now, its greatest problem, after active defence, is logistics rather than war damage. The region's heartland has escaped any major battles or attacks by the opposing Serb forces, so that its industrial capacities are largely intact but generally unable to operate because of lack of energy, feedstocks or basic spare parts and equipment. Imsirovic reports that the Soda So salt mines and the Chlor-Alkaline Chemical Complex are operating at conservation levels but are undamaged, similarly the Lukavac cokery, the many food-processing and metal-working factories.

There has been no serious war damage to the Titovi Rudnici, Banovci, lignite and brown coal mines. This complex of pit and new open-cast mines produced over 9mt/yr before the war. They fed the nearby 300 MW Tuzla electricity station, as well as other stations and customers throughout the former-Yugoslavia. At present the electricity station is operating at about 20% of capacity solely because of inadequate coal deliveries. The coal mines in turn are short of production materials and spare parts.

A major drive has been mounted to get urgent deliveries of these either as donations or on long-term counter-trade arrangements. In particular, the BH government in Sarajevo is proposing to restart traditional electricity deliveries to the Croatian and

Slovenian utilities. In early summer this year it placed all mining and energy capacities, and defence-related industries, on a wartime regime under its central control.

Imsirovic reports that transmission lines to take electricity southwards from Tuzla and across into Croatia at the interconnection with Dalmatia are already operational. Recently, the Ram hydroelectric station on the upper Neretva was recommissioned and began exports to Croatia along this line. Now 'packet negotiations' are under way with the utilities in Slovenia to restart power supplies there as well.

The electricity sector is considered to be BH's biggest export hope, the sector that can be revived and start earning the fastest. The greatest part of war damage has been to the transmission and distribution system. At the end of 1993 this damage (on government-held territory) was roughly estimated at DM300m, and the great majority of hydroelectric and thermal electric stations have so far come through without serious damage.

On the other hand, domestic demand is very truncated. In 1993 it is officially estimated, on scanty and hence not very reliable information, that industry was operating at a mere 4% of prewar levels, and 1993 GDP was about \$1-1.5bn compared to between \$8.5-9bn in the last relatively normal year, 1989.

#### *Attempts to revive Mostar*

Two particular areas were earmarked as international protectorates for a practical start in bringing BH back to life: the besieged Sarajevo, the prewar BH capital city, and the municipality of Mostar.

Mostar was a growing industrial centre in southern central BH straddling the swift, deep Neretva river until it was air-bombed by the Yugoslav People's Army in 1991, and subsequently shelled by changing sets of 'defenders' on different banks for the next 2-3 years. Today it is a divided Croat-Moslem city of rubble and ruin piled high with unexploded grenades, mines and sundry munitions. Metre-for-metre war damage in Mostar is higher than in Sarajevo, Spanish UNPROFOR peacekeepers told *EEE*.

But it is also the EU's first-ever 'administered city'. Under a Memorandum of Agreement with several 'receiving parties' administration of the municipality (or up to the active confrontation line with the Serbian forces, only 6km away in places) has been entrusted for the next two years to former mayor of Bremen, Hans Koschnik and a mixed staff of EU advisors and local department directors. The EU has approved a Ecu60m budget, and sent a first tranche of Ecu20m, for a two-year programme of reconstruction and ethnic reconciliation.

Reinhard Giesen, Administrative Head of the EU Administration (EUA) which has established its headquarters in the repaired and refurbished Ero Hotel (tel/fx 387/88 311 024), confesses that the past two months have mostly been spent on maintaining the peace and a dialogue between the Moslems on the east and the Croats on the west bank. Only the most basic emergency repairs have so far been tackled, like stringing a couple of 10 kv lines across to the east bank and most importantly, building a road bridge to link up the two parts of the old town.

#### *Policy choices remain open*

Project planning is only getting under way, no master reconstruction plan has yet been drawn up and policy choices are still fairly open. For now though a decision has been made to rely maximally on national EU-member aid organisations and the 60 or so NGOs already present in getting ground-level emergency repairs organised. Germany's TWH (federal Agency for Technical Relief), the UK's ODA, the Danish Refugees, Spain's Without Frontiers, the International Rescue Committee from the US, etc, have all set up will be called for sizeable projects through the usual EU channels, Giesen told *EEE*, but a lot of the contracting will be on-the-spot. Policy will be to maximise local inputs, which of course will mostly mean labour and skills. Home reconstruction for example will be geared to securing materials and providing backup to home-owners doing their own repairs.

The ODA, which now has five field engineers posted in major BH cities (Tuzla, Zenica, Sarajevo, Gornji Vakuf and Mostar) and a procurement office in Split (Tel: 385/58 894 009), has been handling the emergency energy repairs. ODA's Tom Connally (Tel/Fax: 387/88 642 474) has been around since early April and already has a long list of urgent electricity jobs. He is presently overseeing repair and rehaul of 16 electricity maintenance vehicles including cherry-pickers; a 10-04 kv electricity grid and transformer station on the west bank; repairs to the hospital electrical system – and he could do with spare parts or replacements. Once a job is diagnosed, materials are requested from Procurement in Split.

High on the ODA list next is taking the 110 kv lines across to the east bank and generally getting more power into what was a well-developed fully integrated city system before by multiplying distribution lines. Jobs on his emergency agenda: on the West bank – repair or replacing 10-15 transformers of 50-1000 kv (estimated cost DM50,000 minimum); repair and replacement of 10 kv underground cable (DM300,000) and 10kv and 35 kv overhead cables (over DM1m); repairs to the low voltage underground (DM50,000) and overhead

grids (DM150,000) and replacing some 40-50 10-0.4 kV transformers (DM220,000) (and probably about 350 in all in the end). On the east bank he has already identified: repair of the Opine and Zalik transformers (DM300,000) and repairs to the grid (DM16m).

The status has yet to be diagnosed of the five upstream hydro stations, of which three are damaged but producing and two are down and appear to be seriously damaged, like the major Cula and Rastani switch-yards.

## **Russian marketplace hots up**

It has been a busy month in the internal Russian oil scene with more hectic trading of shares and the unveiling of new means for firms to sell shares. However, the focus of much activity this month has been the latest issue of shares in Surgutneftegaz which is in the process of issuing 282.06m shares at a face value of R1,000 each.

The offer is the third by the vertically-integrated firm but was only advertised locally from 1 October. Deputy manager for privatisation Vladimir Gribanov said the issue had been registered with the local finance and tax committee for Khanty-Mansiisk district. Surgutneftegaz is simultaneously revaluing its capital, giving existing shareholders 64 new R1,000 shares for every R1,000 share held previously. These shares have been redenominated from an original R250 face value. This involves the issue of a massive 3.79bn ordinary shares and 1.26bn preferred shares, Gribanov said.

Before these issues, Surgutneftegaz had a share capital of only R14.7bn, comprising 58.8m ordinary shares with a face value of R250. Financial consultants AK&M, who track the share prices of 1,300 Russian companies, said these existing shares were quoted at R45,971 bid and R87,413 offer recently.

Oil shares have been among the most dynamic on the emerging Russian stock market this summer, although many have fallen sharply from recent highs over the last week. Yet it is clear that shares in the oil firms are in high demand generally. Shares in Yuganskneftegaz have increased in value from \$1.10 when they were issued in January last to \$57.50 towards the end of September. Shares in other companies such as Lukoil and Surgutneftegaz have also surged and the flow of foreign capital into the Russian market is booming.

In another move designed to speed up the privatisation process, Russia's energy ministry plans to transfer stakes in dozens of oil companies to 10 major oil groups and make it easier for oil compa-

nies to issue shares, under a restructuring of the industry, a ministry official said. The ministry has drawn up detailed proposals of which government stakes should be transferred to which companies, and this will be submitted to the cabinet in October, the official said.

The programme will also involve a decree from President Boris Yeltsin freeing the oil industry from a rule stipulating that companies in which the state owns more than 25% may not issue shares following their initial privatisation. The state owns more than 25% in most of the large vertically integrated oil companies. The major oil groups receiving the stakes will not have to pay for them. The distribution was negotiated to take account of the groups' regional interests and technical specialisation.

The 10 groups are - Lukoil, Yukos, Surgutneftegaz, Sidanco, Vostochnaya Neftyanaya Kompaniya, Vostochno-Sibirskaya Neftgazovaya Kompaniya, Nefteotdacha, Slavneft, Orenburgskaya Neftyanaya Kompaniya and Komitek Holding. Yukos vice-president Gennady Lebedev said his group would receive the state's 38% stakes in Samaraneftgaz, Krasnodarneftgaz, and Voronezhnefteproduktavtomatika as well as in Belgorodnefteprodukt.

These stakes give voting control in the companies, as they are all ordinary voting shares, and 25% of the companies' capital is in the form of non-voting preferred shares, he said.

In another development on the quickly changing scene, the oil producing company Samaraneftgaz, formerly Kuybishevneft, has decided to merge with the country's second biggest oil conglomerate Yukos, a spokesman for Yukos said. "We are expanding ... and will now produce oil in the Volga region," the spokesman said. The spokesman said that under the merger, agreed recently, Samaraneftgaz would become the second production unit of Yukos along with Yuganskneftegaz.

He said the merger was approved by Fuel and Energy minister Yuri Shafranik and first deputy prime minister Oleg Soskovets. Amoco Eurasia, a subsidiary of US Amoco, won a tender last year to develop the Priobye oilfield in southwestern Siberia along with Yuganskneftegaz. Yuganskneftegaz produced 32mt of oil last year. Kuybishevneft oil output for 1993 was 10.6mt.

• Russia's Komineft oil company is preparing a second share issue to raise cash for investment, an official handling the privatisation of the far northern company said. The official, Alexander Muravlyov said that 5.3% of shares unsold from the company's first issue earlier this year would be placed on the local market on 20 October. Komineft produced 9.3mt of crude oil in 1993.

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**Attachment 14**



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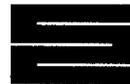
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Zenica, Gornji Vakuf, Sarajevo, Novi Travnik - Bosnia & Herzegovina  
Split (Podstrana) - Croatia



REPUBLIKA BOSNA I HERCEGOVINA  
Ministarstvo vanjskih poslova

**Prof. dr Fahrudin ŠEBIĆ**  
pomoćnik ministra

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SARAJEVO  
Fuada Midžića 19  
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SARAJEVO Omladinska 7  
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Public Enterprise Elektroprivreda of Bosnia and Herzegovina LTD Sarajevo

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**IMG - IBH**  
INTERNATIONAL MANAGEMENT GROUP  
INFRASTRUCTURE FOR BOSNIA AND HERZEGOVINA

**Pierre Verstraelen M.Sc**  
Water & Sanitation Coordinator BH

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**ETF SARAJEVO**

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**JP Elektroprivreda BiH, Sarajevo**  
Public Enterprise for Generation,  
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**Elektroprenos - Sarajevo**  
Transmission and transformation of Electric Power

**M.S.EE MARKOVIĆ OGNJEN, B.Sc.EE**

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Sat/fax: 00-871-1517330

technical manager  
Phoness:  
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**DRUŠTVENO PREDUZEĆE**

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**SOUR 'ELEKTROPRIVREDA BIH' SARAJEVO**  
RO TERMoeLEKTRANA 'K A K A N J'  
72246 CATIĆI Telex: 43147 YU TEKA

**ŠABANOVIĆ ENVER, dipl. maš. inž.**  
glavni inženjer

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Posao:  
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**AČIĆ HADROVIĆ**

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**Attachment 15**

November 30, 1995

**LIST OF CONTACTS (WORKING DRAFT)  
BOSNIA-HERZEGOVINA PROJECT PREPARATION MISSION**

**I. THE WORLD BANK**

1. Mr. Hans J. Aplitz, Division Chief, Infrastructure Division  
Phone No: 202-473-2954
2. Ms. Mary Sheehan, Country Officer, Bosnia & Herzegovina  
and Ms. Ines Fraile, Country Officer, Bosnia & Herzegovina  
Phone No: 202-473-9383
3. Mr. Dick MacEwen, Senior Sanitary Engineer (Water)  
Phone No: 202-473-2497
4. Mr. Hank Busz, Principle Financial Officer (Energy)  
Phone No: 202-473-2686
5. Mr. Maurice Dickerson, Consultant (Transportation)  
Phone No: 804-438-5915

**II. EUROPEAN BANK FOR RECONSTRUCTION AND DEVELOPMENT**

1. Mr. Roy Knighton, Division Chief, Infrastructure and Environment  
Phone No: 011-441-71-338-7184
2. Mr. Kramer and his boss, Mr. Covindassamy (Energy)  
Phone No: 011-44-171-338-6565

**III. CONTACTS IN THE FIELD**

1. Mr. Paul J. Monnory, General manager, IMG  
Phone No: 011-385-1-612-1686  
Fax No: 011-385-1-611-0722

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2. Mr. Xavier DeVictor, Executive Assistant to the General Manager, IMG  
Phone No: 011-385-1-612-1661  
Fax No: 011-385-1-611-0722
3. Mr. Dino Bicciato, (IMG staff based in Sarajevo)  
Phone No: 011-385-1-180-011, Ext. 7642
4. Mr. Sead Kreso, Ministry of Finance, Federal Part  
Phone No: 011-387-71-643-465/644-314/491-333
5. Mr. Neven Tomic, Ministry of Finance, Croation Section  
Phone No: 011-387-88-312-168/312-169
6. Mr. Zulfa Rahman, Ministry of Energy, Mining, and Industry (Croatia Section)  
Phone No: 011-387-88-312-189
7. Mr. Samir Musovic, Assistant Minister  
Ministry of Trade  
Phone No: 011-387-71-444-303/654-418  
Fax No: 011-387-71-663-714/654-418

#### **IV. SECTOR BY SECTOR CONTACTS**

##### **A. ENVIRONMENT SECTOR (Water Supply, Sewerage, and Solid Waste)**

1. Mr. Faruk Sabeta, Vodoprivreda of Bosnia and Herzegovina (the water management company or water enterprise - national level)  
Phone: 470-634
2. Mr. T. Oberman, Vodoprivreda (Croatia Section)  
Phone No: 011-385-21-513-544/514-412
3. Mr. Uros Hrkalovic, Vodoprivreda (Republika Srpska)  
Phone No: 011-381-71-492-163
4. Mr. Munever Imamovic, Ministry of Physical Planning, Natural Resources, and Environmental Protection  
Phone No: 011-387-71-663-548
5. Mr. Marko Bozanovic, Minister of Agriculture, Forestry, and Water Resources Management  
Phone No: 011-387-88-312-173/312-174/312-175

## **B. TELECOMMUNICATIONS SECTOR**

1. Mr. Koluder, Ministry of Transport and Communications, Federation of Bosnia and Herzegovina  
Phone No: 011-387-71-471-630/445-750
2. Mr. Nedeljko Lajic, Ministry of Transport and Telecommunications, Republicka Srpska  
Phone No: 011-381-71-783-713
3. Mr. Kozulj, Ministry of Transport and Communications (Croatian Section)  
Phone No: 011-387-88-310-054/310-053
4. Mr. Andersson, IMG Telecommunications Consultant  
Phone No: 011-385-1-612-1661  
Fax No: 011-385-1-611-0722

## **C. ENERGY SECTOR**

1. All coal mining contacts should be identified through ODA  
Mr. Frank Price, ODA Tuzla  
Phone No: 011-387-75-821-591/821-413
2. Mr. Hayden Barrat, IMG Zenica Office  
Phone No: 011-387-72-36-472
3. Minister Smailbegovic and secretary General Gotovusa, Ministry of Industry and Energy, Federation of BH  
Phone No: 011-387-71-664-942/664-847/664-816
4. Mr. Marinko Bosnjak, Minister of Energy, Mining and Industry, (Croatian Section)  
Phone No: 011-387-88-910-016/910-017
5. Mr. Tony James (ODA)  
Phone No: 011-387-71-444-106,107,108  
Fax No: 011-387-71-473-144

6. District Heating Contacts (All ODA Offices)

ODA Zagreb, Croatia 011-385-1-455-310  
ODA Split, Croatia 011-385-21-561-023/561-203  
ODA Tuzla, BH 011-387-75-821-591/821-413  
ODA Zenica, BH 011-387-72-37-600/415-235

7. Mr. Edhem Bicakcic, Head of Elektorprivreda, BH  
Phone No: 011-387-71-472-418
8. Mr. Mate Jurkovic, Head of Elektroprivreda, (Croatian Section)  
Phone No: 011-387-88-314-714
9. Mr. Boro Botic, Head of Elektroprivreda, Republika Srpska  
Phone No: 011-381-71-783-086
9. Mr. Sancho Ramhorst, International Rescue Committee (IRC), an U.S. NGO  
is working in a number of areas.

**D. TRANSPORTATION**

1. Mr. Hajrudin Topic, BH Railway Company (ZBH)  
Phone No: 011-387-71-656-801
2. Railway Company, (Croatian Section)  
Phone No: 011-387-88-314-714
3. Civil Airports: Sarajevo Airport, Mostar Airport
4. Military Airports: Tuzla Airport, Banja Luka Airport, and Bihac Airport
5. Port of Ploce Croatia (French are looking at - talk to French firm)
6. Mr. Kozulj, Minister of Transport and Communications (Croatian Section)
7. Mr. Koluder, Minister of Transport and Communications (Federation of BH)
8. Mr. Lajic, Minister of Transport and Communications, Republika Srpska
9. ODA Emergency Engineering Unit. Mr. H.F. Spencer,  
ODA Engineering Programme Coordinator