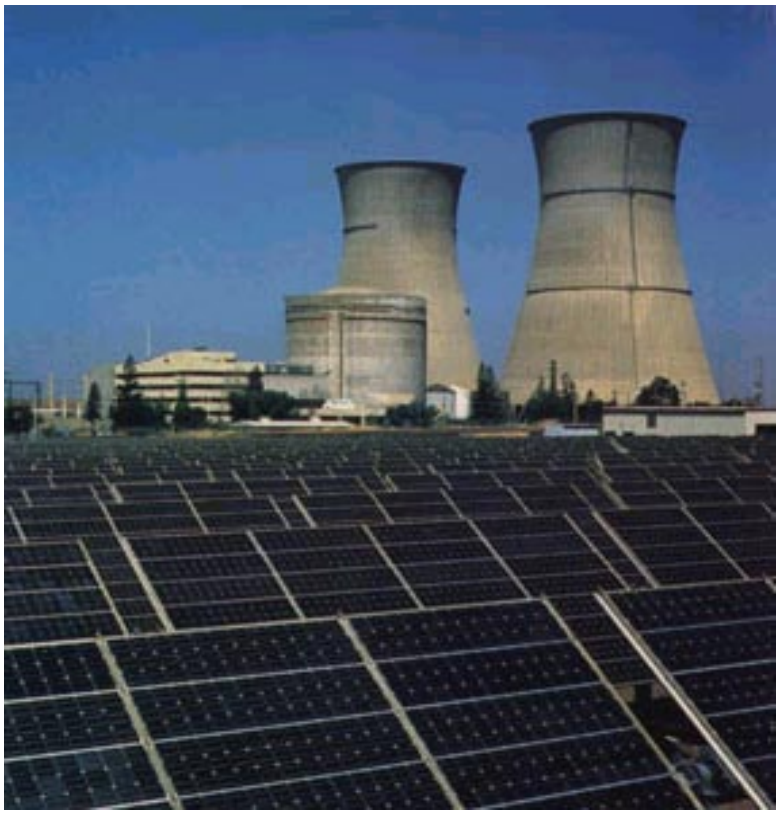

THE ENERGY IN ALBANIA

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FEASIBILITY STUDY FOR REHABILITATION OF FIER THERMAL POWER PLANT

(.....Continued from previous issue.....)

Harza Engineering (an American Company) in collaboration with National Agency of Energy (NAE) and specialists of Fier TPP has evaluated the technical and economic feasibility of rehabilitating some or all units of Fier TPP. This has included an investigation of the options for improvement in available capacity, reduction in forced outage rates, improvement in heat rates, choice of fuel, reductions in self-consumption, and extension of plant life. Among the options which has been considered there is the potential rehabilitation for permiting the use of locally produced residual/heavy fuel oil at high capacity levels over an acceptable number of years without irreparable damage to the boilers and other equipment. Harza Engineering in close collaboration with Albanian specialists has developed sound estimates of the amount of specified pollutants that would be emitted during operation of the rehabilitated plant and what will be the reduction plan of SO_2 in order to meet Albanian and World Bank emission standards.

Rehabilitation of Fier TPP and Alternatives

Each option was analyzed based on estimated investment costs, fuel costs, and operating and maintenance (O&M) costs, net of any cost savings attributable to each option. For this economic analysis, all costs are based on January

1st, 2002 price levels and are not escalated, capital costs do not include interest.

Alternative **A** is for the rehabilitation of one Chinese boiler, providing 12 MW of power. The capital cost for this option is estimated at $ 14.5 million. The fuel would continue to be residual fuel oil. Although historical O&M practices have been deficient, the rehabilitated unit is expected to be more efficient and should require less expenses for operation and maintainance, therefore using the historical maximum is considered appropriate. The rehabilitated unit is estimated to provide steam sales revenues of $ 15.30 per ton for an annual production of 40,000 tons of steam, based on current agreements with the refinery. The rehabilitated unit is expected to be in service for 15 years. Assuming a two-year construction period and a discount rate of 12 %, the levelized cost of power production for Alternative A is $ 0.0791/kWh. This relatively high price reflects the limited service life and high investment cost for this poorly maintained small unit.

Alternative **B** addresses rehabilitation of the 60 MW Czech unit alone. The capital cost for this option is estimated at $ 23 million. It is expected that the rehabilitated unit would fire a combination of residual fuel oil and heavy fuel oil. The rehabilitated unit would also provide steam sales revenues of $ 15.3 per ton for an annual production of 40,000 tons of steam, based on current agreements with the refinery. Assuming a two-year construction period and a discount rate of 12 %, the levelized cost of power production for Alternative B is $ 0.0577/kWh. In spite of the short remaining life of this unit, the levelized cost is relatively favorable. The investment cost is favorable as this is an existing unit, reducing equipment, civil and other construction costs. In addition, the Czech unit can utilize both residual and heavy fuel oil with moderate efficiency, resulting in advantageous fuel costs.

Alternative **C** is for repowering of the 60 MW Czech unit to operate in combined cycle mode with two combustion turbine units and a heat recovery steam generator. Total output for this alternative will be 170 MW. The capital cost for this option is estimated at $113.5 million. The combustion turbines will operate on diesel fuel, with exhaust heat used for generating steam for the Czech steam turbine. Total plant efficiency is estimated at 46 %, based on the selected gas turbine technology with heat recovery. Assuming a two-year construction period and a discount rate of 12 %, the levelized cost of power production for Alternative C is $ 0.0655/kWh. This is within the expected range for modern combined cycle plants, considering its size, liquid fuel, and some used equipment.

Alternative **D** is for construction of a combined cycle power plant at Vlora, with a total output of 250 MW. The capital cost for this option is estimated at $ 192.5 million, based on discussions with numerous industry experts. It includes 5.0 million USD expenditure for oil off-loading and storage facilities. No additional investment was added for the transmission network since it is expected that a new double-circuit transmission line would be built over the next two years between Vlora and Fier.

This facility would operate on diesel fuel, but would not require a long new pipeline due to its location. Delivered cost for fuel is estimated at $ 238 per ton, reflecting reduced delivery costs. Total plant efficiency is estimated at 50 %, reflecting current expectations for new gas turbine technology utilizing liquid fuel. O&M costs are projected to be $0.003/kWh, based on industry expectations for modern plants of this design. Assuming a two-year construction period and a discount rate of 12 %, the levelized cost of power production for Alternative G is $ 0.0611/kWh. This cost reflects economies of scale as the largest of the assessed alternatives, as well as the best fuel efficiency and lowest O&M costs.

Alternative **E** assumes that power would be imported rather than generated, using the equivalent of 170 MW of generation. The capital cost for transmission equipment upgrades required to import this amount of power are estimated at $ 2,500,000. The cost of purchased power is estimated to be $ 0.03/kWh in 2004, $ 0.04 in 2005 through 2009, and $ 0.045 thereafter. Losses of 10 MW or 38.69 GWh are expected when no new generation is added to the system, based on the load flow studies. Using a discount rate of 12 %, the levelized cost of power procurement for Alternative E is $ 0.038/kWh. This price reflects the availability of low-cost foreign electricity, such as that generated by large, efficient, hydro and nuclear units.

Conclusions

The purchased power alternative, Alternative **E**, is the least cost power provision option from among the alternatives assessed. However, this option provides little ability to control costs, would displace most of the employees, and does not provide voltage and frequency control benefits from local generation. Also, this alternative does not address the issue of the utilization of the residual fuel oil produced by the refinery. Without generation at the existing Fier TPP, alternatives to dispose of the residual fuel oil will need to be developed

The Chinese unit rehabilitation, Alternative **A** is not cost effective. The next least cost option is Alternative **B**, the rehabilitation of the 60 MW Czech unit. The other advantage of this alternative is that it continues using the residual oil produced by the refinery. The new combined cycle facility at Vlora, Alternative **C**, provides the next lowest levelized cost of power, capturing the benefits of the Vlora location and utilizing only new and efficient technology.

Photo 1. Fier Thermal Power Plant

However, the Draft Report finished by Harza Engineering Company in close collaboration with Albanian specialists, has recommended to the World Bank (on the meeting of December 12, 2001) to finance the rehabilitation of Fier TPP as an important need for the following reasons:

- With the option of importing electricity there is no possibility to control the electricity supply cost (it depends from the market), while with the rehabilitation of Fier TPP there is the possibility to control this cost and to increase the security of supply. This judgment is much more true having into consideration the difficult situation of electricity supply, which we are passing during those three years and expecially during the last winter season when electricity imported price has been 4.5-5,5 UScent/kWh,

Photo 2. Czech Unit of Fier Thermal Power Plant

- With the option of importing electricity there is no possibility to control the voltage level according to the standards for the whole southern zone (from Fier, Vlore to Sarande). If we rehabilitate the Fier TPP this will be assured, mean while to guarantee the voltage level by import option we must put in the southern part around 115 MVA reactive with a first investment of 3.8 million USD based into power flow calculation.
- The rehabilitation of Fier TPP will reduce technical losses in the whole Albanian transmission system for about 12 MW, or said in a different way the TPP of Fier will not have an installed capacity of 60 MW but 72 MW.
- The rehabilitated Fier TPP will generate more than 500 GWh or 30 % of electricity planned to be imported during 2002. This is a considerable value if we take into consideration the new plans for electricity imported of about 1500 GWh/year.
- Even that we may import electricity this will not resolve the main problem: where will be send residual fuel oil (about 65,000 ton/year) from Fier Refinery if it will not be burned at this TPP? Industrial boilers are not suitable to burn it. So it is very important from the environmental point of view that this amount of residual fuel oil will be burned at this power plant with desulphurisation plant (reduction of SO_2).
- As it is described, the first investment for the option given above for rehabilitation, expansion or new generation will be for sure lower because those are pre-offers. Reduction of the first investment will create possibility to reduce the long marginal running cost of unit electricity generation.
- On the computation of first investment are taken into consideration even the investment of desulphurisation plant (reduction of SO_2). Pre-offer for this plant is 5.5 million USD.
- Residual fuel oil price, which is supply by ARMO to TPP, is 122 USD/ton and price for heavy fuel oil is 179 USD/ton. We should also mention that this fuel offered by Armo has 6 % sulphur content, higher viscosity compared with imported one and lower net calorific value compared with imported one. The price for imported residual fuel oil and heavy fuel oil are respectively 89 USD/ton and 155 USD/ton with sulphur content lower than 2 % and net calorific value higher than indigenous. In order to reduce the long marginal running cost it's very important that the Minister of Industry and Energy reduce the price of residual fuel oil and heavy fuel oil supplied by Armo (Fier Refinery).
- As final conclusion, the study, which will be finished this month (February 2002), has recommended to the World Bank and other International Financial Institutions to rehabilitate Fier TPP only Czech Unit (60 MW).

Dr. Eng. Besim ISLAMI
Vice Chairman
National Agency of Energy

MUNICIPAL ENERGY EFFICIENCY NETWORK IN BULGARIA

During 11-12 April 2002, in Gabrovo-Bulgaria was held the Forth Annual Conference of the Municipal Energy Efficiency Network - EcoEnergy. The mission of EcoEnergy is to contribute to the establishment of energy efficiency as an important component of the policy for sustainable development of municipalities and regions in Bulgaria. In this conference have participated also representatives of the energy efficiency organisations such the Albania-EU Energy Efficiency Centre and other organisation from Macedonia, Serbia, Bosnia and Herzegovina, etc., which are members of the Regional Network for Efficient Use of Energy and Water Resources.

Apart from administrative procedures, sessions related to municipal energy efficiency programs, specialised exhibition of energy efficiency technologies, products and materials, energy efficiency demonstration projects, have been the most interesting ones. During the days of conference, a visit to the demonstration sites in Gabrovo is organised. Such sites consist of energy efficiency retrofit of a school, a hospital, a company and street lighting. All the participants have highly evaluated the results achieved by such energy efficiency demonstration projects.

Eng. Sokol ALIKO
Expert
Energy Efficiency Centre

CREATION OF EDUCATIONAL MATERIAL ON INNOVATIVE TECHNOLOGIES AND MANAGEMENT SYSTEMS IN AREA OF ENERGY, ENVIRONMENT AND SAFETY

In the framework of the Albania-EU Energy Efficiency Centre (Centre) activities for the year 2001, the Centre has given its expertise and contribution in a project of the INTERREG - II Program named "Creation of Educational Material on Innovative Technologies and Management Systems in the Area of Energy, Environment and Safety". This project pertained to the preparation, production and evaluation of educational material via the use of multimedia, aimed to cover the knowledge needs in technologies related to the sectors of Energy Production, Environment Protection and Safety in Industrial Units, and their respective management systems.

The member countries of this project were Albania, Bulgaria, Cyprus and Greece. The Centre was representative of Albania, the Academy of Science and University of Chemical Technology and Metallurgy of Sofia were representative of Bulgaria, Ecognosia Ltd. was representative of Cyprus, and Sigma Consulting Ltd., Aristotle University of Thessaloniki, and Center of Continuous Training SEVE were representative of Greece. Officially the project has started on April 2nd, 2001 and has been finished by the end of November 2001. The educational material is prepared and produced in two forms: static in CD-ROM and dynamic in WEB pages (HTML) that is available on the Internet in Albanian, Bulgarian, English and Greek. Such educational material can be used at the universities, by the students before their graduation year, or by young engineers working in the fields of energy and environment. The working programme for this project consisted of the following phases:

Phase 1 - Needs for Educational Material

The work has consisted in investigation and recognition of the educational needs of the students, new scientists and especially engineers, concerning new technologies and management systems in the fields of energy, environment and safety. The educational subjects has covered the area of energy recovery, energy monitoring, auditing and targeting schemes, waste minimisation, risk assessment in industrial units, environment and safety management systems, etc.

Phase 2 - Preparation of Involved Parties

The work has aimed to the preparation of all the involved parties for the adaptation of multimedia in their education system. In this framework, a meeting is held in Thessaloniki, Greece, for discussions with all involved member countries, on the materials, results and progress of the project.

Phase 3 - Preparation of Educational Material

The work has consisted in gathering and preparing all the educational material in the fields of energy, environment and safety, which is provided as:

- Static, input in multimedia,
- Dynamic, input in WEB pages (HTML) that is available on the Internet in Albanian, Bulgarian, English and Greek,
- Written guidelines and materials, which will be used as an aidtraining tool.

The educational material is prepared firstly in Greek language and then is translated in Albanian, Bulgarian and English languages.

Phase 4 - Preparation of Multimedia

The work has aimed to produce educational multimedia. There are produced three CD-ROMs on the following issues:

- Energy conservation systems, with focus on Thermal Energy Production, Combined Heat and Power Generation and other efficient ways of energy production;
- Environment Management Systems (EMS), with focus on EMS Developing and Implementing, Accreditation of Certification Bodies, Environmental Auditor, and EMS Maintenance;
- Risk assessment in industrial units, with focus on Risk Concept, Risk Analysis, and Safety Management Systems.

Phase 5 - Training of Trainers

A seminar for the training of trainers has been organised. Each of the participating countries has send, in Thessaloniki, two members of their staff for training in multimedia teaching. Apart of the training in theoretical issues, the trainers have been trained in practical issues and real situations that may happen in an industrial plant.

Phase 6 - Dissemination of Results

Each participating country is responsible for actions aiming to disseminate the materials, results and products of this project, as well as for evaluation of these dissemination actions in their respective country. Long term objectives of this project are to help the labour force adjust to the new requirements in the sectors of energy, environment and safety, to provide technical assistance to industries in order to increase their competitiveness, to accelerate the creation of new jobs in the sector of energy, environment and safety and to create trans-border infrastructure for scientific and financial co-operation.

Final Remarks

This project can be considered as an important step in introducing to the Albanian universities the issues such as technologies and management systems in areas of energy, environment and safety and consequently bring steady improvements in the long term. Considering the very promising results and products of this project, which reflects the EU countries experience and standards, in the near future the Centre aims to continue to work in disseminating them.

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Director
Energy Efficiency Centre