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The World Bank

Report No: 34774

IMPLEMENTATION COMPLETION REPORT
(SCL-42840 TF-29479)

ON A

LOAN

IN THE AMOUNT OF $ 35 MILLION EQUIVALENT

TO ELECTROSTOPANSTVO

NA MAKEDONIJA (ESM),

MACEDONIA

FOR THE POWER SYSTEM IMPROVEMENT

PROJECT

December 21, 2005

CURRENCY EQUIVALENTS

(Exchange Rate Effective 12/19/05)

Currency Unit	=	Denar
1 Denar	=	US$ 0.02
US$ 1	=	51.55

FISCAL YEAR

January 1 December 31

ABBREVIATIONS AND ACRONYMS

ECSEE	= Energy Community of South East Europe
EMS	= Energy Management System
ERC	= Energy Regulatory Agency
ERR	= Economic Rate of Return
ESM	= Electrostopanstvo Na Makedonija
FRR	= Financial Rate of Return
IPP	= Independent Power Plant
LRMC	= Long Run Marginal Cost
MEPSO	= Makedonija Elektroprenos
SAR	= Staff Appraisal Report
SCADA	= Supervisory Control and Data Acquisition (System)
UCTE	= Union for the Coordination of the Transmission of Electricity

Vice President:	Shigeo Katsu
Country Director	Orsalia Kalantzopoulos
Sector Manager	Peter Thomson
Task Team Leader/Task Manager:	David Kennedy

MACEDONIA, FORMER YUGOSLAV REPUBLIC OF
POWER

CONTENTS

Project ID: P042399	*Project Name:* POWER
Team Leader: David Kennedy	*TL Unit:* ECSIE
ICR Type: Core ICR	*Report Date: December 23, 2005*

1. Project Data

Name: POWER
L/C/TF Number: SCL-42840; TF-29479
Country/Department: FORMER YUGOSLAV REPUBLIC OF MACEDONIA
Region: Europe and Central Asia Region

Sector/subsector: Power (100%)
Theme: Infrastructure services for private sector development (P); Pollution management and environmental health (S); Climate change (S)

KEY DATES		*Original*	*Revised/Actual*
PCD:	12/25/1995	*Effective:* 07/27/1998	07/27/1998
Appraisal:	11/01/1997	*MTR:* 10/31/2000	
Approval:	02/17/1998	*Closing:* 06/30/2005	06/30/2005

Borrower/Implementing Agency: ESM/ESM
Other Partners: Government of the Swiss Confederation

STAFF	Current	At Appraisal
Vice President:		
Country Director:	Sandra Bloemenkamp	Ellen A. Goldstein
Sector Manager:	Peter D. Thomson	Henk Busz
Team Leader at ICR:	David Kennedy	James Sayle Moose
ICR Primary Author:	James Sayle Moose	

2. Principal Performance Ratings

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HL=Highly Likely, L=Likely, UN=Unlikely, HUN=Highly Unlikely, HU=Highly Unsatisfactory, H=High, SU=Substantial, M=Modest, N=Negligible)

Outcome: S
Sustainability: HL
Institutional Development Impact: SU
Bank Performance: S
Borrower Performance: S

	QAG (if available)	ICR
Quality at Entry:	S	S
Project at Risk at Any Time:	No	

3. Assessment of Development Objective and Design, and of Quality at Entry

3.1 Original Objective:

The objectives of the project were to: 1) increase efficiency of hydropower generation; 2) expand the generating capacity of the major hydropower plants; 3) increase system operating efficiency of the power generation and transmission facilities; 4) reduce losses in the electricity distribution system; 5) facilitate the development of an independent power plant industry; and 6) facilitate the re-integration of the Borrower into UCPTE.

3.2 Revised Objective:

No revisions

3.3 Original Components:

Hydropower Plants. The major component was the rehabilitation of the six major hydropower plants in Macedonia through the provision of equipment and technical assistance and the carrying out of works. These plants are Globocica, Spilje, Tikves, and the three plants in the Mavrovo Cascade (Vrutok, Raven, Vrben). They represent about 28% of Macedonia's generating capacity and 92% of its hydropower capacity. In addition this component involved some work on dam safety since questions were raised about the safety of Mavrovo dam. This turned out not to be justified since the concerns were based on faulty readings by a defective instrument. This component is rated highly satisfactory since the rehabilitation of the plants produced substantially more generating capacity and a greater increase in operating efficiency than was anticipated in the Staff Appraisal Report (SAR).

Enery Management System. This component had three sub-components all related to providing the dispatch center and management with better information and control over the system. These three sub-components were: 1) modernization of the SCADA (supervisory control and data acquisition) system which consisted primarily of the supply and installation of new remote control units (RTUs), 2) completion of the dispatch center, hardware and software which was begun under an earlier Bank Project for the Yugoslav Federation, 3) improvement in ESM's telecommunication facilities. This component is rated satisfactory since all three sub-components are in operation and working as anticipated.

Distribution System. This component was designed to begin the rehabilitation of the Macedonian Distribution System. The cost estimates for complete rehabilitation were around $60 million so this component ($5 million) was very small considering the needs. However, it was focused on those distribution sub-stations in the worst condition. Given the limits on Macedonia's borrowing capacity additional funding was not available at the time the project was prepared. This component is rated satisfactory since the additional investment helped reduce losses in the distribution system although far larger investments were and are needed.

Dam Safety. This was an extremely small component to improve the operations of the dam safety unit in ESM. It consisted of funds for: 1) safety regulations review; 2) overseas training; 3) various safety studies; 4) monitoring instruments; and 5) publications for the library. Originally this component had an allocation of funds ($650,000) to strengthen the Mavrovo Dam but this turned out to be unnecessary since the problem identified turned out to be a faulty piezometer not the dam itself.

TABLE 3.0
PLANNED AND ACTUAL COSTS

A.

COMPONENTS	PLANNED COST	ACTUAL COST	RATING

Hydro Plant Rehabilitation	$35.6 Million	$47.5 Million	HS
Energy Management System	$10.1 Million	$8.5 Million	S
Distribution	$5.0 Million	$3.8 Million	S
Dam Safety	$1.0 Million	$0.2 Million	S
PIU	$0,0 Million	$0.6 Million	HS
Total	$51.7 Million	$60.6 Million	S

The results by component are somewhat different than anticipated. The hydropower component cost more than expected largely due to the strength in the European currencies where most of the equipment came from. Other components were less than anticipated due to: 1) the better than anticipated prices obtained on the Energy Management System (EMS) equipment and software; 2) fewer distribution transformers acquired than anticipated due to a procurement dispute; 3) the lack of a requirement to carry out civil works on the Mavrovo dam as mentioned above.

CURRENCY It should be noted that the above table above is in dollars which was the unit used in the SAR. However, the actual loan was not in dollars but in Deutch Marks (61.5 Million DEM). This loan was then converted into Euro 31,444,450.69. The costs of the project were calculated in DEM or Euro at the time incurred (with varying Dollar/DEM and Dollar/Euro exchange rates) and the actual cost numbers above are the Euro costs (and the DEM costs converted to Euro) converted to dollars at the current exchange rate of about 1.25 dollars per Euro. Thus it is somewhat difficult to compare planned numbers with actual because of currency fluctuations.

3.4 Revised Components:

No revisions

3.5 Quality at Entry:

S

4. Achievement of Objective and Outputs

4.1 Outcome/achievement of objective:

The outcome of the project is rated as fully satisfactory (if not highly satisfactory). The project was completed on time (there was no extension) in spite of very severe social problems in the area in which most of the hydropower plants are located due to an influx of Kosavar refugees followed by civil disturbances (See section 5.1) Also the project objectives were all achieved or over achieved - see below.

The physical major objectives of increasing the capacity and generation of the hydropower plants and reducing their operating costs were over achieved with more capacity and generation achieved than forecast (see below). The EMS/SCADA system was installed at less than the estimated cost and is working well and reducing system operating cost. The distribution component has been successful as well as the dam safety component. Also ESM is once again an active member of UCTE and they could not have participated in UCTE without the Automatic Generation Controls which were installed as part of the project. The final component was to "facilitate the development of independent power producers with the initial plants probably being mini-hydropower plants." This component has been achieved. Five new non-governmental mini-hydropower plants have been built, seven mini-hydropower plants are being rehabilitated and operated by the private sector under a ROT contract. Also there is a proposal from a Slovene firm to build 20 additional mini-hydropower plants although the Bank is requesting open tendering for this proposal. A large, 200 MW gas fired, combined cycle, CHP power plant has been agreed for Skopje in principle. It is

expected to be built by a private group consisting of a private Russian gas producer and the privately owned Skopje District Heating System.

4.2 Outputs by components:

Hydropower plants: The objective was to increase the capacity of the 6 hydropower plants by 31 Mw. In fact the capacity of the plants was increased by 49.2 Mw, about 59% more than projected. The objective was also to increase the potential output from the power plants under normal hydropower conditions by 13 MWh per year. In fact the increase in potential output is 40.9 GWh, slightly over 3 times the target level. The increase in potential output comes not only from the higher capacity but also from more efficient turbines which extract more energy from the water flow. In other words the rehabilitated plants extract more power per cubic meter of water flow than did the unrehabilitated plants.

ESM implemented the hydropower rehabilitation using a method which placed a greater burden on plant management and the PIU. Usually, in order to reduce risk, one contractor is given overall responsibility for rehabilitating an entire power plant. The contractor takes total responsibility and usually charges significantly for undertaking this risk. However, this project was implemented by having 5 packages awarded to different contractors with each package covering specific equipment which was to be rehabilitated in all plants. The specific packages were: 1) turbines and turbine generators; 2) valves and cooling systems; 3) generators, static excitation systems and voltage regulators; 4) controls systems and AC/DC; 5) switch yards and switch gear. ESM made sure that these packages were coordinated both in terms of timing and in terms of making sure that all of the new equipment worked with the other new equipment and old equipment. By reducing contractors risk substantially this reduced costs for the project.

Energy Management System: This objective was completed satisfactorily. The new remote terminal units were installed which improved the SCADA (Supervisory Control and Data Acquisition) System. The software and hardware in the dispatch center (purchased under an earlier Bank project for Yugoslavia) was upgraded and improved. ESM's telecommunications system was greatly improved by installing fiber optic wire between power stations and the dispatch center in Skopje. This fiber optic wire could also be used to carry non-ESM communications if so desired.

Distribution: This component is small and only started the rehabilitation of the Macedonian Distribution System. It was completed satisfactorily although its impact on the overall distribution system was of necessity small as well.

Dam Safety: This component consisted of training, software, replacement of piezometers, new instruments, purchase of books etc. It has resulted in a much strengthened dam safety group in ESM, which is the only dam safety group in Macedonia. There was originally some concern that the phreatic line in the downstream shell of the Mavrovo dam was high and funds were put in the loan for strengthening this shell. However, this turned out not to be the case and the high phreatic line was caused by piezometers which were not functioning properly.

4.3 Net Present Value/Economic rate of return:

Hydropower Plant Rehabilitation

The benefit from the increased capacity resulting from the rehabilitation of the hydropower plants was estimated in the SAR as the 31Mw of additional capacity times an estimated contract value for capacity from outside Macedonia of $100,000/Mw/year for a total benefit of $ 3.1 Million per year. The actual additional capacity is 49.2 Mw and ESM reports that neighboring countries are charging it 1750 Euros/Mw (or about $2200/Mw) for standby capacity for 48 hours. (Since this is expensive ESM tries not to use this facility). This would amount to $ 401,000/Mw/year for stand by capacity. Since Macedonia

does not need standby capacity for much of the year it was decided to use a value for stand by capacity of $220,000/Mw/year. Thus the total benefit would now be estimated at $10.8 Million per year.

The benefit from increased generation was estimated in the SAR at 13.7 GWh per year additional generation times 5 US cents/kWh Long Run Marginal Cost (LRMC) for a total benefit of $685,000 per year. The current estimate of additional generation is 40.9 GWh. If we assume the LRMC is currently about the same, which it seems to be, this benefit would be worth $ 2.0 Million per year. An alternative is to value this benefit at the current cost of imports of about 3.7 Euro cents or 4.6 US cents/kWh. This would produce a benefit of $ 1.88 Million per year. Both of these measures of value exclude any consumers surplus.

Rehabilitation of the hydropower plants has substantially reduced operating costs of these plants. The SAR estimated the rehabilitation of the hydropower plants would reduce repair costs by 50% from about $2 Million per year to about $1 Million per year for 10 years with repair costs starting to rise after that and ending at the then current level of about $2 Million per year after 20 years. The only plant which has been rehabilitated and operating long enough to provide information on the reduction in repairs is Globocica, which has two generating units. For that plant the down time due to required repairs has been reduced from an average of 75 hours per year for each generating unit before rehabilitation to an average of 28 hours per unit after rehabilitation (2 unit average for 2004). Thus repair costs measured in terms of hours have been reduced by 62%. If this 62% reduction is applied to the estimated repair costs of $ 2.8 Million (excluding salaries which are essentially a fixed cost) then the reduction in costs would be $1.74 Million per year.

The number of hours of operation of the plants has increased by 47 hours per year (75-28) due to less down time for repairs. However, it is unlikely that this would lead to much additional electricity output since the plants all are associated with reservoirs and when they are not operating the water is normally saved. There could be a minor benefit in that with fewer repairs the plants might be better able to meet peak demand, but this is likely to be small and was not taken into account.

A fourth benefit was calculated in the SAR from the rehabilitation of the hydropower plants. This is the reduction in unplanned outages estimated at 7 GWhs and valued at 5 US cents/kWh for a total benefit of $350,000 per year. No information is available on the reduction in unplanned outages after rehabilitation, and although this reduction has clearly occurred, this benefit has not been included in the recalculation of the ERR shown below.

TABLE 4.1. HYDROPOWER COMPONENT YEARLY BENEFITS
($ MILLIONS)

BENEFIT TYPE	PLANNED	ACTUAL
CAPACITY	3.1	10.8
ENERGY	0.68	2.0
OPERATING COST REDUCTION	1.0	1.74
UNPLANNED OUTAGES	0.35	n.a.
TOTAL	5.13	14.54

In the SAR the estimated ERR for this, the major component, was 17% real. Based on the first three benefits shown above and the costs of this component shown in the earlier table**, the actual ERR on this component is about 22% real ,** higher than originally estimated due to the higher capacity and greater generation resulting from rehabilitation.

Energy Management System

The benefits from the Energy Management System were assumed to consist of: 1) generation scheduling benefits; 2) benefits from operation and maintenance cost savings; 3) benefits from improved reliability of operations; and 4) benefits from being able to participate in UCTE. The benefits from generation scheduling were estimated at 1% of yearly fuel costs valued at that time as $365,000 per year. This 1% of fuel costs ESM considers to be a reasonable estimate and it would be $754,000 currently. The benefits from operation and maintenance cost savings were estimated in the SAR as reduction in staff of 200 persons with savings of $6700 per person for a total " benefit" of $1.34 Million. In fact the reduction in staff appears to be 100 persons and the average cost of these staff ESM estimates at $3500 per year. The low estimated cost of the staff is due to the fact that ESM does not generally fire staff but replaces retiring staff with new entrants. Thus the $3500 per person is the cost of the new staff that ESM does not have to hire. Therefore the total operations and maintenance cost savings "benefit" is about $350,000 per year. The benefit from improved reliability of operations was estimated at 2.2 GWh of reduction in system outages valued at the cost of unserved energy of $500/MWh. This gave a total value of this benefit of $1.1 Million per year. The estimate reduction in outages of 2.2 GWh is probably OK but ESM believes that there would be no unserved energy- rather they would obtain emergency power from Serbia costing about 55 Euro per MWh. If this is the value of the reduction in outages then this benefit would be estimated at about $ 150,000 per year. The last benefit, participating in UCTE, was not valued in the original report and still cannot be easily valued. However, ESM pointed out that the improved EMS , especially automatic generation control, was a major factor in allowing them to participate in UCTE. In 2000 ESM was able to hold its actual generation within + or - 20 MW of its target generation only 34% of the time. After the EMS system was fully operational in 2004 the company was maintaining its generation within this narrow band 82% of the time.

While the actual benefits from the Energy Management System are less than anticipated, the cost of this system was also less than forecast. As a result the ERR on this component actually was 28% compared with the 30% ERR forecast.

Distribution

The SAR estimated that this component (consisting largely of new transformers) would reduce system losses by 25 GWh per year which was valued at the LRMC of electricity of 5.0 US cents/kWh. This gave a total benefit for this component of $ 1.25 million per year and an ERR of 21%. In fact this component was smaller than anticipated but 9 new distribution transformers were installed. On average they reduced losses by about 988 MWh per year according to ESM. For the total of the 9 transformers this amounts to 8.90 GWh per year which valued at an LRMC of 5 US cents/kWh is $ 445,000 per year. **Considering the smaller investment than anticipated ($3.8 Million instead of $5 Million) the rate of return on this component is still a respectable 11%.**

For the project as a whole the estimated ERR was 21%. The actual ERR was 22%.

TABLE 4.2. PROJECT RESULTS

Major Components	Forecast ERR	Actual ERR	Actual NPV at 10% $ Millions
Hydropower Plants	17%	22%	35.1

Rehabilitation			
Energy Management System	30%	28%	5.3
Distribution Rehabilitation	21%	11%	0.15
Project Total	21%	22%	39.2

It should be noted that the total project included the dam safety and PIU components, for which no benefits could be readily calculated although there were clearly significant benefits. However, the costs of the dam safety and the PIU components were included in total project costs. The result of this inclusion is that, the NPV of the total project benefits is less than the sum of the NPVs of the benefits from the three components for which benefits have been calculated.

4.4 Financial rate of return:

No financial rate of return was calculated in the SAR. However, the actual financial rate of return (FRR) would be the same as the ERR if additional electricity generation and savings for the hydropower and distribution components were valued at 5 US cents per kWh , the LRMC. If they were valued at the cost of emergency supplies from Serbia of 5.5 Euro Cents/kWh then the FRR would be 24% while if the electricity was valued at the average import price currently of about 3.7 Euro cents per kWh (4.6 US cents) then the FRR would be 21%.

4.5 Institutional development impact:

The main institutional requirements under the loan were that the Government should: 1) adopt regulations under the Energy Law acceptable to the Bank governing the operations of IPPs; and 2) set electricity prices according to the methodology in the energy law so prices are higher than 7.5 Pfennigs (3.8 Euro cents). Both of these requirements were met and there has been an expansion of IPPs. In addition to the five small hydropower plants currently operating, another 20 have been discussed with the government (although the Bank argues that the tariff for these plants is too high) and construction of a large 200 MW gas fired plant in Skopje has been agreed with entirely private funding.

The project has also served to continue the Bank's dialogue with the Government on energy and electricity issues. This dialogue has involved issues of industry restructuring, privatization, pricing and payments discipline. The dialogue has contributed to a Government decision to break ESM into four separate companies (generation, distribution, transmission and the Negotino power plant) and privatize some of them. Of these companies, distribution (new ESM) and the Negotino Power Plant will be definitely privatized while the transmission company (MEPSO) will not be privatized. Privatization of the generation company (ELEM) has been put on hold pending resolution of the issues related to the large hydropower plants. A regulatory agency (ERC) has been established to set electricity tariffs and remove them from the political arena. Finally the Bank has pushed steadily on payments discipline in order to try to reduce losses and insure that those customers who receive invoices pay these invoices. This part of the dialogue has been a mixed success and payments discipline is still not as good as would be liked. However, part of the problem is political and cannot be easily resolved at the company level. Privatization may help resolve this issue if it is done correctly.

5. Major Factors Affecting Implementation and Outcome

5.1 Factors outside the control of government or implementing agency:

The project was delayed by the influx of refugees into Macedonia from Kosovo in 2000. This was destabilizing for the country but particularly destabilizing for the project because four of the six hydropower plants are in the North Western part of the country where the influx occurred. The second problem occurred in 2002 when there were civil disturbances in the country centering again in the North

Western part of the country. For some time it was not possible to get foreign engineers or consultants to visit that part of the country. However, in spite of these problems, ESM continued to implement the project with only limited delays which were then made up.

5.2 Factors generally subject to government control:

Through out the entire period of the project the Government controlled the average price of electricity. It kept the price at or above the level it had agreed with the Bank of 7.5 Pfennigs, about 3.8 Euro Cents per Kwh. Had the price been allowed to decline sharply ESM might not have had sufficient funds to provide the required counterpart funding. However, the price did not decline.

The Government did require ESM to continue to supply electricity to certain large customers who did not pay their bills on time if at all. Also ESM was required to supply some of these customers at low prices, close to marginal costs. This led to ESM having a high level of receivables throughout the project implementation period which reduced its cash flow. Also the low sales prices to certain customers reduced profitability. However, in spite of these problems, ESM was able to provide most/all of the required counter part funds although at times it was tight.

5.3 Factors generally subject to implementing agency control:

Project implementation by ESM was excellent with a competent and well staffed PIU.

Distribution losses rose to a high level although they are now in the process of coming down. This was partially ESM's fault in that they were not active enough in cutting off nonpaying customers when they could. However, in certain parts of the country , due to the civil disturbances and after effects, disconnections were not feasible and so that the rise in distribution losses in these areas was not mostly attributable to ESM (see 5.1 above).

5.4 Costs and financing:

The project ended up costing about $ 9 Million more than anticipated (see table 3.0) . Much of this additional cost was local costs paid by ESM including taxes, local products and services. At one point it appeared that the project was short about 5 Million Euro needed to pay for the goods and services purchased overseas. However, this shortfall declined over time and was eventually about 2 Million Euro. ESM paid this extra amount.

6. Sustainability

6.1 Rationale for sustainability rating:

The main component of this project is the rehabilitation of the six largest hydropower plants in Macedonia. Hydropower plants are extremely long lived and have low operating and maintenance costs. With small expenditures on operations and maintenance (less than 10% of the value of the electricity produced) these plants should continue to operate for several more generations. One of the smaller plants that ESM operates, Matka, has been in operation since the mid 1930s and still operates well although it is less efficient than a modern plant. The recently rehabilitated plants may need rehabilitation/upgrading in another 40 years or so, but the economics of doing so should be very favorable. If it is not done they could probably continue to operate though, not as well.

The other components, EMS and distribution transformers, are not as long lived. Because of the continuing rapid advances in information technology, the EMS may need upgrading in another 10 years. However, this should be low cost with a high rate of return. If the upgrading is not done it is likely that the older system

would continue to work it would just be outdated and inefficient. The distribution transformers will also need to be replaced in perhaps 10-20 years as electricity demand grows and larger and newer transformers are required. Again this should be economic since losses may be rising again by that time as the transformers become over loaded.

6.2 Transition arrangement to regular operations:
No transition arrangements are needed. The plants are back in regular operation.

7. Bank and Borrower Performance

Bank
7.1 Lending:
The process of preparing the project and taking it to the Board was done smoothly and with no significant problems. There were some spirited discussion at negotiations about the financial covenants for ESM but an agreement was reached which satisfied both sides.

7.2 Supervision:
Regular supervision was undertaken with missions about twice a year. Doing most of this period the supervision mission consisted of an economist/financial analyst along with an electrical engineer. This allowed the mission to deal with the two main continuing issues, the financial condition of ESM (which was mostly good) and procurement plus project implementation. While supervision was good, if additional budget had been available a third or fourth supervision mission in the year might have accelerated the project somewhat. Even so the project was implemented on time.

7.3 Overall Bank performance:
Overall Bank performance is rated as satisfactory.

Borrower
7.4 Preparation:
The project was prepared by the Bank and ESM with the assistance of outside consultants.The latter primarily reviewed ESM's plans for soundness. Preparation by ESM was quite satisfactory. ESM Management had a clear vision of what needed to be done which was confirmed by the consultants.

7.5 Government implementation performance:
The Government's performance was satisfactory. Its main role was to maintain a satisfactory level of electricity prices which provide ESM with sufficient funds to self finance its part of the project. It also established legislation which helped to attract private investors to the sector.

7.6 Implementing Agency:
The implementing agency, especially the PIU, did an outstanding job. They undertook to coordinate a number of contractors who were working on the plants at the same time and coordinate the outage of the plants with the electricity needs of Macedonia all the while there were various types of civil disturbances occurring in the area of the plants. The Borrower's comments elaborate on the difficulties they had to overcome. Also this was done entirely with ESM staff. No foreign experts were hired for this purpose.

7.7 Overall Borrower performance:
This is rated as satisfactory.

8. Lessons Learned

The borrower had very specific opinions about the lessons that were learned from the project. These are

that the following steps are vital:

- **Careful selection of the members of the PIU team and insisting on keeping the team as compact as possible with no changes in the team during the entire project period.**
- **Arrangements for adequate training of the PIU team immediately after the project's approval and before the real start of the project.**
- **The members of the PIU team should be released from any other obligations at the company, allowing them to devote their time fully to the projects tasks and their successful implementation.**
- **At the beginning of the project, the PIU team should be fully organized and equipped with all necessary technical goods, such as adequate office space, phones, fax & copy machine, printers, cameras, car, stable and fast Internet connection, etc.**
- **The contacts between PIU members and Contractors should be as frequent as possible, even on a daily basis if applicable.**
- **The contacts between PIU members and the Bank Team Leader or his representative should be more frequent then regular Bank's missions. This could improve the overall project performance and support all necessary discussions about all pending issues on the project and its implementation.**

The Bank team has no disagreements with the above conclusions. However, in addition this project reinforces the lesson that worthwhile projects take considerable time to complete and rushing them greatly increases the chances of failure. This project took 7 years from start to completion - as planned. If it had been a five year project it would have had to be extended or would not have been anywhere near as successful.

9. Partner Comments

(a) Borrower/implementing agency:

Prepared by ESM's PIU

Power System Improvement Project (PSIP) was one of the most important projects in the energy sector taken after the separation of the Republic of Macedonia from the Former Yugoslav Federation. The complexity of the project, its interdisciplinary structure and the importance that it has for the electricity sector in the country, made this project most attractive on one side for the contractors and on the other side an implementation challenge for the Electric Power Company
(ESM) as implementation agency.

This project consisted of several sub-components that required significant technical knowledge and managerial capacities to be successfully implemented in the originally designated time frame. The Loan Agreement with IBRD was signed in mid-1998, and the project closing date was: June 30, 2005. We can proudly say that this final deadline was achieved with results which in some cases are even better than expected.

The main issues and problems that we faced during the project implementation were:

1. The first and probably the most difficult decisions was to select the type and the number of contracts as well as an adequate division of sub-components of the project. The final decision was to split the entire project into a number of smaller sub-project in accordance with the type of the goods, equipment and services, as well as to determine the need for consulting services. As a result, for the whole project the

PIU had to closely monitor more than 20 different contracts with almost as many as contractors, most of them executed in parallel, which was extremely complex, time consuming and sometimes difficult to manage. On the one hand this method enabled the PIU to select the best contractors for many separate and specific types of equipment and therefore, to optimize the cost and quality, while on the other hand the costs for coordination and completion of the project and its outcome was assumed by the PIU i.e. ESM as the implementation agency. To be more precise, the PIU had different contracts for turbines, for generators and excitation, for switchgear and switchyard equipment, and for control equipment; however, the cost for coordination of the jobs, inter-contractors obligations, etc, was entirely transferred to the PIU team making implementation extremely difficult and sometimes time-consuming. Therefore, as a first suggestion, the PIU suggests in such projects to combine similar types of equipment as much as possible. For example, we could reduce the number of packages to two or three , for example, all hydro-mechanical equipment in one package, and all electrical equipment in another package, possibly including control systems in different packages or their inclusion in the electric package. In this case, we would have two or three contractors and coordination could be easier. However, this approach would most probably increase the cost of the entire project.

2. In the tender preparation phase, some foreign consulting companies were included (*in our case EdF – France*). Although the consultants paid significant attention to tender document preparation, during implementation of the project, many drawbacks to their work have been found, mostly due to their lack of familiarity with the real situation at the plant level. Therefore, it seems that the use of local experts, as many as possible from the power plants, should in future be strongly encouraged in order prepare the best possible tender documents.

3. As a result of the long implementation period for the whole project and changes in the company's management, changes of members of the PIU team were significant and very unproductive, although the Bank insisted that the PIU team remain stable and permanent. To aid in this matter we suggest that the PIU team should report directly to the Bank's local representative and to only one responsible person from the implementation agency, e.g. the general manager or the investment manager.

4. The PIU team should be stable and established before the project implementation starts. Each member of the PIU should have specific responsibilities and suitable training should be done prior to project implementation. In our case, each member of our PIU team had to learn their job by themselves, which opened considerable room for making mistakes. This is highly ineffective and unprofessional and could lead to serious problems in the implementation.

5. A special IT tool for project monitoring, especially financing and procurement issues should be developed by the Bank or should be suggested by the Bank for unification of the results of implementation, presentations and analysis. This IT tool should be freely available before each project starts to be implemented and could give a realistic view of the project implementation at each moment. It could also aid the Bank's Representatives during each mission to closely monitor the progress of project implementation and if necessary provide an alert about any problems with the project and/or its implementation.

6. Our project was unusual due its distributed implementation at various locations – six hydro power plants, installation of OPGW along the transmission lines, National Dispatch Center in Skopje, and several locations for installation of the power transformers.It was extremely difficult to follow day-to-day activities at each and every location. The PIU had specially designated persons for each sub-project, however, distributed teams of local experts at various locations would be very advantageous for timely project implementation and for execution of all works to the required quality.

7. Collaboration between the PIU and the Bank's Representatives was highly satisfactory. The Bank dispatched its missions at least two times per year, however, during the problematic period of the Project implementation (years 1999/2001) even more. The collaboration with the other Bank staff based in USA (*procurement division, disbursement division, legal advises, etc.*) was also quite satisfactory. Small problems made few delayed responses from the Bank on the PIU request due to problems encountered during the project implementation. We suggest that the response time on any demand or request be as short as possible and that the number of Bank missions be increased since very often they are important for the implementation schedule and decrease possible occurrence of delays.

8. During the implementation period 1998 – 2005, our country was directly or indirectly involved in two major conflicts; in 1999 in Serbia and Kosovo, and in 2001 a civil conflict in Macedonia. These were the main problems that lead to delays in the project implementation, especially due to the recommendation all over the world to avoid Macedonia as a risky country. The Bank Team was very cooperative during all this period and trusted our PIU that albeit this was a serious situation, the full realization of the project would not be unduly delayed. This reflected positively on the whole PIU team who with additional efforts in combination with the Contractors successfully achieved all tasks to the defined quality and on time.

9. The PIU would like to acknowledge that full project implementation was achieved under very difficult conditions due to lack of additional available generation capacity to replace those units which are under rehabilitation, increased energy demands in the country, and tough operational schedules. Usually, we had to work under huge time pressures, which revealed that this method of implementation is not easy and should be avoided in future if possible. This was further aggravated in cases when two or more units of the same plant or at different plants were under rehabilitation. We suggest that in future for such complex projects, better scheduling is applied in coordination with, the National Dispatch Center, the contractors (all of them) and the PIU team members, in order to avoid such highly stressed situations. Shutting one unit until its full rehabilitation is done is one of the options, however this is not always possible, especially in the case of full control system replacement for the entire power plant. In general, the PIU was satisfied with the level of cooperation with the contractors selected for this project.

(b) Cofinanciers:
No comments. (A small amount of Swiss financing was attained early in the project.)

(c) Other partners (NGOs/private sector):
None

10. Additional Information

Annex 1. Key Performance Indicators/Log Frame Matrix

Outcome / Impact Indicators:

Indicator/Matrix	Projected in last PSR[1]	Actual/Latest Estimate
1.Efficiency of hydroelectric generation in terms of increased generation from normalized water flow after rehabilitation. SAR estimate was an additional 13.7 Gwh/year	+39 Gwh (slightly low)	+40. 9 Gwh/year additional obtained or 298% of estimate.
2. reliability of electricity supply. Ability to reconnect with UCTE which provides much improved system reliability.	Was already achieved.	Achieved due to:1) to repairs in Bosnia reconnecting Ex-Yugoslav systems to Western Europe; and 2) installing AGC systems financed by project and required now by UCTE.
3. Facilitate the development of Independent power producers, with the initial plants probably being mini-hydropower plants.	N.A.	5 mini-hydros built, 7 under private rehabilitation (ROT). 20 planned. A 200 Mw privately owned CHP plant in Skopje has also been agreed between the Government and private developers.

Output Indicators:

Indicator/Matrix	Projected in last PSR[1]	Actual/Latest Estimate
Increase in hydropower capacity estimated at 31 MW in SAR	+ 58.8 Mw (was high)	+49.2 MW or 59% more..
2. .Increase of price of electricity to 7.5 pfennings/KwH	7.5 Pfennigs or 3.8 Euro Cents	3.9 Euro Cents
3. Reduction of unserved energy of 1 GwH	N.A.	N.A.
4. Reduction of distribution losses of 0.5% of sales		Actual result is about 0.2% reduction in technical losses due to investment in transformers. Main reason is fewer purchases of transformers than expected due to procurement dispute. Individual transformers performing about as expected.
5.		

[1] End of project

Annex 2. Project Costs and Financing

Project Cost by Component (in US$ million equivalent)

Component	Appraisal Estimate US$ million	Actual/Latest Estimate US$ million	Percentage of Appraisal
Hydropower Plant Rehabilitation	30.60	47.50	
Energy Management System	8.70	8.50	
Distribution Rehabilitation	4.30	3.80	
Dam Safety	1.00	0.20	
PIU	0.00	0.60	
Total Baseline Cost	44.60	60.60	
Physical Contingencies	1.80	0.00	
Price Contingencies	5.30	0.00	
Total Project Costs	51.70	60.60	
Total Financing Required	51.70	60.60	

Project Costs by Procurement Arrangements (Appraisal Estimate) (US$ million equivalent)

Expenditure Category	Procurement Method[1] ICB	NCB	Other[2]	N.B.F.	Total Cost
1. Works	27.41 (0.00)	0.65 (0.00)	0.00 (0.00)	3.18 (0.00)	31.24 (0.00)
2. Goods	19.26 (0.00)	0.00 (0.00)	0.20 (0.00)	0.00 (0.00)	19.46 (0.00)
3. Services	0.00 (0.00)	0.00 (0.00)	1.00 (0.00)	0.00 (0.00)	1.00 (0.00)
4. Miscellaneous	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
5. Miscellaneous	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
6. Miscellaneous	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Total	46.67 (0.00)	0.65 (0.00)	1.20 (0.00)	3.18 (0.00)	51.70 (0.00)

Consultant Guidelines for services. IS

Project Costs by Procurement Arrangements (Actual/Latest Estimate) (US$ million equivalent)

Expenditure Category	Procurement Method[1] ICB	NCB	Other[2]	N.B.F.	Total Cost
1. Works	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
2. Goods	55.66 (37.20)	0.00 (0.00)	0.10 (0.20)	3.90 (0.00)	59.66 (37.40)
3. Services	0.00 (0.00)	0.00 (0.00)	0.94 (0.42)	0.00 (0.00)	0.94 (0.42)

4. Miscellaneous	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
5. Miscellaneous	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
6. Miscellaneous	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Total	55.66 (37.20)	0.00 (0.00)	1.04 (0.62)	3.90 (0.00)	60.60 (37.82)

[1/] Figures in parenthesis are the amounts to be financed by the Bank Loan. All costs include contingencies.

[2/] Includes civil works and goods to be procured through national shopping, consulting services, services of contracted staff of the project management office, training, technical assistance services, and incremental operating costs related to (i) managing the project, and (ii) re-lending project funds to local government units.

Project Financing by Component (in US$ million equivalent)

Component	Appraisal Estimate			Actual/Latest Estimate			Percentage of Appraisal		
	Bank	Govt.	CoF.	Bank	Govt.	CoF.	Bank	Govt.	CoF.
Hydro Power Plant Rehabilitation	27.80	7.90	3.90	29.90	13.70	3.90	107.6	173.4	100.0
Energy Management System	7.60	2.50	0.00	5.10	3.40	0.00	67.1	136.0	0.0
Distribution	3.50	1.50	0.00	3.50	0.30	0.00	100.0	20.0	0.0
Dam Safety	1.00			0.20			20.0		
PIU	0.00	0.00	0.00	0.20	0.40		0.0	0.0	0.0

Annex 3. Economic Costs and Benefits

There is a complete description of this issue in Section 4. Attached below is the summary table.

PROJECT RESULTS

Major Components	Forecast ERR	Actual ERR	Actual NPV at 10% $ Millions
Hydropower Plants Rehabilitation	17%	22%	35.1
Energy Management System	30%	28%	5.3
Distribution Rehabilitation	21%	11%	0.15
Project Total	21%	22%	39.2

It should be noted that the total project includes costs for the dam safety and the PIU components, for which no benefits could be readily calculated although there were clearly significant benefits. As a result of these two cost items the overall project NPV is less than the sum of the NPVs for the three components for which benefits were calculated.

Annex 4. Bank Inputs

(a) Missions:

Stage of Project Cycle	No. of Persons and Specialty (e.g. 2 Economists, 1 FMS, etc.)		Performance Rating	
Month/Year	Count	Specialty	Implementation Progress	Development Objective
Identification/Preparation				
11/95				
7/97				
Appraisal/Negotiation				
11/01/97				
12/10/97				
Supervision				
12/19/1998	*1*	TEAM LEADER (1)	S	S
7/21/1999	*2*	TEAM LEADER, POWER ENGINEER	S	S
12/19/1999	*1*	TEAM LEADER	S	S
3/19/2000	*2*	TEAM LEADER, POWER ENGINEER	S	S
11/28/2000	*2*	TEAM LEADER POWER ENGINEER	S	S
12/22/2000	*1*	POWER ENGINEER	S	S
3/29/2001	*1*	TEAM LEADER	S	S
3/19/2002	*2*	TEAM LEADER, POWER ENGINEER,	S	S
12/17/2002	*2*	TEAM LEADER, POWER ENGINEER	S	S
6/18/2003	*3*	TEAM LEADER, ECONOMIST,POWER ENGINEER	S	S
9/25/2003	*4*	TEAM LEADER, ECONOMIST, ENGINEER, PROJECT OFFICER	S	S
12/14/2003	*3*	TEAM LEADER, SECTOR MANAGER, ECONOMIST	S	S
3/25/2004	*21*	TEAM LEADER, ECONOMIST	S	S
5/24/2004	*6*	TEAM LEADER, ECONOMIST, 2 ENGINEERS, PROCUREMENT, FINANCIAL SPECIALIST	S	S
6/21/2004	*1*	TEAM LEADER	S	S
1/25/2005	*2*	TEAM LEADER,POWER ENGINEER, ECONOMIST		
ICR				
6/6/2005	*3*	TEAM LEADER, POWER ENGINEER, ECONOMIST	S	S
9/19/2005	*3*	TEAM LEADER,	S	S

		POWER ENGINEER, ECONOMIST		

(b) Staff:

Stage of Project Cycle	Actual/Latest Estimate	
	No. Staff weeks	US$ ('000)
Identification/Preparation		
Appraisal/Negotiation		
Supervision		
ICR		
Total		894,636.02

Annex 5. Ratings for Achievement of Objectives/Outputs of Components

(H=High, SU=Substantial, M=Modest, N=Negligible, NA=Not Applicable)

	Rating
☐ *Macro policies*	○ *H* ○ *SU* ○ *M* ○ *N* ● *NA*
☐ *Sector Policies*	● *H* ○ *SU* ○ *M* ○ *N* ○ *NA*
☐ *Physical*	● *H* ○ *SU* ○ *M* ○ *N* ○ *NA*
☐ *Financial*	○ *H* ● *SU* ○ *M* ○ *N* ○ *NA*
☐ *Institutional Development*	○ *H* ● *SU* ○ *M* ○ *N* ○ *NA*
☐ *Environmental*	○ *H* ● *SU* ○ *M* ○ *N* ○ *NA*
Social	
☐ *Poverty Reduction*	○ *H* ○ *SU* ○ *M* ○ *N* ● *NA*
☐ *Gender*	○ *H* ○ *SU* ○ *M* ○ *N* ● *NA*
☐ *Other (Please specify)*	○ *H* ○ *SU* ○ *M* ○ *N* ● *NA*
☐ *Private sector development*	● *H* ○ *SU* ○ *M* ○ *N* ○ *NA*
☐ *Public sector management*	○ *H* ● *SU* ○ *M* ○ *N* ○ *NA*
☐ *Other (Please specify)*	○ *H* ○ *SU* ○ *M* ○ *N* ○ *NA*

Annex 6. Ratings of Bank and Borrower Performance

(HS=Highly Satisfactory, S=Satisfactory, U=Unsatisfactory, HU=Highly Unsatisfactory)

6.1 Bank performance	*Rating*			
☐ *Lending*	○ *HS*	● *S*	○ *U*	○ *HU*
☐ *Supervision*	○ *HS*	● *S*	○ *U*	○ *HU*
☐ *Overall*	○ *HS*	● *S*	○ *U*	○ *HU*

6.2 Borrower performance	*Rating*			
☐ *Preparation*	○ *HS*	● *S*	○ *U*	○ *HU*
☐ *Government implementation performance*	○ *HS*	● *S*	○ *U*	○ *HU*
☐ *Implementation agency performance*	○ *HS*	● *S*	○ *U*	○ *HU*
☐ *Overall*	○ *HS*	● *S*	○ *U*	○ *HU*

Annex 7. List of Supporting Documents

The P drive (P:\Macedonia\Energy\Power) has a large set of documents on this project. These include the Staff Appraisal Report about 20 Aide Memoires, letters, some spread sheets etc. They cover the period from 1997 to September 2005 and include over 200 documents. However, there is also some overlap in the documents on that drive. The legal documents are also available although not in the P drive.