



CASE STUDY
ON THE
POWER AND DISTRICT HEATING REHABILITATION PROJECT
(Loan 1443-KGZ[SF])
IN THE
KYRGYZ REPUBLIC

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ABBREVIATIONS

ADB	–	Asian Development Bank
DANIDA	–	Danish International Development Assistance
JSC	–	joint stock company
KE	–	Kyrgyz Energo
KNEHC	–	Kyrgyz National Energy Holding Company
kWh	–	kilowatt-hour
NDF	–	Nordic Development Fund
PIU	–	project implementation unit
TES-1	–	Bishkek Thermal Energy Station #1
TOE	–	Tonne of Oil Equivalent (cost of energy)
WB	–	World Bank

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I. BACKGROUND

1. An analysis of the severe operational and financial problems faced by the energy sector of the Kyrgyz Republic following the breakup of the Soviet Union was performed in 1994 and 1995 by various aid agencies led by the World Bank (WB). The findings of this assessment were published in a report issued by WB in April 1995.
2. A loan to address the major problems identified in this analysis was proposed with cofinancing provided by WB, Asian Development Bank (ADB), Danish International Development Assistance (DANIDA), Nordic Development Fund (NDF), and a grant by the Swiss Government. Counterpart funding was to be provided by the Kyrgyz National Energy Holding Company (KNEHC).
3. The total value of the proposed project was \$98 million with \$15.2 million to be provided by KNEHC as counterpart funds and approximately \$30 million to be provided by ADB with loan terms of 40 years with a 10-year grace period and a loan fee of 1%.
4. The loan and project were deemed essential to survival of the energy sector in the Kyrgyz Republic and were in agreement with the ADB's country assistance plan (CAP) to provide funding for improvement and sustainability of the delivery of essential services in the country. The loan was scheduled to close in July 2000, but because of delays in the project as discussed later the closing was extended to December 2001.

Loan Approval Date:	July 1996
Loan Effective Date:	April 1997
Scheduled Closing:	July 2000
Actual Closing :	Dec 2001
Actual Term of Implementation:	44 months

5. KNEHC was the implementing agency and it designated a project implementation unit (PIU) and a PIU manager to be responsible for implementing the overall project. This team received training, guidance, and assistance from the technical consultants contracted for the project.
6. The actual amounts provided by ADB were:

Item	Amount (\$)
Procurement of pre-insulated and ordinary pipe for BDHS (Bishkek District Heating System) rehabilitation	7,783,587
Test meters and other equipment for electric power substations	2,292,347
New electric power substation equipment	15,652,184
Consultancy for BDHS rehabilitation (Carl Bro)	476,748
Consultancy for power substation work (Fichtner GmbH)	821,400
Consultancy for audit of accounts (Pricewaterhouse)	450,000
Total	27,476,266

7. The Government has suffered a substantial decline in the value of the local currency (the Som) during the term of project implementation, but the prices paid for imported fuel have not changed substantially in dollar terms.

8. Present prices paid by the Bishkek Thermal Energy Station #1 (TES-1) are:

Coal	\$21.00/ton
Natural Gas	\$54.18/thousand cubic meters
Mazut (heavy oil)	\$74.00/ton

9. There has been improvement in the past 2 years both in growth of gross domestic product and in stabilizing inflation, but the country is still struggling with poverty issues resulting from the break up of the Soviet Union and subsequent transition to a market economy. The economy was also adversely affected by the Russian financial crisis in 1998 resulting in a rapid deterioration in value of the local currency.

II. METHODOLOGY

10. Evaluation of the project was conducted during the month of June 2002 by the thematic consultant with assistance by the PIU manager who had been responsible for implementation of the project on behalf of KNEHC.

11. The evaluation methods employed included:

- (i) Consultation and discussions with all parties involved in implementation of the project; Ministry of Finance, National Energy Agency, WB, and each of the energy sector joint stock companies (JSCs) that made up the former KNEHC.
- (ii) Visits to the sites affected by the project; energy generating station, electric power substations, Bishkek District Heating control and distribution facilities and the electric power distribution system in Bishkek.
- (iii) Review of background documents issued by ADB, WB, and Kyrgyz government agencies.
- (iv) Final reports issued by the various technical consultants employed to assist in the implementation of the project.
- (v) Project performance audit reports by various ADB missions during the course of project implementation.

12. Three major issues were encountered which complicated the evaluation:

- (i) The Bishkek District Heating Rehabilitation Project is not complete. All of the replacement pipe purchased by ADB has been received in Bishkek, but only 30–35% of it has been installed. The remainder is stored at the district heating warehouse area, so most of the projected benefit from this part of the project has not yet been realized.
- (ii) KNEHC, later named Kyrgyz Energo (KE), was divided into seven separate JSCs in July 2001. This made it impossible to obtain comparable numbers for comparison to determine the efficiencies gained through implementation of the project. To attempt this would involve a thorough review of production and financial records of each of the seven JSCs, and even then it may not be practical because of the lack of consistency in records among the companies.

- (iii) The loan was closed in December 2001, only 5 months prior to this evaluation. ADB recommended time frame for project evaluation is 3 years to allow time for the project results to be fully realized and measured.
13. The seven JSCs set up by the KNEHC are:
- (i) The Energy Generation JSC, which is responsible for all thermal power and heat production.
 - (ii) The National Electric Grid JSC, which is responsible for the transport and distribution of all high voltage electric power for delivery to the distribution companies who in turn deliver electric power to the consumer.
 - (iii) The Bishkek District Heating JSC, which is responsible for the distribution of heat and hot water. The district heating network is confined almost exclusively to Bishkek.
 - (iv) The Electric Power Distribution JSCs—four separate distribution companies, each with the responsibility for maintaining low voltage lines and distribution to the consumers in a defined area.
14. The economic internal rate of return (EIRR) calculations cannot be done at this time as relatively few measurements have been taken since KNEHC was unbundled into seven separate JSCs. The individual JSCs do not seem to have the present capability to make the necessary comparable calculations as required by the loan covenants. It would be possible to make these calculations, but this would involve analysis of the financial accounts of all seven JSCs in the energy sector plus the independent measurement of production and consumption numbers for the years 1997 through the present.

III. THE PROJECT

15. WB engaged Burns and Roe Consultants (US) to evaluate the district heating system and parts of the electric power distribution system and to provide a feasibility study to address the major areas of concern. This study and other analysis were used by WB in preparing their study issued in April 1996 which formed the basis for development of the project. WB acted as coordinator for other donors who provided funding for the project.
16. Primary objectives of the project were to improve the reliability and sustainability of the delivery of heat and electric power, to promote long-term economic growth, to reduce heat and electric power waste, and thereby reduce dependence on imported fuel (coal, *mazut*, and natural gas).
17. Secondary objectives included (i) to provide training in the utilization of modern equipment and management to employees of KNEHC, (ii) to assist the Government in improving management of companies in the energy sector leading to privatization of all or part of the energy sector, (iii) to improve job opportunities for Kyrgyz citizens, and (iv) to improve the general living conditions for citizens.

18. The overall rehabilitation project consisted of:
- (i) rehabilitation of the Bishkek thermal power generating station TES-1 (financed by WB);
 - (ii) district heating rehabilitation (financed by ADB, DANIDA, and NDF);
 - (iii) power transmission and distribution rehabilitation (financed by ADB, NDF, and the Swiss Government);
 - (iv) technical consultants to assist in design and implementation of certain parts of the project (financed by ADB);
 - (v) civil works for the power substations, installation of power substation equipment, and installation of the district heating pipelines (financed by KNEHC).

A. Rehabilitation of Thermal Power Generating Station TES-1

19. Financed by WB (International Development Association), this included the installation of an additional 100 megawatts generator which was already on site and the rehabilitation of some boilers and instrumentation. This part of the project is completed. WB has currently approved the financing of phase 2 of this project at \$15 million to procure and install additional boiler works and other improvements. This project is in progress.

B. Rehabilitation of the Bishkek District Heating System

20. The components of this project financed by ADB were procurement of pipe (pre-insulated and regular) with technical assistance and necessary equipment for installation.

21. Other components of the project included rehabilitation of seven pumping stations (out of 19 total) with variable speed pumps, installation of computerized control equipment and renovation of 2,280 heating substations. This was financed by DANIDA and NDF. This work has all been successfully completed including technical assistance and training financed by ADB. The completed portion is operating correctly and operating personnel report that it has operated virtually trouble free for 2 years.

C. Electric Substations

22. Electric Substations: Ala-Archa (new), Chuiskaia (rehabilitation), procurement of various items of equipment, meters and test equipment for other substations: Financed by ADB. All equipment procurement, construction, technical assistance, and installation has been completed.

23. This new substation construction and rehabilitation work included the construction of several kilometers of new high voltage line to connect the substations to existing power grid lines. This has also been successfully completed.

24. There are no observed adverse environmental impacts related to this aspect of the project. There had been concern expressed by Fitchner in their completion report that sealed sumps had not been constructed to contain any oil spill from the transformers. The sumps which

have been constructed appear to be adequate, but the consultant could not confirm that they are properly sealed.

D. Technical Consultants

25. Technical consultants were engaged by KE with approval and financing by ADB to assist in the design and implementation of the project and to provide training to KE personnel in proper operation of the items installed. These consultants were:

26. **Swede Power/Carl Bro** (Sweden) were engaged to provide design work, bid solicitation, training, and other assistance to the implementing agency for renovation of the district heating network. Procurement of pipe and materials financed by ADB was completed in May 1999.

27. The installation of this pipe is to be provided by KE using their own personnel and local contractors as part of the required counterpart funding for the project. There were delays in implementation of this component due to lack of counterpart funds and the necessity to avoid interruptions of heat supply during the heating season so it was necessary to extend the Swede Power/Carl Bro consulting contract by 1 year to November 2000. This was done with no additional cost by revising the work schedule.

28. The installation work of the replacement pipe for the district heating system continues to be delayed for the above reasons and is now estimated to be 30–35% completed. Other parts of this renovation such as installation of an automated control system, variable flow pumps, and heat metering systems were successfully completed by 31 December 2001 and a project completion report was issued by Swede Power/Carl Bro in December 2001.

29. **Clemessy** (France) was engaged to provide design, procurement, testing, and training for electric substation construction and renovation together with the construction of new high voltage line connecting the Ala-Archa substation to existing transmission lines. Civil works for this work and installation of the purchased equipment was provided by KE using local contractors and their own personnel as part of the counterpart funding.

30. All of this work has been completed.

31. **Fichtner, GmbH** (Germany) were engaged as supervising consultants for the electric power work. Completion of this component was delayed by approximately 1 year because of changes in project scope and lack of counterpart funding. The project completion report by Fichtner was issued in August 2000, but the work was not yet complete. Final testing and commissioning of part of this work was done by equipment vendors and KE personnel and this component of the project was actually completed in October 2000.

32. All components of the project were successfully completed with the exception of heating pipe installation by 31 December 2001 and the ADB loan was closed at that time.

33. The implementing agency estimates that 205 new local jobs were created during development of the project and private enterprise was supported through the use of local labor and contractors for as much of the project as was practical.

34. There are no observed adverse environmental impacts resulting from the project. There should be a positive long-term impact resulting from reduced steam and hot water losses and a subsequent reduction in the use of fossil fuels.

IV. EVALUATION

A. Evaluation Summary

Relevance	20%	2.6	(0.20x2.6)
Efficacy	25%	2.2	(0.25x2.2)
Efficiency	20%	2.6	(0.20x2.6)
Sustainability	20%	2.0	(0.20x2.0)
Institutional Development	15%	2.2	(0.15x2.2)

Overall Assessment

2.32

35. The project should be considered successful and in some respects highly successful.

B. Relevance

36. The project is certainly rated highly relevant both at the time of approval and when the project was completed. The energy system was in danger of serious failure when the project was initiated and it was imperative that aid be provided as the country could not finance the essential repairs.

37. The one major short coming in relevance is that no provision was made in design of the project to address problems in the low voltage distribution system. This low voltage system which now falls in the responsibility of the four distribution JSCs is in a very bad state of repair and including this in the project would have resulted in much greater success in the delivery of electric power.

38. The delivery of essential services and improving living conditions for the citizens was one of the priorities of the ADB's CAP developed in 1996 and again in the plan for 2000–2003.

39. There were no substantial changes in the scope or objectives of the project during implementation and none were required.

C. Efficacy

40. The general purposes and objectives of the project have been met especially the physical aspects such as procurement, construction, and operational objectives. The institutional and structural objectives were well defined and mostly achievable, but many were not satisfactorily met by the Kyrgyz Republic as is discussed later in this section.

41. The rehabilitation of TES-1: installation of the additional generator, related instrumentation, and boiler works were done in a professional manner and conform to international standards. TES-1 does not appear to have any serious operational problems. Total generating capacity exceeds current energy demands by a comfortable margin.

42. Procurement of replacement pipe and technical assistance for rehabilitation of the Bishkek District Heating System has been successfully completed. All of the pipe has been received in Bishkek and stored adequately and securely in the district heating warehouse. Training in proper installation was provided to district heating personnel and all technical assistance has been successfully completed. Installation of this material was to be performed by district heating personnel and local contractors with financing provided by KNEHC. Under the

terms of the loan agreement, KNEHC was to provide approximately \$5 million for this purpose, but only \$1.8 million has been provided so the installation work is not yet complete. The remainder of the pipe is in the Bishkek District Heating warehouse area.

43. Bishkek District Heating is attempting to provide funds from their operating budget to complete the installation, but they are presently able to provide about Som29 million (\$600,000) per year. At this rate, it will require some 6 years to complete the installation.

44. All of the work performed in the construction and renovation of electric power substations is very professional and appears to conform to international standards. Plant personnel report that these substations have performed to expectations and are not experiencing any problems.

45. The institutional and structural goals were much more clearly defined in loan covenants and an action plan developed by ADB and WB in conjunction with KNEHC and the Ministry of Finance as the project progressed. These covenants were agreed to by the Kyrgyz Republic but for various reasons, compliance was mixed.

46. There were a number of loan covenants required to be fulfilled by KE and these covenants have generally been met with the following exceptions:

- (i) Counterpart funding—KE was projected to provide \$15.2 million in counterpart financing for the overall project with \$5 million scheduled for the installation of district heating pipe works. KE has only provided \$1.8 million (of the \$5 million) to date and as a result the pipe works are only 30–35% complete.
- (ii) Audited financial reports—Audited financial reports were to be provided no later than 30 June each year for the preceding year. These have been and continue to be provided approximately 1 year after the end of each year.
- (iii) Reduction in receivables—KE was committed to reduce receivables to less than 60 days of billings and to reduce the use of barter. KE has not been able to provide an aging statement for receivables, but barter, collection delay, and uncollectible accounts continue to be a problem. WB estimates that only 30% of billings by the energy sector are paid in cash with the remainder uncollectible (20%) or paid through off sets with government agencies or barter.
- (iv) KE was committed to gradual increase in energy rates to not only make the energy sector self financing, but to eventually bring the cost of electric and heating energy into line with other energy costs on a Ton of Oil Equivalent (TOE) basis. This would result in much more economically efficient choices by consumers in the use of energy and provide the necessary incentive for energy conservation by consumers.

47. Electric power tariffs have been increased several times since implementation of the project with the most recent increase becoming effective on 15 March 2002. The rate structure is somewhat complex, but essentially the average electric tariff for residential consumers is Som44 per kilowatt hour (kWh) and for industrial consumers slightly less. This is equivalent to about \$.01 per kWh.

48. KE has raised energy tariffs by approximately 100% during the project term in an effort to comply with loan covenants, but imported fuel costs in local currency terms have risen by about 400% in the same period so the financial condition of the energy sector remains very tenuous even though the cost of hydropower (\$0.006/kWh) and the dollar value of imported fuel have remained relatively stable.

49. To price electric power on a TOE basis with the world price of oil the price for electric power would need to be in the range of \$.05–\$.06 per kWh and even to cover total production and distribution costs \$.025–\$.03/ kWh, so much more needs to be done in this regard.

50. The financial internal rate of return was projected at 23.3% and the EIRR at 24.1%. It has not been possible to calculate actual rates of return as the project is not yet complete and the full efficiency benefits have not been realized, however, the factors discussed above make it unlikely that the projected rates of return will be realized.

D. Efficiency

51. The implementing agency, the PIU, and the technical consultants engaged to assist in the implementation of the project have fulfilled their obligations well and the project remained within the budget in spite of delays as a result of lack of counterpart funding and some temporary disagreement between KE and consultants regarding the selection of equipment vendors. Funding provided for the project appears to have been applied efficiently and effectively. The project was implemented very efficiently in terms of design, procurement of materials, construction, and operation.

52. It was necessary to extend the schedule for the project by more than 1 year, primarily because of a shortage of counterpart funds. In spite of this, it was completed within the budget and is very operationally successful.

53. It was not practical to calculate a final EIRR for the project as discussed previously in this report, but it is not likely that the projected EIRR of 24.1% will be achieved. The remaining problems in low voltage power distribution and continued non-payment and theft of energy (both heat and electric) will make it difficult to achieve the projected rate of return.

54. The ongoing delay in the rehabilitation of the Bishkek District Heating System insures that heat losses will continue to occur for the next several years.

E. Sustainability

55. Sustainability of the project depends in great measure upon future actions by the Government regarding the increase in energy tariffs to cover operating and replacement costs in the energy sector. In present circumstances, tariffs for electricity and heat are not adequate to cover these costs. The Government has raised tariffs several times during implementation of the project in an attempt to comply with loan covenants, but these increases have not kept up with the rapid increase in the local currency cost of imported fuel. They must also take measures to reduce the theft and under reporting of energy usage and continue to improve collections and reduce uncollectible accounts.

56. The Russian financial crisis of 1998 had a particularly devastating impact on the financial condition of the country because of their dependence on imported fuel and trade with Russia.

57. Reliability of electric power has not improved materially, but the failures are primarily related to factors which the project did not address such as the obsolete low voltage distribution network, the condition of high voltage components that were not included, and the rapid local currency increase in the cost of imported fuel. Reliability would have probably been much worse without the project.

58. Improvements made in the delivery of heat and electric power resulting from the project can be sustained provided that the Government continues with and accelerates the present policy of raising energy tariffs and reducing losses through non-payment and theft of electric power. A new energy law has been proposed which would address some of these problems and the Government is pursuing appropriate policies to insure survival of the energy sector.

F. Institutional Development and Other Impacts

59. Management of the energy sector has been improved by the project primarily through the introduction of international accounting standards and improvement in other financial management aspects of the various enterprises. There is general recognition of the need for cost accounting and control in all of the energy sector JSCs and the Government even though all of the improvements that were contained in the loan covenants have not yet been implemented.

60. The restructuring of KNEHC into seven JSCs will eventually improve transparency and accountability which will improve financial management of all components of the energy sector even though it is creating a great deal of confusion in the short term.

61. Audited financial statements have been provided to the lenders even though they have been late and there has been improvement in the efficient management of all aspects of the enterprises.

G. Other Observations Relating to Evaluation

62. In June 2001, KNEHC was reorganized into seven separate JSCs as a prelude to privatization.

63. Approximately 94% of the stock of each of the JSCs is retained by the Government with the remainder held by employees or by other parties so the Government, through the Ministry of Finance and the State Energy Agency, still exercises total control over the operation of the JSCs. The boards of directors are made up of government officials appointed by the Government. The JSCs all deposit into a common bank account and distribution to each company is determined in an allocation by the Ministry of Finance and the National Energy Agency based upon estimated requirements for company operation.

64. Given this structure, they are JSCs in name only and are still essentially government-owned enterprises. The essential, inherent conflict in this arrangement is that the owner of the enterprise (the Kyrgyz Republic) is motivated primarily by the political impact of rates and efficient operation rather than the potential benefit to shareholders. The inherent bias is to keep energy rates within politically acceptable bounds and to provide employment to a maximum number of people.

65. Electric power and heating rates cannot be raised to the needed levels without proper provision to provide for very low income consumers. Estimates by the Ministry of Finance and

WB are that 60% of the population is classified as poor with 20% classified as extremely poor. These percentages have not changed appreciably since the project was initiated.

V. ASSESSMENT OF ADB AND THE GOVERNMENT

66. ADB has performed its responsibilities well during implementation of the project. All funds were provided in a timely manner and oversight was adequate with a number of project review missions following progress during implementation. When problems were discovered, ADB with WB and the Kyrgyz Republic developed a clearly-defined action plan to improve operation of the energy sector. These loan covenants will greatly improve the management and sustainability of the energy sector when they are fully implemented.

67. The Government has generally made a good faith effort to perform their responsibilities in oversight of the project, compliance with loan covenants, and provision of counterpart funding as required. They have also made a good faith effort to comply with all of the loan covenants. These efforts have not always been successful for the various reasons discussed in other sections of this report, but this has been largely the result of factors which the Government could not control.

68. All of the cofinancing agencies have participated and have provided committed funding in a reasonably timely manner.

69. A resolution has been proposed in the Kyrgyz parliament to provide vouchers to low-income consumers which would relieve the energy sector of the financial burden of providing energy to the poor and recognize it as a social cost in the budget. This resolution has been pending since at least 1997 with no action taken. The measures taken by the State Energy Agency and Ministry of Finance to this point is to set very low tariffs for the first basic 150 kWh/month of usage. This only serves to create an overall low electric power tariff for all consumers.

70. A very serious problem where the Government is concerned is the widespread theft of electricity and under reporting of hot water usage by residential consumers. The State Energy Agency and others report that approximately 36% of electric power is stolen by wiring around the installed meters.

71. The State Energy Agency has proposed a new energy law which will address this problem by providing severe penalties for the practice of bypassing meters. This resolution should be approved and enforced.

VI. ISSUES, LESSONS LEARNED, AND FOLLOW-UP ACTIONS

72. The unbundling of KE into seven separate JSCs only some 10 months ago has made evaluation of the project more difficult as many financial and operational divisions are still being sorted out. All of the JSCs seem to be managed quite well from an operations view. The financial and commercial aspects are more problematic. There appears to be a real difficulty in keeping meaningful accounts and a lack of knowledge in most cases of international accounting standards. Commercial functions have presented more difficulties in making the adjustments required in transition from a managed economy and should be monitored in the future.

73. The Government has faced a number of difficulties during implementation of the project including a severe financial crisis in 1998 and as a result was not able to provide required

counterpart funding in a timely manner. The persistent level of poverty in the country continues to make it difficult socially to increase tariffs for energy consumption to levels which would make the energy sector financially viable. This is an area which should be emphasized to give consumers more incentive to conserve energy and to force more efficient choice in the use of energy types. Tariff increases are also essential to provide the energy sector with sufficient funding to assure long-term sustainability.

74. Various resolutions have been introduced to provide energy subsidy vouchers to low-income people allowing overall energy tariffs to be increased. This approach would recognize the cost of providing electric power and heat to low-income citizens as a social cost rather than placing the financial burden on the energy sector as it is now.

75. ADB should follow events in the Kyrgyz Republic to ensure that energy tariffs continue to be increased. ADB must also monitor the safe storage of replacement pipe for the Bishkek District Heating System to ensure that it is kept secure and installed on a reasonable schedule.

76. While many problems remain in the energy sector, the major short-term emphasis for both funding and technical assistance should be in improvement of the low voltage distribution networks. Most of the infrastructure of the four JSCs involved in distribution is old, obsolete, and in bad repair. Frequent outages persist and system losses including theft of electric power are estimated to exceed 35%. The Kyrgyz Republic should be encouraged to strengthen and enforce the energy law as regards the theft of energy.

77. In retrospect, the project could have been better designed initially by including funds and technical assistance for both the low voltage distribution network and for the international grid control system which is located in Uzbekistan and controls the distribution of electric power among the participating states of the Kyrgyz Republic, Kazakhstan, and Uzbekistan.

78. Future lending projects which require counterpart funding should also contain contingency plans for the possibility that these funds may not be available as promised.