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KYRGYZSTAN: REPORT ON FINANCIAL ANALYSIS OF KYRGYZENERGO

(Deliverable 2.6)
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Final Report

Prepared for

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Energy and Infrastructure Division

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EXECUTIVE SUMMARY

Deliverable 2 6 Financial Analysis of Kyrgyzenergo

The Minister of Finance and Economics requested USAID/Hagler Bailly to assist in developing a financial model of Kyrgyzenergo as it is currently structured and as it would be structured after unbundling its distribution assets The Government intended to submit the results to Parliament in support of the Government's approved Program for Denationalization and Privatization of Kyrgyzenergo The various Committees of Parliament had refused to consider the Program until the Government provided such financial analysis, expressing their concern, in essence, that unbundling would unravel all the various cross-subsidies and result in high tariff levels for high cost regions

The following table and charts summarize the preliminary results of the USAID/Hagler Bailly model In essence, the model showed that although Kyrgyzenergo reports an average tariff of 11 4 tyiyn and profits of 1 7 tyiyn under old accounting methods, under international accounting standards, the average tariff actually collected on kwh actually consumed would be only 7 tyiyn, and Kyrgyzenergo would show losses of 2 tyiyn per kwh (20 tyiyn = 1 cent US) The primary reason for the large difference is the fact that the old methods do not (or Kyrgyzenergo will not) take adequate account of the huge theft and non-payments problems During the data collection phase of this task, one member of Kyrgyzenergo's accounting staff said to us, "Why should we consider the losses? They are not our fault If we considered the losses, we would not show profits " And, presumably, the employees would not receive their bonuses of 25% of annual salary

The model also showed that just as Kyrgyzenergo as a whole is actually unprofitable, so are all its distribution components, except Bishkek However, based on a model run that assumed operating under commercial business practices (system losses go down to 12% and collections would go up to 95%), all but two distribution entities would show real profit under current tariff levels (That profit level, however, would not be enough to pay for repairs, rehabilitation and extension of the system Profit enough to sustain the distribution enterprise as a self-financing business would require a tariff increase) The conclusion to be drawn is that, except for two distribution entities with very low population densities and extreme weather conditions, the distribution enterprises are unprofitable not because of high costs but because of low collections and high theft

The State Energy Agency used the results of the USAID/Hagler Bailly model when preparing a more lengthy analysis of financial parameters of Kyrgyzenergo's operations that the Government sent to the Parliament when it resubmitted its Program on Privatization of Kyrgyzenergo on June 5, 1998

In the meantime, Kyrgyzenergo produced its own financial analysis to show that unbundling would result in a fourfold worsening of financial results, alleging that unbundling would cause collections to decrease and losses to increase

The results of the USAID/Hagler Bailly model are frequently used in briefings on the financial reasons for the deteriorating technical state of the energy sector and, in particular, for the load shedding of last winter, as shown on the following charts

Results of USAID - Hagler Bailly Financial Model of Kyrgyzenergo

		Calculated using	
		Old methods	International Accounting Standards
1	Base case-current operations		
	15% technical losses		
	40% theft		
	18% non payment		
	Average tariff/kWh	11 4 tyiyn	7 tyiyn
	Profit/kWh (billed)	1 7 tyiyn	
	Profit/kWh (used)*		-0 23 tyiyn
2	Commercial operations case		
	12% technical losses		
	2% theft		
	5% bad debt		
	(all else the same, including tariff level)		
	Average tariff/kWh	11 4 tyiyn	10 5 tyiyn
	Profit/kWh (billed)	4 6 tyiyn	
	Profit/kWh (used)*		4 0 tyiyn

* Operating income (receipts - cost of CO) per kWh used

Notes Under old accounting methods, Kyrgyzenergo reports a profit, under IAS, Kyrgyzenergo would show losses The discrepancy is primarily because the financial implications of theft are ignored under old accounting methods

If Kyrgyzenergo adopted commercial business practices (reducing theft and increasing collections), it would become profitable, and there would not be such a substantial difference between IAS or the old methods in reporting profit

Результаты финансовой модели АО "Кыргызэнерго", разработанной Хаглер Баи- ЮСАИД

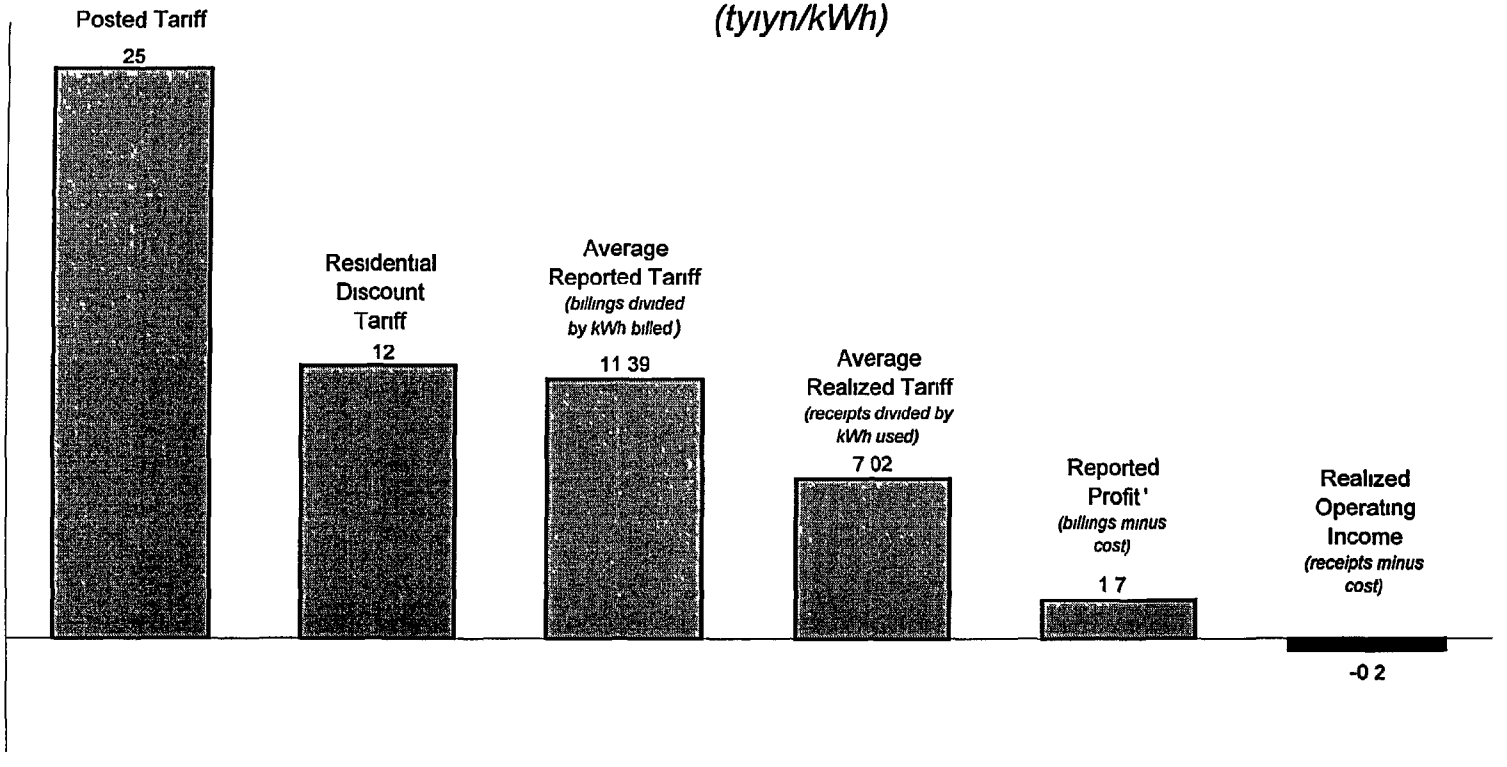
		Подсчет с применением Ранних методов	Международных стандартов бухучета
1	Базовая текущая деятельность 15% технических потерь 40% хищения 18% неуплаты		
	Средний тариф/кВт ч	11 4 тыйын	7 тыйын
	Прибыль/кВт ч (от учтенной э/э)	1 7 тыйын	
	Прибыль/кВт ч (потребленной э/э)*		-0 23 тыйын
2	Финансовая деятельность 12% технических потерь 2% хищения 5% безнадежные долги (все остальное одинаково, в том числе уровни тарифа)		
	Средний тариф/кВт ч	11 4 тыйын	10 5 тыйын
	Прибыль/кВт ч (от учтенной э/э)	4 6 тыйын	
	Прибыль/кВт ч (потребленной э/э)*		4 0 тыйын

* Доход от производственной деятельности (поступления - себестоимость товарной продукции) от одного потребленного кВтч

Примечания Подсчет по методу АО "Кыргызэнерго" показывает прибыль, а применение компанией международных стандартов по бухучету показывает убыток Расхождение главным образом вызвано тем, что при проведении подсчета по ранним методам не учитываются расходы, связанные с хищениями

АО "Кыргызэнерго" начало бы работать рентабельно и не было бы такой существенной разницы между МСБУ и ранними методами при составлении отчетов о прибыли, если бы приняло коммерческие методы ведения бизнеса (сокращая хищения и увеличивая сбор по счетам)

Kyrgyzenergo Actually Loses Money on Every kWh Used in Kyrgyzstan, Even Though it Reports a Profit

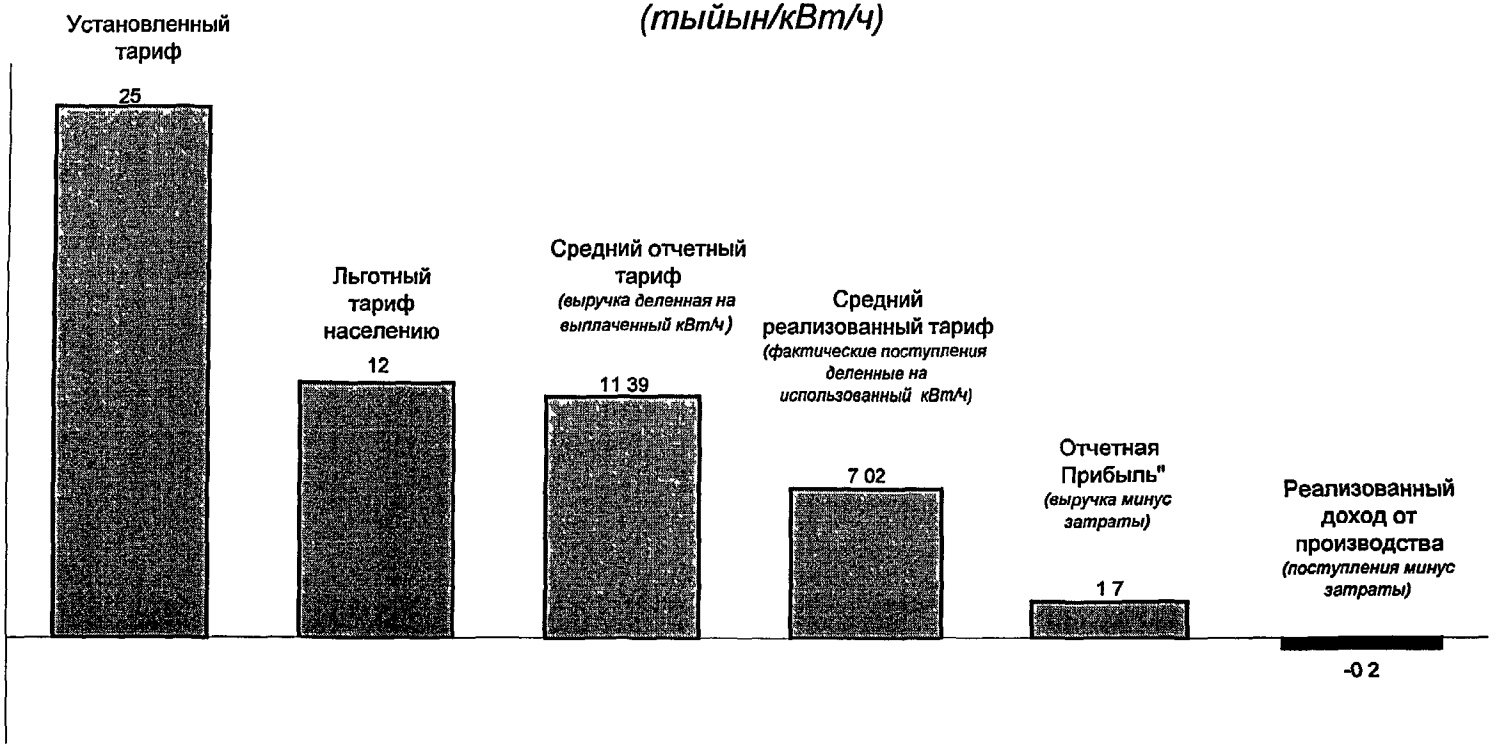


Note Although Kyrgyzenergo reported total revenues of $ 77 8 M in 1996, the recent Price Waterhouse Audit of Kyrgyzenergo's 1996 financial results reported sales at $100 M The PW audit also reported a loss of $13 8 M (before extraordinary income of a $5 M Swiss Government grant)

July 6 1998
5los_mon xls

Фактически Кыргызэнерго теряет деньги по каждому кВт/ч электроэнергии, потребляемой в Кыргызстане, хотя по отчетам оно получает прибыль

(тыйын/кВт/ч)



Примечание По отчетам АО "Кыргызэнерго" общий объем доходов составляет 77 8 млн долларов, хотя проведенный недавно организацией Price Waterhouse аудит финансовой деятельности АО "Кыргызэнерго" за 1996 год показывает, что реализация составила 100 млн долларов Результаты аудита PW показывают, что потери составили 13,8 млн долларов (до поступления чрезвычайного дохода в виде гранта 5 млн долларов от Правительства Швейцарии)

Июль 6 1998
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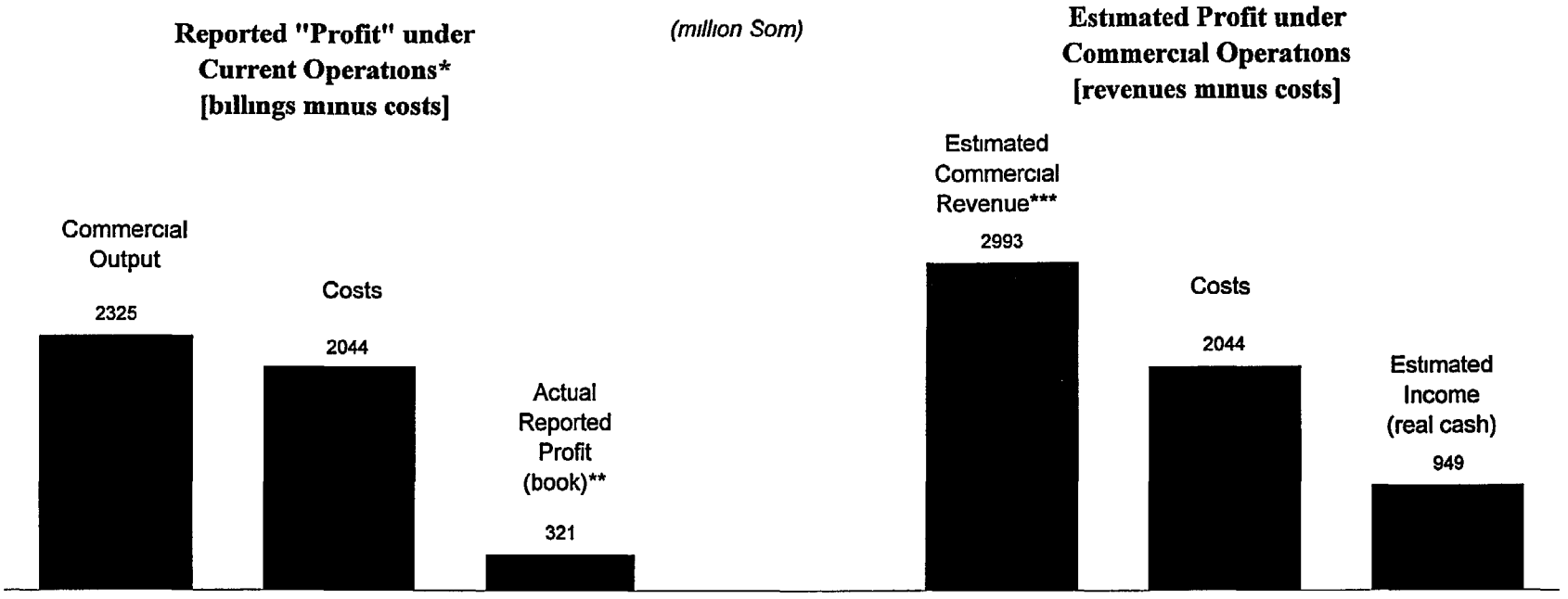
If Kyrgyzenergo had used Commercial Business Practices in 1997 (collected bills, stopped theft), it would have made enough <u>real</u> profit to buy enough coal to avoid load-shedding and to finish Tash-Kumyr + Shamaldysai



* Based on data from Kyrgyzenergo as of March 10, 1998

** Actual 1997 profit of 321mln Som as reported by Kyrgyzenergo includes effects of various other transactions and mutual clearings

*** Based on assumption that 50% of domestic electric use (all residential actual use) was paid for at 12 tyiyn/kWh and 50% (all other use) was paid for at 25 tyiyn/kWh, and that actual revenue for thermal energy, exports, and frequency regulation was the same as reported billings

July 6 1998
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Если бы АО "Кыргызэнерго" внедрило в 1997 году коммерческие принципы деятельности (собирало оплату по счетам, устранило хищения), то получило бы достаточно прибыли для покупки угля во избежание введения лимитов потребления, а также для финансирования Таш-Кумырской и Шамалдысайской ГЭС

(миллион сом)

* Основано на данных АО "Кыргызэнерго" от 10 03 98

** Фактическая прибыль 1997 года в 321 млн сом по отчету Кыргызэнерго включает в себя результаты прочих сделок и взаимных расчетных операций

*** Основано на предположении, что 50% фактического использования электроэнергии на внутреннем рынке (все потребление бытовых абонентов) оплачивалось по 12 тыйын за кВт ч и 50% (потребление других абонетов)- по 25 тыйын за кВт ч, а также на том, что фактическая выручка от теплоэнергии и экспорта была равна отчетной прибыли

Июль 6 1998
5realprr xls

Calculation of Estimated 1997 Revenue and Profit If Kyrgyzenergo Had Operated Using Commercial Business Practices

12584	mln kwh	Total Production
-1875	"-"	Export
10709	"-"	Domestic Production
-1606	"-"	Own Use and Technical Losses @ 15%
9103	"-"	Production for Sale
x 50%		Population % Share of Total Consumption (billings plus unmetered use)
4552	"-"	Population Actual Consumption
x 12	tyiyn/kwh	Discounted Tariff for Population
546 2	mln Som	
4552	mln kwh	All Other Consumption
x 25	tyiyn/kwh	Posted Tariff for Industrial and Budget Agencies
1138	mln Som	
546 2	mln Som	Estimated Revenue from Population
+1138	mln Som	Estimated Revenue from All Other
1684 2	mln Som	Estimated Revenue from Actual Domestic Electricity Consumption
+949 3	mln Som	Kyrgyzenergo Reported Revenue from Export
+107 6	mln Som	Kyrgyzenergo Reported Revenue from Frequency Regulation
+251 8	mln Som	Kyrgyzenergo Reported Revenue from Thermal Energy
2993	mln Som	Estimated Total Revenue Operated Using Commercial Business Practices

Profit Using Commercial Business Practices

2993	mln Som	Revenue if Kyrgyzenergo collected all bills and stopped theft
-2044	mln Som	Reported costs in 1997
949	mln Som	Profit if Kyrgyzenergo used commercial business practices
=	$54 mln	@ 17 5 Som/$1
	$30 mln	Kyrgyzenergo estimate of cost to complete Tash-Kumyr plus Shamaldysai
	$15-20 mln	Cost of additional coal to bring TES production up to 3000 mln kwh/year

Расчет возможных доходов и прибыли в 1997 г., если бы АО "Кыргызэнерго" работало по принципам коммерческой деятельности

12584	млн кВт ч	Общее производство
-1875	"-"	Экспорт
10709	"-"	Внутреннее производство
-1606	"-"	Собственное потребление и технич потери @ 15%
9103	"-"	Производство на продажу
x 50%		Доля населения (%) в общем потреблении (выписанные счета плюс неучтенное потребление)
4552	"-"	Фактическое потребление населением
x 12	тыйын/кВт ч	Льготы для населения
546 2	млн сом	
4552	млн кВт ч	Другое потребление
x 25	тыйын/кВт ч	Официально объявленный тариф для промышленных и бюджетных организаций
1138	млн сом	
546 2	млн сом	Подсчитанный доход от населения
+1138	млн сом	Подсчитанный доход от всех других категорий
1684 2	млн сом	Подсчитанный доход от фактического внутренного потребления электричества
+949 3	млн сом	Отчетные данные Кыргызэнерго по доходам от экспорта
+107 6	млн сом	Отчетные данные КЕ по доходам от регулирования частотности
+251 8	млн сом	Отчетные данные КЕ по доходам от теплоэнергии
2993	млн сом	Подсчитанный валовой доход от деятельности с использованием коммерческих принципов

Если бы Кыргызэнерго работало по принципам коммерческой деятельности

2993	млн сом	Возможные доходы, если бы Кыргызэнерго собирало все счета и устранило хищение
-2044	млн сом	Отчетные данные по затратам в 1997
949	млн сом	Прибыль, если бы Кыргызэнерго работало по принципам коммерческой деятельности
=	$54 млн	@ 17 5 сом/$1

$ 30 млн — Расчеты Кыргызэнерго стоимости завершения Таш-Кумыра и Шамалдысая

$ 15-20 млн — Стоимость дополнительного угля, чтобы довести производство на ТЭЦ до 3000 млн кВт ч

Report on Technical and Financial Model of Kyrgyzenergo, (based on 1996 results) Developed by USAID/Hagler Bailly

HISTORY AND PURPOSE OF MODEL

Introduction

In early September 1997 the Ministry of Finance requested USAID/Hagler Bailly to develop a financial model of Kyrgyzenergo, to verify earlier financial analysis done by Price Waterhouse that showed the distribution companies of Kyrgyzenergo would be profitable if they were privatized and operated using commercial business practices This model was to be presented to Parliament, at its request, as part of its consideration of the Government's approved Program of Denationalization and Privatization of Kyrgyzenergo

Based on preliminary estimates, we immediately saw that most of the distribution companies were not profitable under existing management practices, but that they would have the potential to be profitable under appropriate investment programs, managerial direction, and collection policies Accordingly, we realized that the model could not be only a one-time financial report, which would merely reflect the policies and procedures by which the company was then being run Instead, the model had to incorporate operational and managerial data, by which government decision makers and prospective investors could evaluate the profit potential of the distribution companies, both under current conditions and under alternative scenarios and assumptions Such a model would also be the most effective in presenting and defending the Government's Privatization Program to Parliament

Moreover, this model would provide a useful tool for potential investors, Government officials, and Kyrgyzenergo managers These agents require a hybrid technical and financial analytical model, because only such a model permits decision makers to evaluate the effect of assumptions about operations, management (including collection and disconnection policies), pricing, and other policy matters that they might adopt in order to make the company profitable

State Energy Agency Model

Late in 1997, the State Energy Agency developed a financial model of Kyrgyzenergo ("SEA Model"), for presentation to Parliament, which, in contrast to ours, showed robust profits in the distribution companies As far as we could tell, SEA's data were consistent with ours

The disparity in their results stemmed from the fact that they employed outdated definitions of costs, revenues, and profitability that do not meet international accounting standards Their definitions conformed to those still in use in Kyrgyzstan's electric power sector, even though new Kyrgyz Accounting Standards, which are consistent with International Accounting Standards, have been adopted and should now be in use by Kyrgyzenergo and the SEA The differences are discussed below, under "Issues in Building Model" Because we wanted the SEA, Kyrgyzenergo and Parliament to understand our results and appreciate their implications, we decided to develop a spreadsheet model that was consistent with the SEA model but also presented additional calculations that are necessary for evaluating Kyrgyzenergo from an investors perspective

The SEA model includes several years of forecasted data We did not attempt to forecast key input data, such as usage or costs However, the model we produced can be used to evaluate profitability in the future, under various scenarios, if forecasts of the principal inputs are provided

USAID/Hagler-Bailly/State Energy Agency Model

The LOTUS worksheet SEACOMM WK3 contains the technical and financial model developed by USAID/Hagler Bailly in conjunction with the State Energy Agency and the State Property Fund Our model employs only historical data (1996, at the time of its completion) We did not fully understand the methods by which SEA developed its forecasts, and we were reluctant both to use their forecasts or to develop independent ones Our intention was to augment the SEA model for 1996 and, if possible, 1997, with several calculated values that we regarded as important in representing the financial health of the distribution companies and of Kyrgyzenergo overall In order to engender trust in the compatibility of the two models, we attempted to replicate SEA's results Because of some differences in our sources of data, as explained below, the output of our model differs slightly, but this should not be interpreted as a disagreement with SEA in any sense Rather, such slight discrepancies were the result of the need to maintain the mathematical consistency of our computations

Issues and questions about the data and techniques employed in the SEA model are contained in a memorandum of December 8, 1997 on "Comments on the Financial Model Developed by State Energy Agency"

GUIDE TO USING MODEL

This section is based upon a memorandum dated December 18, 1997, addressed to Mr Arstand, of the State Energy Agency, "Preliminary version of USAID/Hagler Bailly Technical and Financial Model of Kyrgyzenergo, 1996 results" The memorandum explained how to read and/or modify the spreadsheet model contained on the accompanying diskette, focusing on the similarities and differences between the USAID/Hagler Bailly model and the SEA model

Data Used in This Study

The data used in this study came from Kyrgyzenergo With the exception of the cost data, the data were taken and/or calculated from reports provided by Miss Svetalana Ifimenka, Head of the Marketing Department These reports are the only source that we are aware of for detailed data about residential customers Since the Marketing Department provided no cost data, the cost data were taken from the Kyrgyzenergo report, *Technical and Economic Indices and Financial Results of Kyrgyzenergo* The latter report is the source of data for the State Energy Agency's financial model, and its data on energy is similar, but not identical, to the data we used Although we would have preferred to be completely consistent with the SEA model, we felt that we could make the most effective use of the residential data by employing billing and sales data (i e , energy-related data) from the same marketing reports that yielded the customer data

The LOTUS spreadsheet SEACUST WK3 contains customers by customer class, including the discount categories of residential customers

The model SEACOMM WK3 includes 5 sheets On the first sheet, the original eight distribution companies are shown separately On the second and third sheets, Chui, Kemin, and Talas are combined into Severenergo On the fourth sheet, Issyk-Kul and Naryn are combined into Vostokenergo The fifth sheet presents the results organized by the five distribution companies that will be created

A detailed description of sources of all the data is contained in a memorandum of October 23, 1997, on "Explanations of terms used in Technical and Financial Model"

Calculations Introduced in the USAID/Hagler Bailly Model

The following discussion indicates why we found some of Kyrgyzenego's definitions and

calculations to be inadequate or misleading in representing the financial health of Kyrgyzenergo However, a full discussion of our objections is deferred until the section, "Issues in Building Model"

Sales

Kyrgyzenergo uses the term "sales" interchangeably to denote either Commercial Output, meaning billed revenues or revenue actually received Because of the great disparity between Commercial Output and revenue actually received, USAID/Hagler Bailly adopted the latter definition and uses the term "Sales" to refer exclusively to revenue actually received We received detailed sales data from the Marketing Department

The SEA model does not appear to analyze sales, in the sense that we use the word

Calculations in the USAID/Hagler Bailly model employing sales data include

- Sales as a percentage of Commercial Output (billed revenues) This represents the ability of the company to collect its billed revenues The values range from a low of 49% for Talas to a high of 97% for Bishkek DC

- Residential sales as a percentage of residential Commercial Output (billed revenues) For each distribution company, this percentage is significantly lower than for the company overall

- Barter as a percentage of total sales Barter accounts for more than half of every company's sales

We expect that the continuing investigations of billing and collections, by Hagler Bailly and other organizations, will clarify some of the issues concerning sales

Used Energy

Hagler Bailly introduced the term, "Used Energy", defined as the billed energy plus the commercial losses, which include theft Used Energy is the energy available for potential sale, whose cost must be covered by the revenues collected

Average Tariff

Kyrgyzenergo calculates the "Average Tariff" (tyiyn per kWh) as the ratio of billed

revenues to the corresponding billed energy "Average Tariff" was a useful measure in former times before the spread between billings and revenues received became so large However, it is no longer a useful measure and is, in fact, misleading given the high rates of theft and non-payment in the system Hagler Bailly introduced the term "Average Realized Tariff," defined as the average tariff actually collected, calculated as the ratio of sales (revenue actually received) to used energy (billed energy plus commercial losses) This measure is useful and approximates what the Average Tariff intended to measure in former times For each distribution company, the Average Realized Tariff is significantly lower than the Average Tariff calculated by Kyrgyzenergo, usually half or less

Profit

Kyrgyzenergo calculates the profit of each company by comparing the billed revenues to the total (operating) costs Since received revenues (Sales) are substantially lower than billed revenues, this definition of profit includes revenues that the company does not actually collect

Kyrgyzenergo also expresses "unit profit" in terms of billed energy rather than total energy actually used it compares the average tariff (based upon billed revenues) to the (total) cost of generation, transmission, and distribution expressed per billed kWh Regardless of how it's calculated, the use of "unit" profitability is merely an expository device Profitability occurs if, and only if, the total revenue covers the total costs

Correspondingly, Hagler Bailly introduced the calculation, "profit per kWh of used energy" This calculation is based upon the same total cost as Kyrgyzenergo's, but lower revenues (Sales rather than billed energy) and higher energy (billed energy plus commercial losses, rather than just billed energy) The result lowers the perceived cost per unit, but, in all cases, by less than the recalculated average tariff lowers the revenue per unit

The weakness of Kyrgyzenergo's calculations lies in the fact that, even when the official posted tariff rates cover the cost of one kWh, many kWh are used but not paid for, and, therefore, the company is not, in fact, "profitable", in contrast to what Kyrgyzenergo's calculations show Furthermore, the tariffs do not cover all the costs, and, therefore, the companies are not profitable in the sense of being able to earn enough money to stay in business, sustain service levels, and maintain their physical assets

ISSUES IN BUILDING MODEL

Data Are Uninformative Because of Their Definitions

Cost of Commercial Output

This is actually the cost of total output, including the cost of energy lost Although this definition tends to overstate the unit cost of energy, this discrepancy is more than offset by the error of defining the Average Tariff (see below)

Average Tariff

Defined as the billed revenues divided by the billed kWh Because of the high rate of nonpayment of bills, the realized revenues ("sales") are much lower than the billed revenues Furthermore, because of commercial losses (theft of energy that is not billed), the used energy greatly exceeds the amount of energy that is billed

Both the numerator and the denominator used to calculate Average Tariff are therefore misleading indicators for two reasons First, the numerator is overstated because much of the billed revenues are not collected, so they do not contribute to covering the company's costs Second, the denominator is understated because the energy used by customers includes a great deal of electricity that is not metered or billed

For Kyrgyzenergo as a whole and for each distribution company, the Average Realized Tariff based upon Sales and Used Energy is significantly lower than the Average Tariff, usually half or less

Profit, Profitability

Kyrgyzenergo compares the Average Tariff (as defined above) of each distribution company to the cost of commercial output (as defined above), and asserts that Kyrgyzenergo as a whole and every distribution company except Naryn and Osh is making a profit But when profit is estimated by recalculating cost in terms of Used Energy and Average Realized Tariff on the basis of sales, only Bishkek DC and Issyk-Kul DC are profitable

By Kyrgyzenergo's measure, Kyrgyzenergo and every distribution company except Naryn and Osh is making a profit By Western standards, however, only the paid revenues (i e , sales) count toward profitability By this standard, only Bishkek and Issyk-Kul are profitable, all other distribution companies and Kyrgyzenergo as a whole are unprofitable (This is primarily because of the theft and non-payment problems)

Sales

Kyrgyzenergo uses the word "sales", on various occasions, to refer to both billed revenue (whether or not it is paid) and paid revenue (i e , the international concept of sales)

For each distribution company, residential Sales (revenue received) as a percentage of residential Commercial Output (billed revenue) is significantly lower than for the company overall, showing that it is harder to collect revenues from residential customers than from industrial and commercial customers This seems surprising, because most residential energy is self-reported and would appear to have greater potential to be underreported than to be reported and unpaid

Accounts Receivable

Accounts receivable are measured in a unit called, "equivalent days" However, "equivalent days" is defined as the total balance in Accounts Receivable divided by the average billing for one day Thus, it is a measure of the amount of money that is unpaid, but it does not in any way represent the length of time bills are unpaid Many different patterns of nonpayment can lead to the same amount in Accounts Receivable at the point in time at which it is measured

In addition, the balances in Accounts Receivable are not identified as to the customer class from which it is derived Therefore, it is impossible to tell which classes take more and which take less time to pay, and which classes are more and which are less likely to pay at all

Exports

Kyrgyzenergo's standard financial reports overestimate the profitability of exports This is so because first, profit is based on billings rather than revenues received (despite tens of millions of dollars in receivables, and second, the costs associated with exports are limited to only generation costs No technical losses or transmission costs are attributed to exports Accordingly, the profits from exports are overstated, while the profits from domestic transactions are understated by the same amount

More realistic analysis of the profits derived from exports is necessary, in general, for setting cost-based tariffs for each customer class and, in particular, for determining policy concerning exports

Data Are Suspect

Commercial Losses (i e , theft)

This is the difference between total losses and "normative" (technical) losses It represents the energy that is used but not accounted for (even as unpaid accounts receivable) Commercial losses are believed to be caused by theft of electricity from the system Only Naryn and Issyk-Kul have commercial losses below 10%, but they have normative losses above 24% They and Bishkek DC have the lowest total losses, ranging from 29-32%

Normative or Technical Losses (i e , line losses)

Although engineers assert that an electric power system cannot function reliably if technical (line) losses exceed 15%, the Marketing Department data show that only Bishkek DC has losses below 15% We postulate, therefore, that Kyrgyzenergo may be overstating its normative losses in order to reduce its estimated commercial losses

Residential Discounts

We conjectured that high discounts were being provided to an excessive number of residential customers, and that if these discounts could be decreased or eliminated, the companies would be significantly more profitable In attempting to quantify the revenues lost to discounts, however, we were unable to produce credible estimates, based upon the data received from Kyrgyzenergo

The Marketing Department provided several reports, which proved to be mutually inconsistent They were also inconsistent with aggregate data that included, but did not separately identify, discount customers For example, one report contained estimates of the billed revenues and the amount (in som) of discount associated with each of the residential discount categories However, this report was inconsistent with the data for total residential customers, because, for several of the distribution companies, the billed revenues for total residential customers (which were provided by Kyrgyzenergo) were less than the estimated billings for only the discount customers Subsequently, we were given a report summarizing the number of customers by category, including the discount customers Making reasonable assumptions about energy usage by discount customers, we estimated the associated revenues However, we did not succeed in producing reasonable results Accordingly, we remain skeptical of the report on customer categories

The summary spreadsheet report of the discount customers is attached to this memorandum, as SEACUST WK3

Conclusions

The analysis discussed in this memorandum shows that most of the distribution companies are not now profitable at current tariff levels, primarily because of the theft and non-payment problems However, when the model's assumptions are varied to reflect the adoption of commercial business practices under privatization (decreased losses, increased billings and increased collection of billed revenue,) the companies show a profit at current tariff levels The model is in the file HBFINMOD WK3

Several alternative scenarios are presented in the spreadsheet model SEACOML WK3, which is documented in the memorandum of February 17, 1998 "Further Results in the Technical and Financial Model"

ANNEX 1

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis

Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department

	Chu DC	Bishkek DC	Osh DC	Jala-Abad DC	Issyk-Kul DC	Naryn DC	Kemin DC	Talas DC	Total Electric
Transmitted through Network	6,001,200	2,133,000	2,573,000	2,168,700	1,194,900	715,100	2,468,000	464,500	17,718 400
Released to Network	2,646,500	1,416 700	2 540,300	1,627,500	1,171,700	709,000	728,700	464,500	11,304,900
Actual Losses (K kwh)	1 283,600	418,100	1 128,900	591,100	374 500	223,000	355,900	176,300	4,551,400
Technical Losses (K kwh)	563,700	168,600	422 900	416,800	286 000	179,200	147,300	96,600	2,281,100
Commercial Losses (K kwh)	719 900	249,500	706 000	174,300	88,500	43,800	208,600	79,700	2,270 300
Actual Losses (as % of transmitted)	21 39%	19 60%	43 87%	27 26%	31 34%	31 18%	14 42%	37 95%	25 69%
Technical Losses (as % of transmitted)	9 39%	7 90%	16 44%	19 22%	23 94%	25 06%	5 97%	20 80%	12 87%
Commercial Losses (as % of released)	27 20%	17 61%	27 79%	10 71%	7 55%	6 18%	28 63%	17 16%	20 08%
Actual Losses (as % of released)	48 50%	29 51%	44 44%	36 32%	31 96%	31 45%	48 84%	37 95%	40 26%
Billed Energy (K kwh), Total	1 362 895	998 634	1,411,354	1,036 427	797,231	486 022	372,806	288,218	6 753,586
Billed Energy, Residential	639,197	326 665	455,990	375,720	397 709	251,609	113,201	186,781	2,746,871
Commercial Output (billings) (ksom), Total	166,496	145,067	131 417	109 376	87,786	44 485	54,259	30,290	769,175
Commercial Output, Residential	49,723	25 529	25,744	20,924	32 175	11,563	9,140	14,147	188,945
Sales (receipts), Total	138,840	140,907	103,967	85,432	70 215	33,240	46 229	14,732	633,561
Sales, Barter and Mutual Payments	105,767	94,485	86 332	68,053	44,158	18,758	35,831	8,929	462,312
Sales, Cash	33,074	46,422	17 635	17,379	26,057	14 482	10,398	5,803	171,249
Sales, Residential	20,668	18,787	17,652	12 000	12,950	1 939	7,573	4,421	95,989
Sales as Percentage of CO	83 39%	97 13%	79 11%	78 11%	79 98%	74 72%	85 20%	48 64%	82 37%
Residential Sales as % of Residential CO	41 57%	73 59%	68 57%	57 35%	40 25%	16 77%	82 86%	31 25%	50 80%
Average Tariff (CO/billed energy), Total	0 12216	0 14527	0 09311	0 10553	0 11011	0 09153	0 14554	0 10509	0 11389
Average Tariff, Residential	0 07779	0 07815	0 05646	0 05569	0 08090	0 04596	0 08074	0 07574	0 06879
Cost of CO (Kemin included in Chu)		73,091	135,018	105,124	69,591	61 628		30,101	654,409
Cost of CO for generation		44,482	79,250	50,289	36,923	21,906		14,350	351 500
Cost of CO for transmission and distribution		28,609	55,767	54,835	32,668	39,722		15,751	302,909
Cost of CO per kWh billed energy	0 10362	0 07319	0 09567	0 10143	0 08729	0 12680	0 10362	0 10444	0 09690
Used Energy (K kwh) (Total-Tech Losses)	2,082 800	1,248 100	2,117,400	1,210,700	885 700	529,800	581,400	367,900	9,023,800
Cost of CO per kwh used energy	0 06751	0 05856	0 06377	0 08683	0 07857	0 11632	0 06751	0 08182	0 07252
Avg realized tariff (sales/used energy)	0 06666	0 11290	0 04910	0 07056	0 07928	0 06274	0 07951	0 04004	0 07021
Used Energy, Residential	976,831	408,269	684,104	438,897	441,842	274,272	176,540	238,419	3,670,230
Avg realized residential tariff	0 02116	0 04602	0 02580	0 02734	0 02931	0 00707	0 04290	0 01854	0 02615
Barter and Mutual Payments as % of sales	76 18%	67 05%	83 04%	79 66%	62 89%	56 43%	77 51%	60 61%	72 97%

	Chu DC	Bishkek DC	Osh DC	Jala-Abad DC	Issyk-Kul DC	Naryn DC	Kemin DC	Talas DC	Total Electric
Billed res energy as % of total billed energy	46 90%	32 71%	32 31%	36 25%	49 89%	51 77%	30 36%	64 81%	40 67%
Residential CO as % of total CO	29 86%	17 60%	19 59%	19 13%	36 65%	25 99%	16 85%	46 71%	24 56%
Residential sales as % of total sales	14 89%	13 33%	16 98%	14 05%	18 44%	5 83%	16 38%	30 01%	15 15%
Profit, per kwh billed, as calculated by KE	0 01854	0 07207	-0 00255	0 00410	0 02282	-0 03527	0 04192	0 00065	0 01699
Operating income (receipts-cost of CO) per kwh used	-0 00085	0 05433	-0 01466	-0 01626	0 00070	-0 05358	0 01200	-0 04178	-0 00231
Profit, res per kwh billed, as calculated by K	-0 02583	0 00496	-0 03921	-0 04574	-0 00639	-0 08084	-0 02288	-0 02870	-0 02811
Operating income, res , per kwh used	-0 04635	-0 01255	-0 03796	-0 05949	-0 04926	-0 10925	-0 02461	-0 06328	-0 04637
Customers by category									
Industrial	146	542	307	30	734	53	83	198	2 093
Agricultural	207	5	498	573	1,662	335	178	178	3,636
Budget Organizations (Government)	260	205	473	420	830	0	144	0	2,332
Commercial	0	0	0	0	0	0	0	0	0
Other	1,373	2,256	0	0	0	526	445	334	4,934
Residents (total including discount customer	141,138	184,967	259,752	138,704	102 261	45,726	52,416	45,339	970,303
Total discounts (persons)	12,976	14,056	158,065	97,752	16,080	45,726	5,040	5,423	355,118
Energy sector employees (50%)	3,050	2 600	2,076	11,908	1,204	850	506	269	22,463
War invalids (100%)	1 371	1,439	2,789	2 102	1,235	473	947	303	10,659
War veterans (50%)	2 810	2,664	4,917	5 183	2,505	652	1,199	953	20,883
Families of deceased (50%)	1,314	2,327	0	0	915	0	0	269	4,825
Veterans of Afghan war (50%)	135	316	1,907	0	286	148	285	46	3,123
Chernobyl participants (50%)	124	173	438	269	237	137	108	99	1,585
Disabled (hearing and sight) (50%)	680	1,002	2,417	1,229	399	118	197	230	6,272
Merit pensioners (50%)	128	720	185	167	98	115	42	15	1,470
Rehabilitated pensioners (50%)	592	329	0	0	0	0	0	44	965
Military pensioners (50%)	515	929	0	0	0	0	0	0	1,444
Mountain residents (50%)	0	0	53,131	17,322	0	42,813	0	0	113,266
Low-income families (25%)	2,257	4,157	90,205	59,572	9,201	420	1,756	3,195	170,763
Total discount customers	12,976	16,656	158,065	97,752	16,080	45,726	5,040	5,423	357,718
Total customers	143,124	187,975	261,030	139,727	105,487	46,640	53,266	46,049	983,298
Discount customers as % of total residential	9 07%	8 86%	60 55%	69 96%	15 24%	98 04%	9 46%	11 78%	36 38%
100% disc cust as % of disc cust	10 57%	8 64%	1 76%	2 15%	7 68%	1 03%	18 79%	5 59%	2 98%
100% disc cust as % of total residential	0 96%	0 77%	1 07%	1 50%	1 17%	1 01%	1 78%	0 66%	1 08%
50-100% disc cust as % of disc cust	82 61%	75 04%	42 93%	39 06%	42 78%	99 08%	65 16%	41 08%	52 26%
50-100% disc cust as % of total residential	7 49%	6 65%	26 00%	27 32%	6 52%	97 14%	6 17%	4 84%	19 01%

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis

Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department

Combining Chu and Kemin

	Chu DC	Kemin DC	Chu + Kemin
Transmitted through Network	6,001,200	2,468,000	8,469,200
Released to Network	2,646,500	728,700	3,375,200
Actual Losses (K kwh)	1,283 600	355 900	1,639,500
Technical Losses (K kwh)	563,700	147,300	711,000
Commercial Losses (K kwh)	719 900	208,600	928,500
Actual Losses (as % of transmitted)	21 39%	14 42%	19 36%
Technical Losses (as % of transmitted)	9 39%	5 97%	8 40%
Commercial Losses (as % of released)	27 20%	28 63%	27 51%
Actual Losses (as % of released)	48 50%	48 84%	48 57%
Billed Energy (K kwh), Total	1,362 895	372 806	1,735,701
Billed Energy, Residential	639,197	113 201	752,398
Commercial Output (billings) (ksom), Total	166,496	54,259	220,755
Commercial Output, Residential	49,723	9,140	58,863
Sales (receipts), Total	138,840	46,229	185,069
Sales, Barter and Mutual Payments	105,767	35 831	141,598
Sales, Cash	33,074	10,398	43,472
Sales, Residential	20,668	7,573	28,241
Sales as Percentage of CO	83 39%	85 20%	83 83%
Residential Sales as % of Residential CO	41 57%	82 86%	47 98%
Average Tariff (CO/billed energy), Total	0 12216	0 14554	0 12718
Average Tariff, Residential	0 07779	0 08074	0 07823
Cost of CO (Kemin included in Chu)			179,856
Cost of CO for generation			104,300
Cost of CO for transmission and distribution			75,557
Cost of CO per kWh billed energy	0 10362	0 10362	0 10362
Used Energy (K kwh) (Total-Tech Losses)	2,082,800	581,400	2,664,200
Cost of CO per kwh used energy	0 06751	0 06751	0 06751
Avg realized tariff (sales/used energy)	0 06666	0 07951	0 06947
Used Energy, Residential	976,831	176,540	1,154,887
Avg realized residential tariff	0 02116	0 04290	0 02445
Barter and Mutual Payments as % of sales	76 18%	77 51%	76 51%

	Chu DC	Kemin DC	Chu + Kemin
Billed res energy as % of total billed energy	46 90%	30 36%	43 35%
Residential CO as % of total CO	29 86%	16 85%	26 66%
Residential sales as % of total sales	14 89%	16 38%	15 26%
Profit, per kwh billed, as calculated by KE	0 01854	0 04192	0 02356
Operating income (receipts-cost of CO) per kwh used	-0 00085	0 01200	0 00196
Profit, res per kwh billed as calculated by KE	-0 02583	-0 02288	-0 02539
Operating income res , per kwh used	-0 04635	-0 02461	-0 04306
Customers by category			
Industrial	146	83	229
Agricultural	207	178	385
Budget Organizations (Government)	260	144	404
Commercial	0	0	0
Other	1,373	445	1818
Residents (total, including discount customers)	141,138	52 416	193554
Total discounts (persons)	12,976	5 040	18016
Energy sector employees (50%)	3,050	506	3556
War invalids (100%)	1,371	947	2318
War veterans (50%)	2,810	1,199	4009
Families of deceased (50%)	1,314	0	1314
Veterans of Afghan war (50%)	135	285	420
Chernobyl participants (50%)	124	108	232
Disabled (hearing and sight) (50%)	680	197	877
Merit pensioners (25%)	128	42	170
Rehabilitated pensioners (25%)	592	0	592
Military pensioners (50%)	515	0	515
Mountain residents (50%)	0	0	0
Low-income families (25%)	2,257	1,756	4013
Total discount customers	12,976	5,040	18016
Total customers	143,124	53,266	196390
Discount customers as % of total residential	9 07%	9 46%	9 17%
100% disc cust as % of disc cust	10 57%	18 79%	12 87%
100% disc cust as % of total residential	0 96%	1 78%	1 18%
50-100% disc cust as % of disc cust	82 61%	65 16%	77 73%
50-100% disc cust as % of total residential	7 49%	6 17%	7 13%

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis
Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department.
Severelectro, combining Chu, Kemin, and Talas

	Chu DC	Kemin DC	Chu + Kemin	Talas	Severelectro
Transmitted through Network	6,001,200	2 468,000	8,469 200	464,500	8 933,700
Released to Network	2 646,500	728,700	3,375,200	464 500	3 839,700
Actual Losses (K kwh)	1,283,600	355 900	1,639,500	176,300	1,815,800
Technical Losses (K kwh)	563,700	147,300	711 000	96,600	807,600
Commercial Losses (K kwh)	719,900	208 600	928,500	79,700	1,008,200
Actual Losses (as % of transmitted)	21 39%	14 42%	19 36%	37 95%	20 33%
Technical Losses (as % of transmitted)	9 39%	5 97%	8 40%	20 80%	9 04%
Commercial Losses (as % of released)	27 20%	28 63%	27 51%	17 16%	26 26%
Actual Losses (as % of released)	48 50%	48 84%	48 57%	37 95%	47 29%
Billed Energy (K kwh), Total	1,362 895	372 806	1 735,701	288,218	2,023,918
Billed Energy, Residential	639 197	113,201	752 398	186,781	939,178
Commercial Output (billings) (ksom), Total	166,496	54,259	220 755	30,290	251,045
Commercial Output, Residential	49,723	9,140	58,863	14 147	73,010
Sales (receipts), Total	138,840	46 229	185,069	14,732	199 801
Sales, Barter and Mutual Payments	105 767	35 831	141,598	8,929	150,527
Sales, Cash	33 074	10,398	43 472	5,803	49,274
Sales, Residential	20 668	7,573	28,241	4 421	32,662
Sales as Percentage of CO	83 39%	85 20%	83 83%	48 64%	79 59%
Residential Sales as % of Residential CO	41 57%	82 86%	47 98%	31 25%	44 74%
Average Tariff (CO/billed energy), Total	0 12216	0 14554	0 12718	0 10509	0 12404
Average Tariff, Residential	0 07779	0 08074	0 07823	0 07574	0 07774
Cost of CO (Kemin included in Chu)			179,856	30,101	209,958
Cost of CO for generation			104,300	14,350	118,649
Cost of CO for transmission and distribution			75,557	15,751	91,308
Cost of CO per kWh billed energy	0 10362	0 10362	0 10362	0 10444	0 10374
Used Energy (K kwh) (Total-Tech Losses)	2 082,800	581,400	2 664,200	367,900	3,032 100
Cost of CO per kwh used energy	0 06751	0 06751	0 06751	0 08182	0 06924
Avg realized tariff (sales/used energy)	0 06666	0 07951	0 06947	0 04004	0 06590
Used Energy, Residential	976 831	176,540	1,154,887	238,419	1,407,014
Avg realized residential tariff	0 02116	0 04290	0 02445	0 01854	0 02321
Barter and Mutual Payments as % of sales	76 18%	77 51%	76 51%	60 61%	75 34%

	Chu DC	Kemin DC	Chu + Kemin	Talas	Severelectro
Billed res energy as % of total billed energy	46 90%	30 36%	43 35%	64 81%	46 40%
Residential CO as % of total CO	29 86%	16 85%	26 66%	46 71%	29 08%
Residential sales as % of total sales	14 89%	16 38%	15 26%	30 01%	16 35%
Profit, per kwh billed, as calculated by KE	0 01854	0 04192	0 02356	0 00065	0 02030
Operating income (receipts-cost of CO) per kwh used	-0 00085	0 01200	0 00196	-0 04178	-0 00335
Profit, res per kwh billed, as calculated by KE	-0 02583	-0 02288	-0 02539	-0 02870	-0 02600
Operating income res per kwh used	-0 04635	-0 02461	-0 04306	-0 06328	-0 04603
Customers by category					
Industrial	146	83	229	198	427
Agricultural	207	178	385	178	563
Budget Organizations (Government)	260	144	404	0	404
Commercial	0	0	0	0	0
Other	1 373	445	1 818	334	2 152
Residents (total, including discount customers)	141,138	52,416	193 554	45,339	238 893
Total discounts (persons)	12 976	5,040	18,016	5,423	23 439
Energy sector employees (50%)	3 050	506	3 556	269	3,825
War invalids (100%)	1,371	947	2 318	303	2,621
War veterans (50%)	2 810	1,199	4 009	953	4,962
Families of deceased (50%)	1 314	0	1 314	269	1 583
Veterans of Afghan war (50%)	135	285	420	46	466
Chernobyl participants (50%)	124	108	232	99	331
Disabled (hearing and sight) (50%)	680	197	877	230	1,107
Merit pensioners (50%)	128	42	170	15	185
Rehabilitated pensioners (50%)	592	0	592	44	636
Military pensioners (50%)	515	0	515	0	515
Mountain residents (50%)	0	0	0	0	0
Low-income families (25%)	2 257	1 756	4,013	3,195	7,208
Total discount customers	12,976	5,040	18,016	5,423	23,439
Total customers	143,124	53,266	196,390	46,049	242,439
Discount customers as % of total residential	9 07%	9 46%	9 17%	11 78%	9 67%
100% disc cust as % of disc cust	10 57%	18 79%	12 87%	5 59%	11 18%
100% disc cust as % of total residential	0 96%	1 78%	1 18%	0 66%	1 08%
50-100% disc cust as % of disc cust	82 61%	65 16%	77 73%	41 08%	69 25%
50-100% disc cust as % of total residential	7 49%	6 17%	7 13%	4 84%	6 69%

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis
Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department
Vostokenergo, combining Issyk Kul and Naryn

	Issyk-Kul DC	Naryn DC	Vostokenergo
Transmitted through Network	1 194,900	715,100	1,910 000
Released to Network	1,171,700	709,000	1,880,700
Actual Losses (K kwh)	374,500	223,000	597,500
Technical Losses (K kwh)	286 000	179,200	465,200
Commercial Losses (K kwh)	88,500	43,800	132,300
Actual Losses (as % of transmitted)	31 34%	31 18%	31 77%
Technical Losses (as % of transmitted)	23 94%	25 06%	24 74%
Commercial Losses (as % of released)	7 55%	6 18%	7 03%
Actual Losses (as % of released)	31 96%	31 45%	31 77%
Billed Energy (K kwh), Total	797,231	486,022	1,283 254
Billed Energy, Residential	397,709	251,609	649,318
Commercial Output (billings) (ksom), Total	87 786	44,485	132,271
Commercial Output, Residential	32,175	11 563	43 739
Sales (receipts), Total	70,215	33,240	103,454
Sales, Barter and Mutual Payments	44,158	18,758	62,916
Sales, Cash	26,057	14,482	40,538
Sales, Residential	12,950	1,939	14,889
Sales as Percentage of CO	79 98%	74 72%	78 21%
Residential Sales as % of Residential CO	40 25%	16 77%	34 04%
Average Tariff (CO/billed energy), Total	0 11011	0 09153	0 10307
Average Tariff, Residential	0 08090	0 04596	0 06736
Cost of CO	69,591	61,628	131,219
Cost of CO for generation	36,923	21,906	58,830
Cost of CO for transmission and distribution	32,668	39,722	72,390
Cost of CO per kWh billed energy	0 08729	0 12680	0 10225
Used Energy (K kwh) (Total-Tech Losses)	885,700	529,800	1,415,500
Cost of CO per kwh used energy	0 07857	0 11632	0 09270
Avg realized tariff (sales/used energy)	0 07928	0 06274	0 07309
Used Energy, Residential	441,842	274,272	712,566
Avg realized residential tariff	0 02931	0 00707	0 02089
Barter and Mutual Payments as % of sales	62 89%	56 43%	60 82%

Billed res energy as % of total billed energy	49 89%	51 77%	50 60%
Residential CO as % of total CO	36 65%	25 99%	33 07%
Residential sales as % of total sales	18 44%	5 83%	14 39%
Profit per kwh billed, as calculated by KE	0 02282	-0 03527	0 00082
Operating income (receipts-cost of CO) per kwh used	0 00070	-0 05358	-0 01961
Profit, res per kwh billed, as calculated by KE	-0 00639	-0 08084	-0 03489
Operating income, res , per kwh used	-0 04926	-0 10925	-0 07181
Customers by category			
Industrial	734	53	787
Agricultural	1,662	335	1,997
Budget Organizations (Government)	830	0	830
Commercial	0	0	0
Other	0	526	526
Residents (total, including discount customers)	102 261	45 726	147,987
Total discounts (persons)	16 080	45 726	61,806
Energy sector employees (50%)	1 204	850	2,054
War invalids (100%)	1,235	473	1,708
War veterans (50%)	2,505	652	3,157
Families of deceased (50%)	915	0	915
Veterans of Afghan war (50%)	286	148	434
Chernobyl participants (50%)	237	137	374
Disabled (hearing and sight) (50%)	399	118	517
Merit pensioners (50%)	98	115	213
Rehabilitated pensioners (50%)	0	0	0
Military pensioners (50%)	0	0	0
Mountain residents (50%)	0	42,813	42 813
Low-income families (25%)	9,201	420	9 621
Total discount customers	16,080	45,726	61,806
Total customers	105,487	46,640	152,127
Discount customers as % of total residential	15 24%	98 04%	40 63%
100% disc cust as % of disc cust	7 68%	1 03%	2 76%
100% disc cust as % of total residential	1 17%	1 01%	1 12%
50-100% disc cust as % of disc cust	42 78%	99 08%	84 43%
50-100% disc cust as % of total residential	6 52%	97 14%	34 30%

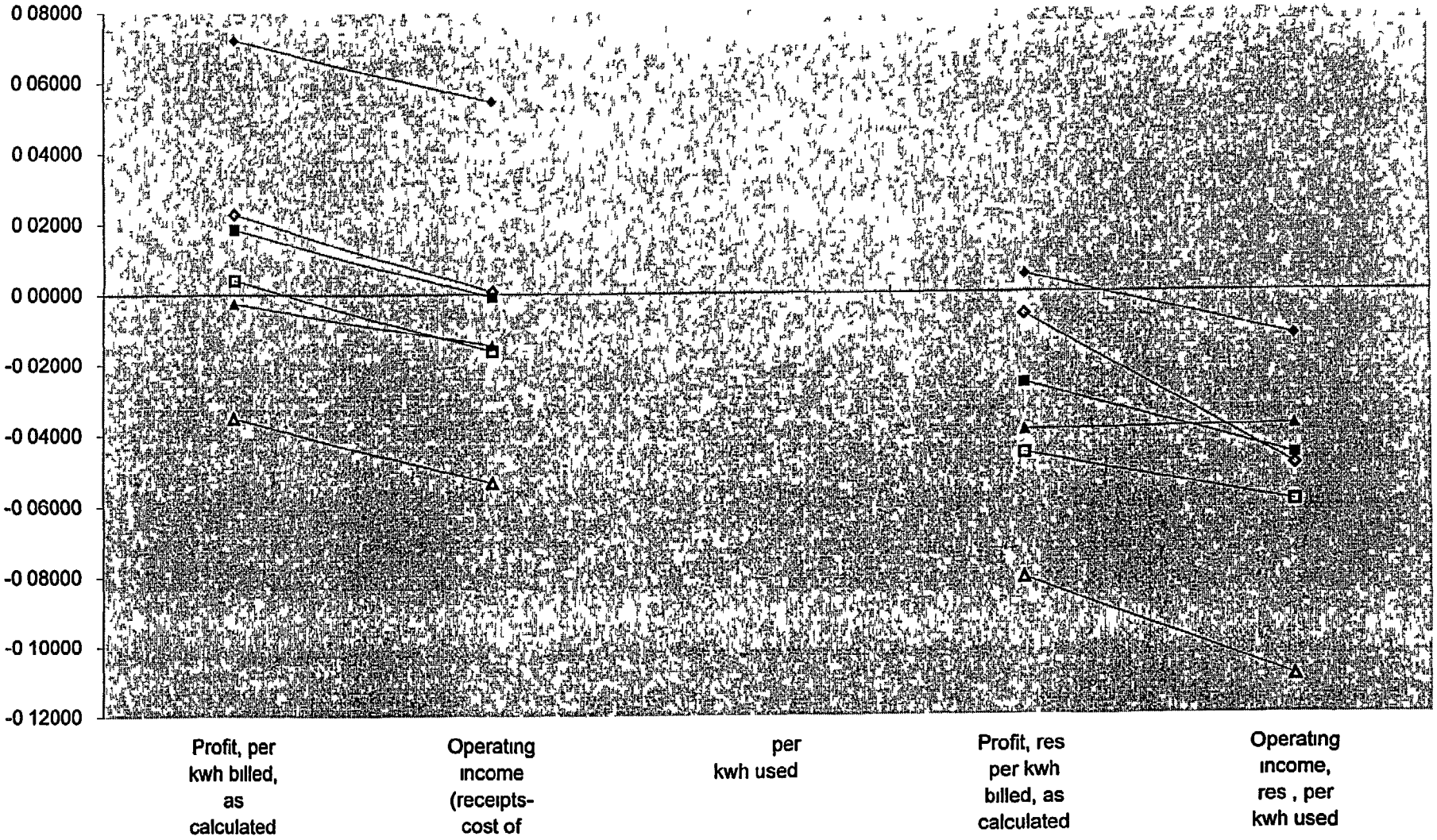
Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis

Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Transmitted through Network	8 933,700	1 910,000	2 573,000	2,168,700	2,133,000	17,718,400
Released to Network	3 839,700	1 880,700	2 540,300	1 627,500	1,416,700	11,304,900
Actual Losses (K kwh)	1 815 800	597,500	1 128,900	591,100	418,100	4,551,400
Technical Losses (K kwh)	807,600	465 200	422 900	416,800	168,600	2,281,100
Commercial Losses (K kwh)	1,008,200	132 300	706,000	174,300	249,500	2,270,300
Actual Losses (as % of transmitted)	20 33%	31 28%	43 87%	27 26%	19 60%	25 69%
Technical Losses (as % of transmitted)	9 04%	24 36%	16 44%	19 22%	7 90%	12 87%
Commercial Losses (as % of released)	26 26%	7 03%	27 79%	10 71%	17 61%	20 08%
Actual Losses (as % of released)	47 29%	31 77%	44 44%	36 32%	29 51%	40 26%
Billed Energy (K kwh) Total	2,023,918	1,283 254	1,411,354	1,036 427	998,634	6,753,586
Billed Energy, Residential	939,178	649,318	455,990	375,720	326,665	2,746,871
Commercial Output (billings) (ksom), Total	251,045	132,271	131,417	109,376	145,067	769,175
Commercial Output, Residential	73,010	43,739	25,744	20,924	25,529	188,945
Sales (receipts), Total	199,801	103,454	103,967	85,432	140,907	633,561
Sales, Barter and Mutual Payments	150,527	62,916	86,332	68,053	94,485	462,312
Sales, Cash	49 274	40,538	17,635	17,379	46,422	171,249
Sales, Residential	32,662	14,889	17,652	12,000	18,787	95,989
Sales as Percentage of CO	79 59%	78 21%	79 11%	78 11%	97 13%	82 37%
Residential Sales as % of Residential CO	44 74%	34 04%	68 57%	57 35%	73 59%	50 80%
Average Tariff (CO/billed energy) Total	0 12404	0 10307	0 09311	0 10553	0 14527	0 11389
Average Tariff, Residential	0 07774	0 06736	0 05646	0 05569	0 07815	0 06879
Cost of CO	209,958	131,219	135,018	105,124	73,091	654,409
Cost of CO for generation	118,649	58,830	79,250	50,289	44,482	351,500
Cost of CO for transmission and distribution	91,308	72,390	55,767	54,835	28,609	302,909
Cost of CO per kWh billed energy	0 10374	0 10225	0 09567	0 10143	0 07319	0 09690
Used Energy (K kwh) (Total-Tech Losses)	3,032,100	1,415,500	2,117,400	1,210,700	1,248,100	9,023,800
Cost of CO per kwh used energy	0 06924	0 09270	0 06377	0 08683	0 05856	0 07252
Avg realized tariff (sales/used energy)	0 06590	0 07309	0 04910	0 07056	0 11290	0 07021
Used Energy, Residential	1,407,014	716 233	684,104	438 897	408 269	3,654,517
Avg realized residential tariff	0 02321	0 02079	0 02580	0 02734	0 04602	0 02627
Barter and Mutual Payments as % of sales	75 34%	60 82%	83 04%	79 66%	67 05%	72 97%
Billed res energy as % of total billed energy	46 40%	50 60%	32 31%	36 25%	32 71%	40 67%

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Residential CO as % of total CO	29 08%	33 07%	19 59%	19 13%	17 60%	24 56%
Residential sales as % of total sales	16 35%	14 39%	16 98%	14 05%	13 33%	15 15%
Profit, per kwh billed as calculated by KE	0 02030	0 00082	-0 00255	0 00410	0 07207	0 01699
Operating income (receipts-cost of CO) per kwh used	-0 00335	-0 01961	-0 01466	-0 01626	0 05433	-0 00231
Profit, res per kwh billed, as calculated by KE	-0 02600	-0 03489	-0 03921	-0 04574	0 00496	-0 02811
Operating income, res , per kwh used	-0 04603	-0 07191	-0 03796	-0 05949	-0 01255	-0 04625
Customers by category						
Industrial	427	787	307	30	542	2,093
Agricultural	563	1 997	498	573	5	3,636
Budget Organizations (Government)	404	830	473	420	205	2,332
Commercial	0	0	0	0	0	0
Other	2,152	526	0	0	2,256	4 934
Residents (total, including discount customers)	238,893	147,987	259,752	138,704	184,967	970 303
Total discounts (persons)	23,439	61,806	158,065	97,752	14,056	355 118
Energy sector employees (50%)	3,825	2,054	2,076	11,908	2,600	22,463
War invalids (100%)	2,621	1,708	2,789	2,102	1,439	10,659
War veterans (50%)	4,962	3,157	4,917	5,183	2,664	20,883
Families of deceased (50%)	1,583	915	0	0	2 327	4,825
Veterans of Afghan war (50%)	466	434	1,907	0	316	3,123
Chernobyl participants (50%)	331	374	438	269	173	1,585
Disabled (hearing and sight) (50%)	1,107	517	2,417	1,229	1,002	6,272
Merit pensioners (50%)	185	213	185	167	720	1,470
Rehabilitated pensioners (50%)	636	0	0	0	329	965
Military pensioners (50%)	515	0	0	0	929	1,444
Mountain residents (50%)	0	42 813	53,131	17 322	0	113,266
Low-income families (25%)	7,208	9 621	90,205	59 572	4,157	170,763
						0
Total discount customers	23,439	61 806	158,065	97,752	16 656	357,718
Total customers	242,439	152 127	261,030	139,727	187,975	983,298
Discount customers as % of total residential	9 67%	40 63%	60 55%	69 96%	8 86%	36 38%
100% disc cust as % of disc cust	11 18%	2 76%	1 76%	2 15%	8 64%	2 98%
100% disc cust as % of total residential	1 08%	1 12%	1 07%	1 50%	0 77%	1 08%
50-100% disc cust as % of disc cust	69 25%	84 43%	42 93%	39 06%	75 04%	52 26%
50-100% disc cust as % of total residential	6 69%	34 30%	26 00%	27 32%	6 65%	19 01%

Current



Current
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ANNEX 2

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis Commercial assumptions
Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department.
All commercial losses attributed to residential customers Residential billed energy as percent of total is assumed same as in base case

Tech losses	12 00%	Sales as % of CO	95 00%
Comm losses	2 00%		

	Chu DC	Bishkek DC	Osh DC	Jala-Abad DC	Issyk-Kul DC	Naryn DC	Kemin DC	Talas DC	Total Electric
Transmitted through Network	6,001,200	2,133,000	2,573,000	2,168,700	1,194,900	715,100	2,468,000	464 500	17,718,400
Released to Network	2,646,500	1 416,700	2,540 300	1,627,500	1,171,700	709,000	728,700	464,500	11 304,900
Actual Losses (K kwh)	370,510	198,338	355,642	227 850	164,038	99,260	102,018	65,030	1,582,686
Technical Losses (K kwh)	317,580	170,004	304,836	195 300	140,604	85,080	87,444	55,740	1,356,588
Commercial Losses (K kwh)	52,930	28,334	50,806	32,550	23,434	14,180	14,574	9,290	226,098
Actual Losses (as % of transmitted)	6 17%	9 30%	13 82%	10 51%	13 73%	13 88%	4 13%	14 00%	8 93%
Technical Losses (as % of released)	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%
Commercial Losses (as % of released)	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%
Actual Losses (as % of released)	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%
Billed Energy (K kwh), Total	2,275,990	1,218,362	2,184,658	1,399,650	1,007,662	609,740	626,682	399,470	9,722,214
Billed Energy, Residential	1,067,437	398 541	705 834	507,394	502,685	315,656	190,290	258,878	3,946,715
Commercial Output (billings) (ksom), Total	278,043	176,986	203 422	147,708	110,957	55,809	91,209	41,981	1,106,114
Commercial Output, Residential	83,036	31,146	39,850	28,257	40,668	14,507	15,365	19,608	272,435
Sales (receipts), Total	264,141	168,137	193,251	140,322	105,409	53,019	86,648	39,882	1,050,809
Sales, Barter and Mutual Payments	201,219	112,744	160,472	111,777	66,292	29,920	67,158	24,173	773,755
Sales, Cash	62,921	55,393	32,779	28,545	39,117	23,099	19,490	15,709	277,054
Sales, Residential	78,884	29,588	37,857	26,844	38,635	13,782	14,596	18,627	258,813
Sales as Percentage of CO	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%
Residential Sales as % of Residential CO	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%
Average Tariff (CO/billed energy), Total	0 12216	0 14527	0 09311	0 10553	0 11011	0 09153	0 14554	0 10509	0 11377
Average Tariff, Residential	0 07779	0 07815	0 05646	0 05569	0 08090	0 04596	0 08074	0 07574	0 06903
Cost of CO (Kemin included in Chu)	179,856	73,091	135,018	105,124	69,591	61,628		30,101	654,409
ost of CO for generation	104,300	44,482	79,250	50,289	36,923	21,906		14,350	351,500
ost of CO for transmission and distribution	75,557	28 609	55,767	54,835	32,668	39,722		15,751	302,909
ost of CO per kWh billed energy	0 10362	0 05999	0 06180	0 07511	0 06906	0 10107	0 10362	0 07535	0 06731
Used Energy (K kwh) (Total-Tech Losses)	2,328,920	1,246,696	2,235,464	1,432,200	1,031,096	623,920	641,256	408 760	9,948,312
ost of CO per kwh used energy	0 06196	0 05863	0 06040	0 07340	0 06749	0 09878	0 06196	0 07364	0 06578

	Chu DC	Bishkek DC	Osh DC	Jala-Abad DC	Issyk-Kul DC	Naryn DC	Kemin DC	Talas DC	Total Electric
Avg realized tariff (sales/used energy)	0 11342	0 13487	0 08645	0 09798	0 10223	0 08498	0 13512	0 09757	0 10563
Used Energy, Residential	1 120 367	426,875	756 640	539 944	526,119	329 836	204,864	268 168	4 172 813
Avg realized residential tariff	0 07041	0 06931	0 05003	0 04972	0 07343	0 04178	0 07125	0 06946	0 06202
Barter and Mutual Payments as % of sales	76 18%	67 05%	83 04%	79 66%	62 89%	56 43%	77 51%	60 61%	73 63%
Billed res energy as % of total billed energy	46 90%	32 71%	32 31%	36 25%	49 89%	51 77%	30 36%	64 81%	40 59%
Residential CO as % of total CO	29 86%	17 60%	19 59%	19 13%	36 65%	25 99%	16 85%	46 71%	24 63%
Residential sales as % of total sales	29 86%	17 60%	19 59%	19 13%	36 65%	25 99%	16 85%	46 71%	24 63%
Profit, per kwh billed, as calculated by KE	0 01854	0 08527	0 03131	0 03042	0 04105	-0 00954	0 04192	0 02974	0 04646
Operating income (receipts-cost of CO) per kwh used	0 05146	0 07624	0 02605	0 02458	0 03474	-0 01380	0 07316	0 02393	0 03985
Profit, res per kwh billed, as calculated by KE	-0 02583	0 01816	-0 00534	-0 01942	0 01184	-0 05511	-0 02288	0 00039	0 00172
Operating income, res per kwh used	0 00845	0 01069	-0 01036	-0 02368	0 00594	-0 05699	0 00929	-0 00418	-0 00376
Actual 1996 data used for assumptions									
Billed Energy (K kwh), Total	1,362,895	998,634	1 411 354	1,036,427	797,231	486,022	372,806	288,218	6,753,586
Billed Energy, Residential	639,197	326,665	455 990	375,720	397,709	251,609	113,201	186 781	2,746,871
Average Tariff (CO/billed energy), Total	0 12216	0 14527	0 09311	0 10553	0 11011	0 09153	0 14554	0 10509	0 11389
Average Tariff, Residential	0 07779	0 07815	0 05646	0 05569	0 08090	0 04596	0 08074	0 07574	0 06879
Sales as Percentage of CO (not used)	83 39%	97 13%	79 11%	78 11%	79 98%	74 72%	85 20%	48 64%	82 37%
Barter and Mutual Payments as % of sales	76 18%	67 05%	83 04%	79 66%	62 89%	56 43%	77 51%	60 61%	72 97%
Cash as % of sales	23 82%	32 95%	16 96%	20 34%	37 11%	43 57%	22 49%	39 39%	

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis

Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department

All commercial losses attributed to residential customers Residential billed energy as percent of total is assumed same as in base case

Tech losses	12 00%	Sales as % of CO	95 00%
Comm losses	2 00%		

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Transmitted through Network	8,933,700	1 910 000	2,573 000	2,168,700	2,133,000	17,718,400
Released to Network	3,839 700	1,880,700	2,540,300	1 627,500	1,416 700	11,304,900
Actual Losses (K kwh)	537,558	263,298	355 642	227 850	198,338	1,582,686
Technical Losses (K kwh)	460,764	225,684	304 836	195,300	170,004	1,356,588
Commercial Losses (K kwh)	76,794	37 614	50,806	32,550	28,334	226,098
Actual Losses (as % of transmitted)	6 02%	13 79%	13 82%	10 51%	9 30%	8 93%
Technical Losses (as % of released)	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%
Commercial Losses (as % of released)	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%
Actual Losses (as % of released)	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%
Billed Energy (K kwh), Total	3,302,142	1 617 402	2,184,658	1,399,650	1,218 362	9,722,214
Billed Energy, Residential	1,532,325	818 394	705,834	507,394	398 541	3,962,488
Commercial Output (billings) (ksom) Total	409,594	166,713	203,422	147 708	176,986	1,104,423
Commercial Output, Residential	119 120	55,128	39,850	28,257	31,146	273,500
Sales (receipts), Total	389,114	158 377	193,251	140,322	168,137	1,049 201
Sales, Barter and Mutual Payments	293,152	96,318	160,472	111 777	112,744	774,462
Sales, Cash	95,962	62,060	32 779	28,545	55,393	274,739
Sales, Residential	113,164	52,372	37 857	26,844	29 588	259,825
Sales as Percentage of CO	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%
Residential Sales as % of Residential CO	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%
Average Tariff (CO/billed energy), Total	0 12404	0 10307	0 09311	0 10553	0 14527	0 11360
Average Tariff, Residential	0 07774	0 06736	0 05646	0 05569	0 07815	0 06902
Cost of CO	209 958	131,219	135 018	105,124	73,091	654,409
Cost of CO for generation	118 649	58,830	79,250	50,289	44 482	351,500
Cost of CO for transmission and distribution	91,308	72,390	55,767	54,835	28,609	302,909
Cost of CO per kWh billed energy	0 06358	0 08113	0 06180	0 07511	0 05999	0 06731
Used Energy (K kwh) (Total-Tech Losses)	3,378,936	1 655 016	2,235,464	1,432,200	1,246 696	9,948,312

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	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Cost of CO per kwh used energy	0 06214	0 07929	0 06040	0 07340	0 05863	0 06578
Avg realized tariff (sales/used energy)	0 11516	0 09570	0 08645	0 09798	0 13487	0 10547
Used Energy, Residential	1,609,119	856,008	756,640	539 944	426,875	4,188,586
Avg realized residential tariff	0 07033	0 06118	0 05003	0 04972	0 06931	0 06203
Barter and Mutual Payments as % of sales	75 34%	60 82%	83 04%	79 66%	67 05%	73 81%
Increase in res avg realized tar over base case	3 5	3 0	1 9	2 0	1 6	2 5
Billed res energy as % of total billed energy	46 40%	50 60%	32 31%	36 25%	32 71%	40 76%
Residential CO as % of total CO	29 08%	33 07%	19 59%	19 13%	17 60%	24 76%
Residential sales as % of total sales	29 08%	33 07%	19 59%	19 13%	17 60%	24 76%
Profit, per kwh billed, as calculated by KE	0 06046	0 02195	0 03131	0 03042	0 08527	0 04629
Operating income (receipts-cost of CO) per kwh used	0 05302	0 01641	0 02605	0 02458	0 07624	0 03968
Profit, res per kwh billed, as calculated by KE	0 01416	-0 01377	-0 00534	-0 01942	0 01816	0 00171
Operating income, res , per kwh used	0 00819	-0 01810	-0 01036	-0 02368	0 01069	-0 00375
Actual 1996 data used for assumptions						
Billed Energy (K kwh), Total	2,023,918	1,283,254	1 411 354	1 036 427	998,634	6,753,586
Billed Energy, Residential	939,178	649,318	455,990	375,720	326,665	2,746,871
Average Tariff (CO/billed energy), Total	0 12404	0 10307	0 09311	0 10553	0 14527	0 11389
Average Tariff, Residential	0 07774	0 06736	0 05646	0 05569	0 07815	0 06879
Sales as Percentage of CO (not used)	79 59%	78 21%	79 11%	78 11%	97 13%	82 37%
Residential sales as % of total sales	16 35%	14 39%	16 98%	14 05%	13 33%	15 15%
Barter and Mutual Payments as % of sales	75 34%	60 82%	83 04%	79 66%	67 05%	72 97%
Cash as % of sales	24 66%	39 18%	16 96%	20 34%	32 95%	27 03%

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis
Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department
Base case Actual 1996 data

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Transmitted through Network	8 933,700	1,910 000	2,573,000	2,168,700	2 133 000	17,718,400
Released to Network	3 839,700	1,880,700	2,540,300	1 627,500	1,416,700	11,304 900
Actual Losses (K kwh)	1 815,800	597,500	1,128,900	591,100	418,100	4,551,400
Technical Losses (K kwh)	807,600	465,200	422 900	416,800	168,600	2,281,100
Commercial Losses (K kwh)	1,008,200	132,300	706,000	174,300	249,500	2,270 300
Actual Losses (as % of transmitted)	20 33%	31 28%	43 87%	27 26%	19 60%	25 69%
Technical Losses (as % of transmitted)	9 04%	24 36%	16 44%	19 22%	7 90%	12 87%
Commercial Losses (as % of released)	26 26%	7 03%	27 79%	10 71%	17 61%	20 08%
Actual Losses (as % of released)	47 29%	31 77%	44 44%	36 32%	29 51%	40 26%
Billed Energy (K kwh), Total	2,023,918	1,283,254	1,411,354	1,036,427	998,634	6,753,586
Billed Energy, Residential	939,178	649 318	455,990	375,720	326,665	2,746,871
Commercial Output (billings) (ksom), Total	251,045	132 271	131,417	109,376	145,067	769,175
Commercial Output, Residential	73,010	43,739	25,744	20,924	25,529	188,945
Sales (receipts), Total	199,801	103,454	103,967	85,432	140,907	633,561
Sales, Barter and Mutual Payments	150,527	62,916	86,332	68,053	94,485	462,312
Sales, Cash	49,274	40 538	17,635	17,379	46 422	171,249
Sales, Residential	32,662	14,889	17,652	12,000	18,787	95,989
Sales as Percentage of CO	79 59%	78 21%	79 11%	78 11%	97 13%	82 37%
Residential Sales as % of Residential CO	44 74%	34 04%	68 57%	57 35%	73 59%	50 80%
Average Tariff (CO/billed energy), Total	0 12404	0 10307	0 09311	0 10553	0 14527	0 11389
Average Tariff, Residential	0 07774	0 06736	0 05646	0 05569	0 07815	0 06879
Cost of CO	209,958	131,219	135,018	105,124	73,091	654,409
Cost of CO for generation	118,649	58 830	79,250	50,289	44,482	351,500
Cost of CO for transmission and distribution	91,308	72,390	55,767	54 835	28,609	302,909
Cost of CO per kWh billed energy	0 10374	0 10225	0 09567	0 10143	0 07319	0 09690
Used Energy (K kwh) (Total-Tech Losses)	3,032,100	1,415,500	2,117,400	1,210,700	1,248,100	9,023,800

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Cost of CO per kwh used energy	0 06924	0 09270	0 06377	0 08683	0 05856	0 07252
Avg realized tariff (sales/used energy)	0 06590	0 07309	0 04910	0 07056	0 11290	0 07021
Used Energy, Residential	1,620,702	719,844	685,840	476,603	426,790	3,929,778
Avg realized residential tariff	0 02015	0 02068	0 02574	0 02518	0 04402	0 02443
Barter and Mutual Payments as % of sales	75 34%	60 82%	83 04%	79 66%	67 05%	72 97%
Billed res energy as % of total billed energy	46 40%	50 60%	32 31%	36 25%	32 71%	40 67%
Residential CO as % of total CO	29 08%	33 07%	19 59%	19 13%	17 60%	24 56%
Residential sales as % of total sales	16 35%	14 39%	16 98%	14 05%	13 33%	15 15%
Profit, per kwh billed, as calculated by KE	0 02030	0 00082	-0 00255	0 00410	0 07207	0 01699
Operating income (receipts-cost of CO) per kwh used	-0 00335	-0 01961	-0 01466	-0 01626	0 05433	-0 00231
Profit, res per kwh billed, as calculated by KE	-0 02600	-0 03489	-0 03921	-0 04574	0 00496	-0 02811
Operating income, res , per kwh used	-0 04909	-0 07202	-0 03803	-0 06165	-0 01454	-0 04809

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis
Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department
All commercial losses attributed to residential customers
Base case Actual 1996 data

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Transmitted through Network	8 933 700	1 910 000	2 573 000	2 168,700	2,133,000	17,718,400
Released to Network	3,839 700	1 880 700	2,540 300	1 627 500	1,416,700	11,304,900
Actual Losses (K kwh)	1,815,800	597,500	1,128,900	591 100	418,100	4,551,400
Technical Losses (K kwh)	807,600	465,200	422,900	416,800	168,600	2,281,100
Commercial Losses (K kwh)	1,008,200	132,300	706,000	174,300	249,500	2,270,300
Actual Losses (as % of transmitted)	20 33%	31 28%	43 87%	27 26%	19 60%	25 69%
Technical Losses (as % of transmitted)	9 04%	24 36%	16 44%	19 22%	7 90%	12 87%
Commercial Losses (as % of released)	26 26%	7 03%	27 79%	10 71%	17 61%	20 08%
Actual Losses (as % of released)	47 29%	31 77%	44 44%	36 32%	29 51%	40 26%
Billed Energy (K kwh), Total	2,023,918	1,283,254	1,411,354	1,036,427	998,634	6,753,586
Billed Energy, Residential	939,178	649,318	455,990	375,720	326,665	2,746,871
Commercial Output (billings) (ksom), Total	251,045	132,271	131 417	109,376	145,067	769,175
Commercial Output, Residential	73 010	43 739	25 744	20 924	25 529	188,945
Sales (receipts), Total	199,801	103,454	103,967	85,432	140,907	633,561
Sales Barter and Mutual Payments	150,527	62,916	86,332	68,053	94,485	462,312
Sales Cash	49,274	40,538	17,635	17,379	46,422	171,249
Sales, Residential	32 662	14 889	17 652	12 000	18,787	95,989
Sales as Percentage of CO	79 59%	78 21%	79 11%	78 11%	97 13%	82 37%
Residential Sales as % of Residential CO	44 74%	34 04%	68 57%	57 35%	73 59%	50 80%
Average Tariff (CO/billed energy), Total	0 12404	0 10307	0 09311	0 10553	0 14527	0 11389
Average Tariff, Residential	0 07774	0 06736	0 05646	0 05569	0 07815	0 06879
Cost of CO	209,958	131,219	135,018	105,124	73,091	654,409
Cost of CO for generation	118,649	58,830	79,250	50,289	44,482	351,500
Cost of CO for transmission and distribution	91,308	72 390	55 767	54,835	28 609	302,909
Cost of CO per kWh billed energy	0 10374	0 10225	0 09567	0 10143	0 07319	0 09690
Used Energy (K kwh) (Total-Tech Losses)	3,032,100	1,415,500	2,117,400	1,210,700	1,248,100	9,023,800

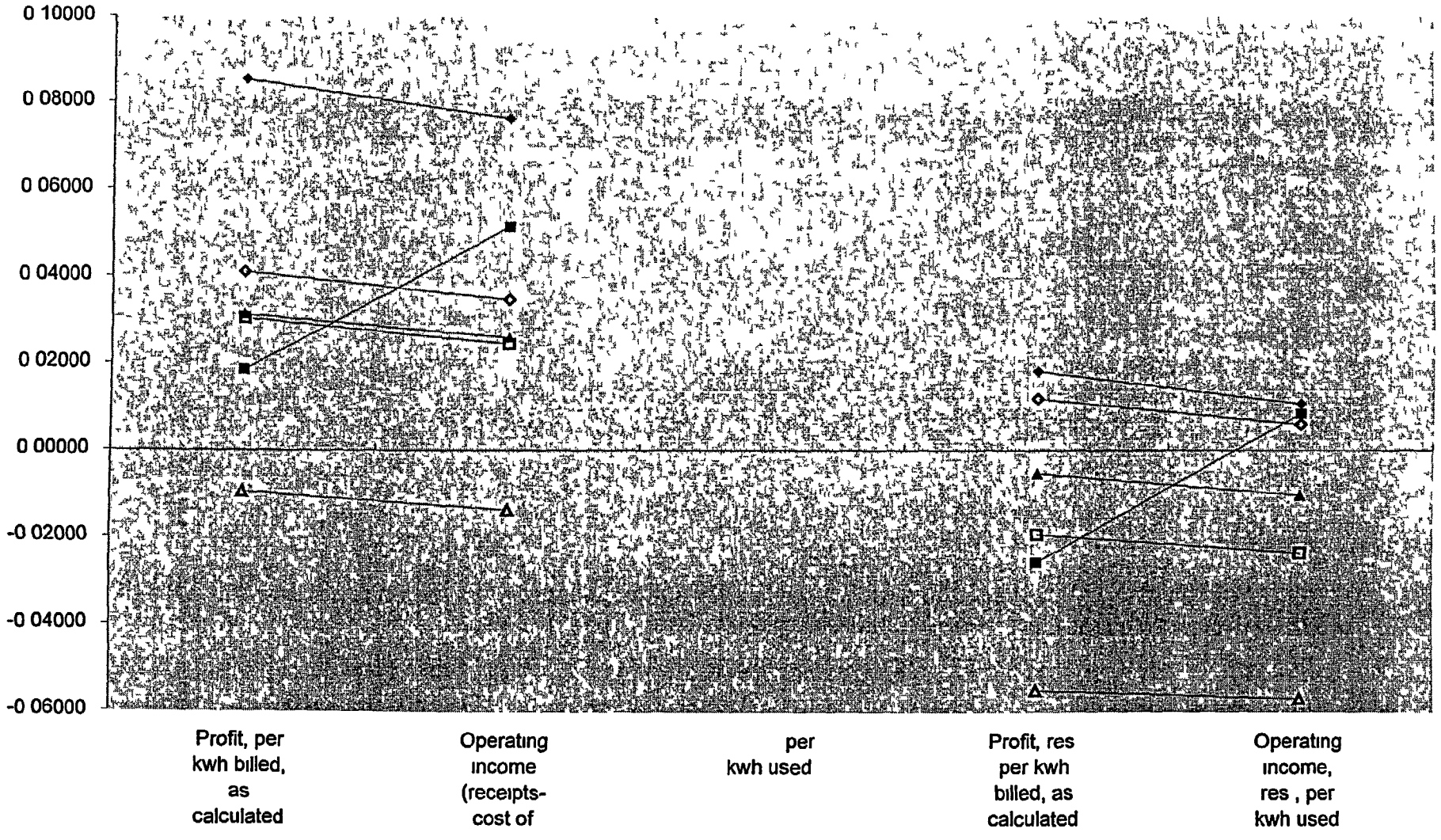
	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Cost of CO per kwh used energy	0 06924	0 09270	0 06377	0 08683	0 05856	0 07252
Avg realized tariff (sales/used energy)	0 06590	0 07309	0 04910	0 07056	0 11290	0 07021
Used Energy, Residential	1 947,378	781,618	1,161,990	550,020	576,165	5,017,171
Avg realized residential tariff	0 01677	0 01905	0 01519	0 02182	0 03261	0 01913
Barter and Mutual Payments as % of sales	75 34%	60 82%	83 04%	79 66%	67 05%	72 97%
Billed res energy as % of total billed energy	46 40%	50 60%	32 31%	36 25%	32 71%	40 67%
Residential CO as % of total CO	29 08%	33 07%	19 59%	19 13%	17 60%	24 56%
Residential sales as % of total sales	16 35%	14 39%	16 98%	14 05%	13 33%	15 15%
Profit, per kwh billed, as calculated by KE	0 02030	0 00082	-0 00255	0 00410	0 07207	0 01699
Operating income (receipts-cost of CO) per kwh used	-0 00335	-0 01961	-0 01466	-0 01626	0 05433	-0 00231
Profit, res per kwh billed, as calculated by KE	-0 02600	-0 03489	-0 03921	-0 04574	0 00496	-0 02811
Operating income, res , per kwh used	-0 05247	-0 07365	-0 04857	-0 06501	-0 02596	-0 05339

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis Based on actual 1996 data, and assumptions
Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department

(a) Base case as presented in 12/97 Commercial losses apportioned between residential and non-residential customers.
(b) Base case revised. All commercial losses attributed to residential customers
(c) Commercial case As in (b), with commercial losses at 2%, technical losses at 12%, and collections at 95% of billings

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Average tariff, total (as calculated by KE)						
(a) Base case	0 12404	0 10307	0 09311	0 10553	0 14527	0 11389
(b) Revised base case	0 12404	0 10307	0 09311	0 10553	0 14527	0 11389
(c) Commercial case	0 12404	0 10307	0 09311	0 10553	0 14527	0 11360
Residential average tariff (as calculated by KE)						
(a) Base case	0 07774	0 06736	0 05646	0 05569	0 07815	0 06879
(b) Revised base case	0 07774	0 06736	0 05646	0 05569	0 07815	0 06879
(c) Commercial case	0 07774	0 06736	0 05646	0 05569	0 07815	0 06902
Average realized tariff, total (sales/used energy)						
(a) Base case	0 06590	0 07309	0 04910	0 07056	0 11290	0 07021
(b) Revised base case	0 06590	0 07309	0 04910	0 07056	0 11290	0 07021
(c) Commercial case	0 11516	0 09570	0 08645	0 09798	0 13487	0 10547
Average realized tariff, res (sales/used energy)						
(a) Base case	0 02015	0 02068	0 02574	0 02518	0 04402	0 02443
(b) Revised base case	0 01677	0 01905	0 01519	0 02182	0 03261	0 01913
(c) Commercial case	0 07033	0 06118	0 05003	0 04972	0 06931	0 06203
(d) Previous commercial case	0 04057	0 02722	0 04543	0 03796	0 05497	0 03979

Current



Current

ANNEX 3

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis Commercial assumptions
Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department

Tech losses	12 00%	Sales as % of CO	95 00%
Comm losses	2 00%		

	Chu DC	Bishkek DC	Osh DC	Jala-Abad DC	Issyk-Kul DC	Naryn DC	Kemin DC	Talas DC	Total Electric
Transmitted through Network	6,001,200	2,133,000	2,573,000	2,168,700	1,194,900	715,100	2,468,000	464,500	17,718,400
Released to Network	2,646,500	1,416,700	2,540,300	1,627,500	1,171,700	709 000	728,700	464,500	11,304,900
Actual Losses (K kwh)	370,510	198 338	355 642	227,850	164,038	99,260	102 018	65 030	1,582,686
Technical Losses (K kwh)	317,580	170,004	304,836	195,300	140,604	85 080	87,444	55,740	1,356,588
Commercial Losses (K kwh)	52,930	28,334	50,806	32,550	23,434	14,180	14,574	9,290	226,098
Actual Losses (as % of transmitted)	6 17%	9 30%	13 82%	10 51%	13 73%	13 88%	4 13%	14 00%	8 93%
Technical Losses (as % of released)	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%
Commercial Losses (as % of released)	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%
Actual Losses (as % of released)	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%
Billed Energy (K kwh), Total	2,275,990	1,218,362	2,184,658	1,399 650	1,007,662	609,740	626,682	399,470	9,722,214
Billed Energy, Residential	1,067,437	398,541	705,834	507,394	502,685	315,656	190,290	258 878	3,946,715
Commercial Output (billings) (ksom), Total	278,043	176,986	203,422	147,708	110,957	55,809	91,209	41,981	1,107,276
Commercial Output, Residential	83,036	31,146	39,850	28 257	40 668	14,507	15,365	19,608	271,477
Sales (receipts), Total	264,141	168,137	193,251	140,322	105,409	53 019	86,648	39,882	1,050,809
Sales, Barter and Mutual Payments	201,219	112,744	160,472	111,777	66,292	29,920	67,158	24,173	773,755
Sales, Cash	62,921	55,393	32,779	28,545	39,117	23,099	19,490	15,709	277,054
Sales, Residential	39,319	22,417	32,811	19,710	19 441	3,092	14,195	11,968	162,955
Sales as Percentage of CO	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%	94 90%
Residential Sales as % of Residential CO	47 35%	71 97%	82 34%	69 75%	47 80%	21 32%	92 39%	61 04%	60 03%
Average Tariff (CO/billed energy), Total	0 12216	0 14527	0 09311	0 10553	0 11011	0 09153	0 14554	0 10509	0 11389
Average Tariff, Residential	0 07779	0 07815	0 05646	0 05569	0 08090	0 04596	0 08074	0 07574	0 06879
Cost of CO (Kemin included in Chu)	179,856	73,091	135,018	105,124	69,591	61,628		30,101	654,409
Cost of CO for generation	104,300	44,482	79,250	50,289	36,923	21,906		14,350	351,500
Cost of CO for transmission and distribution	75,557	28,609	55,767	54,835	32 668	39,722		15,751	302,909
Cost of CO per kWh billed energy	0 10362	0 05999	0 06180	0 07511	0 06906	0 10107	0 10362	0 07535	0 06731

	Chu DC	Bishkek DC	Osh DC	Jala-Abad DC	Issyk-Kul DC	Naryn DC	Kemin DC	Talas DC	Total Electric
Used Energy (K kwh) (Total-Tech Losses)	2,328,920	1 246,696	2,235 464	1 432 200	1,031,096	623,920	641,256	408,760	9,948,312
Cost of CO per kwh used energy	0 06196	0 05863	0 06040	0 07340	0 06749	0 09878	0 06196	0 07364	0 06578
Avg realized tariff (sales/used energy)	0 11342	0 13487	0 08645	0 09798	0 10223	0 08498	0 13512	0 09757	0 10563
Used Energy, Residential	1,092,261	407,810	722,249	519 194	514,375	322,997	194,715	264 899	4,038,499
Avg realized residential tariff	0 03600	0 05497	0 04543	0 03796	0 03780	0 00957	0 07290	0 04518	0 04035
Barter and Mutual Payments as % of sales	76 18%	67 05%	83 04%	79 66%	62 89%	56 43%	77 51%	60 61%	73 63%
Billed res energy as % of total billed energy	46 90%	32 71%	32 31%	36 25%	49 89%	51 77%	30 36%	64 81%	40 59%
Residential CO as % of total CO	29 86%	17 60%	19 59%	19 13%	36 65%	25 99%	16 85%	46 71%	24 52%
Residential sales as % of total sales	14 89%	13 33%	16 98%	14 05%	18 44%	5 83%	16 38%	30 01%	15 51%
Profit, per kwh billed as calculated by KE	0 01854	0 08527	0 03131	0 03042	0 04105	-0 00954	0 04192	0 02974	0 04658
Operating income (receipts-cost of CO) per kwh used	0 05146	0 07624	0 02605	0 02458	0 03474	-0 01380	0 07316	0 02393	0 03985
Profit, res per kwh billed as calculated by KE	-0 02583	0 01816	-0 00534	-0 01942	0 01184	-0 05511	-0 02288	0 00039	0 00147
Operating income, res , per kwh used	-0 02596	-0 00366	-0 01497	-0 03544	-0 02970	-0 08920	0 01094	-0 02846	-0 02543
Actual 1996 data used for assumptions									
Billed Energy (K kwh), Total	1,362,895	998,634	1,411,354	1,036 427	797,231	486,022	372,806	288,218	6,753,586
Billed Energy, Residential	639,197	326 665	455,990	375 720	397,709	251,609	113,201	186,781	2,746,871
Average Tariff (CO/billed energy), Total	0 12216	0 14527	0 09311	0 10553	0 11011	0 09153	0 14554	0 10509	0 11389
Average Tariff, Residential	0 07779	0 07815	0 05646	0 05569	0 08090	0 04596	0 08074	0 07574	0 06879
Sales as Percentage of CO (not used)	83 39%	97 13%	79 11%	78 11%	79 98%	74 72%	85 20%	48 64%	82 37%
Residential sales as % of total sales	14 89%	13 33%	16 98%	14 05%	18 44%	5 83%	16 38%	30 01%	15 15%
Barter and Mutual Payments as % of sales	76 18%	67 05%	83 04%	79 66%	62 89%	56 43%	77 51%	60 61%	72 97%
Cash as % of sales	23 82%	32 95%	16 96%	20 34%	37 11%	43 57%	22 49%	39 39%	

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis
Energy released to network is not identical to KE data in SEA model. It is from report provided by marketing department

Tech losses	12 00%	Sales as % of CO	95 00%
Comm losses	2 00%		

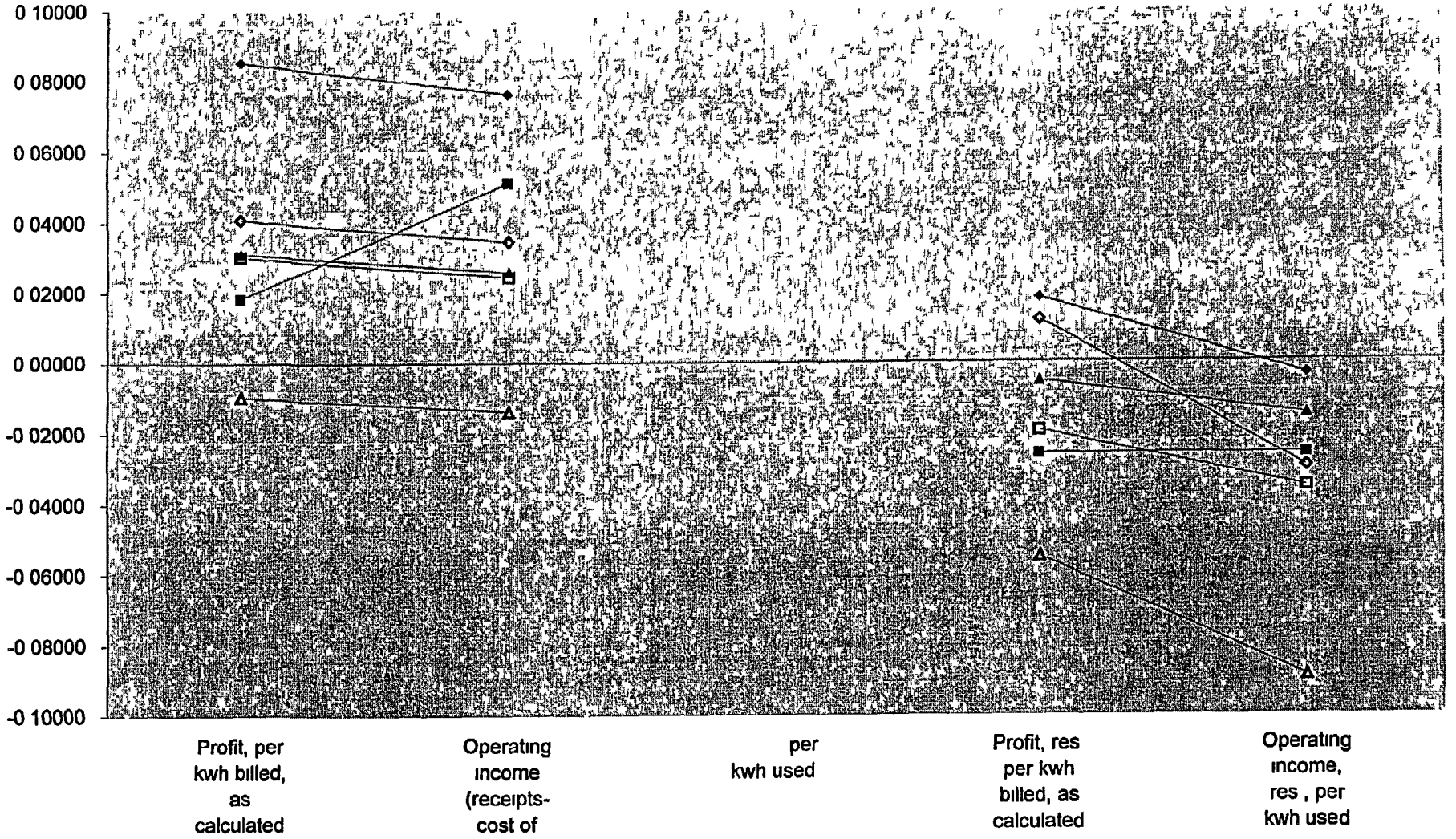
	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Transmitted through Network	8,933,700	1 910 000	2,573 000	2,168 700	2,133,000	17,718,400
Released to Network	3 839,700	1 880 700	2,540,300	1,627,500	1,416,700	11,304,900
Actual Losses (K kwh)	537 558	263,298	355,642	227,850	198,338	1,582 686
Technical Losses (K kwh)	460,764	225,684	304,836	195 300	170,004	1,356,588
Commercial Losses (K kwh)	76,794	37,614	50 806	32,550	28,334	226,098
Actual Losses (as % of transmitted)	6 02%	13 79%	13 82%	10 51%	9 30%	8 93%
Technical Losses (as % of transmitted)	12 00%	12 00%	12 00%	12 00%	12 00%	12 00%
Commercial Losses (as % of released)	2 00%	2 00%	2 00%	2 00%	2 00%	2 00%
Actual Losses (as % of released)	14 00%	14 00%	14 00%	14 00%	14 00%	14 00%
Billed Energy (K kwh), Total	3,302 142	1,617,402	2,184,658	1,399,650	1 218 362	9,722 214
Billed Energy Residential	1 532 325	818,394	705,834	507,394	398 541	3,962,488
Commercial Output (billings) (ksom), Total	409 594	166,713	203,422	147,708	176 986	1,104 423
Commercial Output, Residential	119 120	55,128	39,850	28,257	31 146	273,500
Sales (receipts), Total	389 114	158,377	193,251	140,322	168,137	1,049,201
Sales, Barter and Mutual Payments	293,152	96,318	160,472	111,777	112,744	774 462
Sales Cash	95,962	62,060	32,779	28,545	55,393	274,739
Sales, Residential	63,609	22,793	32,811	19,710	22,417	161,341
Sales as Percentage of CO	95 00%	95 00%	95 00%	95 00%	95 00%	95 00%
Residential Sales as % of Residential CO	53 40%	41 35%	82 34%	69 75%	71 97%	58 99%
Average Tariff (CO/billed energy), Total	0 12404	0 10307	0 09311	0 10553	0 14527	0 11360
Average Tariff, Residential	0 07774	0 06736	0 05646	0 05569	0 07815	0 06902
Cost of CO	209,958	131 219	135,018	105,124	73,091	654,409
Cost of CO for generation	118 649	58,830	79 250	50 289	44,482	351,500
Cost of CO for transmission and distribution	91,308	72,390	55,767	54 835	28,609	302,909
Cost of CO per kWh billed energy	0 06358	0 08113	0 06180	0 07511	0 05999	0 06731

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Used Energy (K kwh) (Total-Tech Losses)	3 378 936	1,655,016	2,235,464	1 432 200	1 246 696	9,948,312
Cost of CO per kwh used energy	0 06214	0 07929	0 06040	0 07340	0 05863	0 06578
Avg realized tariff (sales/used energy)	0 11516	0 09570	0 08645	0 09798	0 13487	0 10547
Used Energy, Residential	1 567,960	837,427	722 249	519 194	407,810	4,054,639
Avg realized residential tariff	0 04057	0 02722	0 04543	0 03796	0 05497	0 03979
Barter and Mutual Payments as % of sales	75 34%	60 82%	83 04%	79 66%	67 05%	73 81%
	2 013017609	1 315939713	1 765072681	1 507763664	1 248784272	1 629059566
Billed res energy as % of total billed energy	46 40%	50 60%	32 31%	36 25%	32 71%	40 76%
Residential CO as % of total CO	29 08%	33 07%	19 59%	19 13%	17 60%	24 76%
Residential sales as % of total sales	16 35%	14 39%	16 98%	14 05%	13 33%	15 38%
Profit, per kwh billed, as calculated by KE	0 06046	0 02195	0 03131	0 03042	0 08527	0 04629
Operating income (receipts-cost of CO) per kwh used	0 05302	0 01641	0 02605	0 02458	0 07624	0 03968
Profit res per kwh billed, as calculated by KE	0 01416	-0 01377	-0 00534	-0 01942	0 01816	0 00171
Operating income, res , per kwh used	-0 02157	-0 05207	-0 01497	-0 03544	-0 00366	-0 02599
Actual 1996 data used for assumptions						
Billed Energy (K kwh), Total	2,023 918	1,283,254	1 411,354	1,036,427	998,634	6,753,586
Billed Energy, Residential	939,178	649 318	455,990	375,720	326 665	2,746,871
Average Tariff (CO/billed energy), Total	0 12404	0 10307	0 09311	0 10553	0 14527	0 11389
Average Tariff Residential	0 07774	0 06736	0 05646	0 05569	0 07815	0 06879
Sales as Percentage of CO (not used)	79 59%	78 21%	79 11%	78 11%	97 13%	82 37%
Residential sales as % of total sales	16 35%	14 39%	16 98%	14 05%	13 33%	15 15%
Barter and Mutual Payments as % of sales	75 34%	60 82%	83 04%	79 66%	67 05%	72 97%
Cash as % of sales	24 66%	39 18%	16 96%	20 34%	32 95%	27 03%

Energy Usage and Billed and Paid Revenues by Customer Class, for Financial Analysis
Energy released to network is not identical to KE data in SEA model It is from report provided by marketing department
Base case Actual 1996 data

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Transmitted through Network	8 933,700	1,910 000	2,573,000	2 168,700	2,133,000	17,718,400
Released to Network	3,839,700	1,880,700	2,540,300	1 627 500	1,416,700	11 304,900
Actual Losses (K kwh)	1 815 800	597,500	1 128 900	591 100	418,100	4 551,400
Technical Losses (K kwh)	807 600	465,200	422 900	416,800	168,600	2 281,100
Commercial Losses (K kwh)	1,008,200	132,300	706 000	174,300	249,500	2,270 300
Actual Losses (as % of transmitted)	20 33%	31 28%	43 87%	27 26%	19 60%	25 69%
Technical Losses (as % of transmitted)	9 04%	24 36%	16 44%	19 22%	7 90%	12 87%
Commercial Losses (as % of released)	26 26%	7 03%	27 79%	10 71%	17 61%	20 08%
Actual Losses (as % of released)	47 29%	31 77%	44 44%	36 32%	29 51%	40 26%
Billed Energy (K kwh), Total	2 023,918	1,283,254	1,411,354	1,036,427	998,634	6,753,586
Billed Energy, Residential	939,178	649,318	455,990	375,720	326,665	2,746,871
Commercial Output (billings) (ksom), Total	251,045	132,271	131,417	109,376	145,067	769,175
Commercial Output, Residential	73,010	43 739	25,744	20,924	25,529	188,945
Sales (receipts), Total	199,801	103,454	103 967	85,432	140,907	633,561
Sales, Barter and Mutual Payments	150 527	62,916	86 332	68,053	94,485	462,312
Sales, Cash	49,274	40,538	17 635	17,379	46,422	171,249
Sales, Residential	32 662	14,889	17,652	12,000	18,787	95,989
Sales as Percentage of CO	79 59%	78 21%	79 11%	78 11%	97 13%	82 37%
Residential Sales as % of Residential CO	44 74%	34 04%	68 57%	57 35%	73 59%	50 80%
Average Tariff (CO/billed energy), Total	0 12404	0 10307	0 09311	0 10553	0 14527	0 11389
Average Tariff, Residential	0 07774	0 06736	0 05646	0 05569	0 07815	0 06879
Cost of CO	209,958	131,219	135,018	105,124	73,091	654,409
Cost of CO for generation	118,649	58,830	79,250	50,289	44,482	351 500
Cost of CO for transmission and distribution	91,308	72 390	55,767	54 835	28,609	302,909
Cost of CO per kWh billed energy	0 10374	0 10225	0 09567	0 10143	0 07319	0 09690
Used Energy (K kwh) (Total-Tech Losses)	3,032,100	1,415 500	2,117,400	1,210,700	1,248,100	9,023,800

	Severelectro	Vostokenergo	Oshelecktro	J-A Elektro	Bishkekelektro	Total
Cost of CO per kwh used energy	0 06924	0 09270	0 06377	0 08683	0 05856	0 07252
Avg realized tariff (sales/used energy)	0 06590	0 07309	0 04910	0 07056	0 11290	0 07021
Used Energy Residential	1,620,702	719 844	685 840	476,603	426,790	3,929,778
Avg realized residential tariff	0 02015	0 02068	0 02574	0 02518	0 04402	0 02443
Barter and Mutual Payments as % of sales	75 34%	60 82%	83 04%	79 66%	67 05%	72 97%
Billed res energy as % of total billed energy	46 40%	50 60%	32 31%	36 25%	32 71%	40 67%
Residential CO as % of total CO	29 08%	33 07%	19 59%	19 13%	17 60%	24 56%
Residential sales as % of total sales	16 35%	14 39%	16 98%	14 05%	13 33%	15 15%
Profit, per kwh billed, as calculated by KE	0 02030	0 00082	-0 00255	0 00410	0 07207	0 01699
Operating income (receipts-cost of CO) per kwh used	-0 00335	-0 01961	-0 01466	-0 01626	0 05433	-0 00231
Profit, res per kwh billed, as calculated by KE	-0 02600	-0 03489	-0 03921	-0 04574	0 00496	-0 02811
Operating income, res , per kwh used	-0 04909	-0 07202	-0 03803	-0 06165	-0 01454	-0 04809


Current
0 10000
0 08000
0 06000
0 04000
0 02000
0 00000
-0 02000
-0 04000
-0 06000
-0 08000
-0 10000
Profit, per kwh billed, as calculated
Operating income (receipts- cost of
per kwh used
Profit, res per kwh billed, as calculated
Operating income, res , per kwh used

ANNEX 4

MEMO

DATE December 18, 1997

TO Mr Arstand
State Energy Agency

Joellyn Murphy
Avtandil Kalmanbetov

FROM Linda Kalver

SUBJECT Preliminary version of USAID/Hagler Bailly Technical and Financial Model of Kyrgyzenergo, 1996 results

The accompanying diskette contains the technical and financial model developed by USAID/Hagler Bailly in conjunction with the State Energy Agency and the State Property Fund Our intention is to augment the SEA model with several calculated values that we think are important in representing the financial health of the distribution companies and of Kyrgyzenergo overall Otherwise, we have attempted to replicate SEA's results Because of some differences in our sources of data, as explained below, the output of our model will differ slightly, but this is not to be interpreted as a disagreement with SEA in any sense Rather, such slight discrepancies are necessary to maintain the mathematical consistency of our computations

Description of model

The format of the USAID/Hagler Bailly model follows that of the report, *Technical and Economic Indices and Financial Results of Kyrgyzenergo as of 1996* ("KE Indices") The data used in the model came from Kyrgyzenergo With the exception of the cost data, the data were taken and/or calculated from reports provided by Miss Ifimenka, Head of the Marketing Department These reports are the only source that I am aware of for detailed data about residential customers Since the Marketing Department provided no cost data, the cost data were taken from "KE Indices", which, I understand, is the source of data for the State Energy Agency's financial model SEA's data on energy are similar, but not identical, to the data I have used Although I would prefer to be completely consistent with the SEA model, I felt that I could make the most effective use of the residential data by employing billing and sales data (i e , energy-related data) from the same marketing reports that yielded the customer data

Appended to the model is a table displaying customers by customer class, including the discount categories of residential customers

The model includes 5 sheets On the first sheet, the original eight distribution companies are shown separately On the second and third sheets, Chu, Kemin, and Talas are combined into Severenergo On the fourth sheet, Issyk-Kul and Naryn are combined

into Vostokenergo The fifth sheet presents the results organized by the five distribution companies that will exist in 1998

Calculations introduced in the USAID/Hagler Bailly model

Average tariff

Kyrgyzenergo calculates the average tariff (tyiyn per kWh) as the ratio of billed revenues to the corresponding billed energy Both the numerator and the denominator are misleading indicators for two reasons First, much of the billed revenues are not collected, therefore, they do not contribute to covering the company's costs Second, the energy used by customers includes a great deal of electricity that is not reported and, therefore, not billed This electricity is included in estimated losses, under the heading, "commercial losses" Any realistic estimate of total costs must include the cost of producing the electricity lost as well as the electricity billed

At the present time, we are investigating the billing and collection system, to try to increase the amount of used energy that is paid for, as well as the Accounts Receivable, to try to characterize (e g , by usage, customer class, etc) the bills that are not paid Subsequently to the completion of such study, we can refine the definition of average tariff to include a set of estimates, some of which reflect a portion of accounts receivable, namely, those revenues that can realistically be expected

As a first step, we have introduced the "average tariff based upon sales and used energy" This is calculated as the ratio of electricity sales (i e , revenue collected) to "used energy", defined as billed energy plus the commercial losses Used energy is the energy produced for potential sale, whose cost must be covered by the revenues collected For each distribution company, the average tariff based upon sales and used energy is significantly lower than the average tariff calculated by Kyrgyzenergo, usually half or less

The residential average tariff is calculated in the same way, based upon the billings and the billed energy for residential customers The residential "average tariff based upon sales and used energy" is, likewise, calculated from the sales and used energy for residential customers

Sales

It appears that Kyrgyzenergo uses the term "sales" to denote either commercial output (billed revenues) or revenue received Because of the great disparity between commercial output and revenue received, USAID/Hagler Bailly has adopted the latter definition and uses the term "sales" to refer exclusively to revenue received

The SEA model does not appear to analyze sales, in this sense of the word We believe that it sales are an important indicator of financial health, therefore, we were

pleased to receive detailed sales data from the Marketing Department

Calculations in the USAID/Hagler Bailly model employing sales data include

- Sales as a percentage of CO This represents the ability of the company to collect its billed revenues The values range from a low of 49% for Talas to a high of 97% for Bishkek DC

- Residential sales as a percentage of residential CO For each distribution company, this percentage is significantly lower than for the company overall, showing that it is harder to collect revenues from residential customers than from industrial and commercial customers This seems surprising, because some of residential energy usage is self-reported and would appear to have greater potential to be underreported than to be reported and unpaid

- Sales, barter, as a percentage of total sales Barter accounts for more than half of every company's sales

We expect that the present investigations of billing and collections will clarify some of the issues concerning sales

Profit

Kyrgyzenergo calculates the profit of each company by comparing the billed revenues to the total (operating) costs, by this measure it asserts that every distribution company except Naryn and Osh is making a profit By Western standards, however, only the paid revenues (i e , sales) count toward profitability By this standard, only Bishkek and Issyk-Kul are profitable

Kyrgyzenergo expresses profit per unit of billed energy it compares the average tariff (based upon billed revenues) to the (total) cost of generation, transmission, and distribution expressed per billed kWh Correspondingly, we have introduced the calculation profit per kWh of used energy This calculation lowers the perceived cost per unit, but, in all cases, by less than the recalculated average tariff lowers the revenue per unit

The use of "unit" profitability is merely an expository device Profitability occurs if, and only if, the total revenue covers the total costs Our recalculation does not change the total costs, it does change the total revenue used in determining profit The limitation of Kyrgyzenergo's calculations lies in the fact that, even when the official tariff rates cover the cost of one kWh, many kWh are used but not paid for, and, therefore, the company

is not, in fact, "profitable", in contrast to what Kyrgyzenergo's calculations show Furthermore, the tariffs do not cover all the costs, and, therefore, the companies are not profitable in the sense of earning enough money to stay in business, sustain service levels, and maintain their physical assets

Conclusions

The analysis discussed in this memorandum shows that most of the distribution companies are not now profitable at current tariff levels However, when the model's assumptions are varied to reflect decreased losses and/or increased ability to collect billed revenue, the companies show a profit at current tariff levels

At the present time, we have not undertaken an investigation of costs

We look forward to expanding the model to analyze projections for 1998 and 1999 The SEA model provides a considerable portion of the data we will require We are attempting to obtain projections of the energy delivered to each distribution company, including not only the energy released to its own network but also the energy supplied for transit We are requesting the assistance of the marketing department in obtaining this and additional data

The model is in the file HBFINMOD WK3, a LOTUS file that can also be used in EXCEL 1

ANNEX 5

MEMO

DATE	October 21, 1997
TO	Joellyn Murphy Avtandil Kalmenbetov
FROM	Linda Kalver
SUBJECT	Technical and Financial Model of Kyrgyzenergo

Introduction

My assignment for USAID/Hagler Bailly, as originally specified, was to develop a financial model of Kyrgyzenergo The purpose of the model was to encourage Parliament to adopt the proposed program of privatization The model was intended to demonstrate that the distribution companies of Kyrgyzenergo will be profitable when they are privatized

SEA Model

Form of model Flow chart of transactions between agents, including all entities of Kyrgyzenergo, banks, and customers

Strengths

- This model identifies the agents who are directly and indirectly responsible for the profitability of Kyrgyzenergo If a model of this form were properly developed, it would enable the management of each entity to determine the directions in which to focus attention
- The model explicitly takes account of exports and imports
- The model explicitly takes account of large industrial customers

Weaknesses

- The model does not include operational data
- The model does not take account of the mix within the residential customer class, nor of discounts
- I think the model is overcomplicated

Eventual reporting format

Form Flow chart of costs and revenues, based on a chart prepared by Hagler Bailly on American Electric Power's revenue stream This chart shows the costs that enter into the revenue requirements, the average tariff, and the ability of the tariff to cover the financial needs of the company

Advantages

- If the simplifying assumption is made that demand for energy is constant

(rather than a function of price), the operating costs are likewise constant In this case, the costs (other than purchased power - see below) can be taken directly from the company's records

- In this case, alternative proposed tariffs can be evaluated for their effect on operating income, ability to cover the company's fixed charges, and the resulting return on investment
- The return on investment and/or the dividend can be prespecified and the tariff estimated from the revenue requirement and the need to cover the fixed charges Tariffs can be compared under alternative assumptions about financial losses and delinquent payments
- In Kyrgyzenergo's accounting system, the operating costs of the distribution companies includes the average production cost of the power delivered to its network After privatization, in order to obtain power from Kyrgyzenergo, the distribution companies will have to pay a price above the cost of generation (i e , the wholesale tariff) The form of this model readily allows the evaluation of alternative wholesale tariffs
- Since this model calculates profits as the difference between revenues and costs (in contrast to Kyrgyzenergo's calculation, which is the difference between billings and costs), improvements in the metering and collection processes will be reflected in the results

Reasons for taking a different approach

The "model" must be more than a one-time financial report if it is to be a useful to to Kyrgyzenergo management, the SEA, and the SPF in presenting and defending the Government's Privatization Program to Parliament, and to potential investors We assumed that Kyrgyzenergo presented data that was seriously flawed, and that if we cleaned up the data we would produce more meaningful results (For example, we originally thought that their reported depreciation included expenses for maintenance and repair as well as the amortization of capital, however, this appears not to be so) On the other hand, we also felt sure that accurate reporting would show that the distribution companies other than Bishkek DC were highly unprofitable (Under the rougher methods of estimation described below, we have indeed demonstrated that)

Therefore, the initial assignment could be interpreted as "Potential investors will never believe Kyrgyzenergo's figures showing that all the distribution companies except Naryn DC are profitable (for good reasons, as discussed below) Therefore, USAID/Hagler Bailly should develop an independent model showing their profit potential, under current conditions and under alternative scenarios and assumptions

As I learned about, accumulated, and made my own calculations with Kyrgyzenergo's data, I came to believe that a hybrid technical and financial analytical

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model would be of great value to Government officials, Kyrgyzenergo managers, and investors This is so because such a model would permit decision makers to test assumptions about operations, management (including collection and disconnection policies), pricing, and other policy matters that they would adopt in order to make the company profitable, rather than merely reflect the policies and procedures by which the company is currently run

Other reasons supporting a hybrid model include

- We cannot tell whether Kyrgyzenergo is reporting its total cost data accurately, but (comparing a variety of sources) it appears to report them consistently It is my understanding that Price Waterhouse is auditing the company and modernizing its accounting methods We should certainly incorporate their results in later refinements of the model, but we should not attempt to duplicate their efforts
- We do not now need highly detailed cost data for rate-setting, as we are not developing tariffs based upon marginal cost but are looking at overall profitability [1]
- We do not need highly detailed data for generation, because we are focusing on the distribution companies, which will be the first entities to be privatized (Later, when we study the generating companies we will be concerned with fuel and non-fuel costs When we study the grid, we will also be concerned with distance-related transmission costs)
- We need data that are sufficiently disaggregated to respond to changes in assumptions of the types mentioned in the previous paragraph, but we do not need precise accounting data

Focus of investigations

The previous section describes the use of the model by Government decision makers, by Kyrgyzenergo managers, and by potential investors who will be able to simulate their own operation of the company By contrast, the bulk of our internal analysis should concern customers, tariffs, and revenues of Kyrgyzenergo

Definition of profit

We have analyzed some of the concepts used by Kyrgyzenergo in their financial reporting, and we will explain them when we document the model Our first, and most striking result, concerned profitability Kyrgyzenergo calculates profits as the difference between billed revenues and costs Under this definition, all the distribution companies

[1] We are designing a tariff that is uniform throughout the country for each customer class We are doing so to conform to the tariff policy but, as you know, it is also my professional opinion that this is a completely acceptable alternative

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except Naryn show a profit However, since most of the distribution companies have a large proportion of their billings in accounts receivable (indeed, one company has accumulated accounts receivable exceeding 100% of current billings), this is a misleading figure The correct calculation of profit is sales (i e , received payment) less costs Under this definition of profit, only Bishkek DC is profitable

There are at least four basic reasons that revenues are so low financial losses (e g , through theft of electricity) account for a significant percentage of the electricity delivered to the network, many of the residential customers (including 100% of the customers of Naryn DC) receive substantial discounts, much of the revenue that is billed ("commercial output") is not collected, and delinquent customers are rarely disconnected (or, if they are, may be illegally reconnected) Additionally, metering of electricity is sporadic and unreliable Through a combination of management decisions and government intervention, the situation can be greatly improved The model allows the user to evaluate alternative policies concerning the first three of the above reasons For example, the user can estimate the impact of reducing losses, reducing and/or restructuring the discounts, or adopting an aggressive program of collection By imposing a few additional assumptions, the user can also evaluate more complex scenarios, such as the effect of a change in the customer mix, or the write-off of a portion of accounts receivable as bad debt

Transfer payments for electricity from Kyrgyzenergo

In Kyrgyzenergo's accounting system, the operating costs of each distribution company includes the cost of generation of the energy delivered to its network This is evaluated at 0309 som, which is the average generation cost for Kyrgyzenergo After privatization (but before the development of competition in generation), the cost of energy will be equal to a regulated wholesale tariff, which will necessarily be higher than the cost of production The user will be able to evaluate the effect of alternative wholesale tariffs on each company's profitability and return on investment The model can also accommodate tariffs that differ by region

The model being developed

Overview

On behalf of USAID/Hagler Bailly, I am developing a flexible "workbook" model in LOTUS 1-2-3 [2] At the present stage, it contains two worksheets of input data, by operating entity, received from Kyrgyzenergo Eventually, it will have a separate worksheet for each distribution company, in which the user will be able to input forecast values of significant variables and see their overall effect At present, however, it can be used only as a model of a single point in time, to determine the impact of alternative (current) values of the variables

[2] A workbook is the three-dimensional analog of a spreadsheet It consists of an indexed sequence of spreadsheets (usually called worksheets), which are linked

Data entry and other developments thus far

One worksheet contains a large table of input data, primarily from the table entitled, "Technical and Economic Indices and Financial Results of Kyrgyzenergo as of 1996", augmented by asset and depreciation data from the Form 1 report, tax data received from Mrs Rejich, Chief Accountant of Kyrgyzenergo, and data concerning losses due to the veteran discounts, received from Miss Ifemenka, Head of the Marketing Department From this worksheet, I first recalculated profit (correctly) from sales and costs, and I observed the effect on financial figures and the average tariff I next evaluated the effect of hypothetical changes in losses and discounts

The other worksheet of input data contains customer data, by company and customer class (including residential discount classes), received from Miss Ifemenka I have used this worksheet to calculate statistics about customer mix and percentages of discount customers

I have not yet employed the two data worksheets together to evaluate alternatives

Conclusions and recommendations

I think that the model USAID/Hagler Bailly is developing will be a useful tool in the privatization process The results are unlikely to change substantively as the data and the methods are refined While the model is being developed (and before it is user-friendly), we can use it internally to advise the Government Accordingly, I think that the Government should be made aware of the development of this model and encouraged to promote both the model and the privatization effort

MEMO

DATE: October 23, 1997

TO Joellyn Murphy
Avtandil Kalmanbetov

FROM: Linda Kalver

SUBJECT: Explanations of terms used in Technical and Financial Model

In labeling data used in the technical and financial model, I have attempted to use the definitions that are employed by Kyrgyzenergo In some cases, these differ from the definitions that are familiar in the United States I have also indicated the units of measure The sequence of definitions generally follows the sequence of data in the model Please let me know if you think that I have misunderstood any of them

Data from Form 1, report on fixed assets as of 1/1/97, received from Privatization Committee of Kyrgyzenergo

Book value (ksom) - Original cost of asset

Balance (ksom) - Book value less the accumulated depreciation since the asset was acquired

Assessed value (ksom) - I think this is the result of the revaluation that has taken place, but I am not certain of this The assessed value appears, in every instance I have seen, to equal, or be almost the same as, the book value The assessed value of plant is not needed in any of my calculations

Data from report, Technical and Economic Indices and Financial Results of Kyrgyzenergo, received (in English) from Mark Heitner, of the World Bank The data are conformable with other data I have received directly from Kyrgyzenergo Many, but not all, values in the report are identical to data provided directly by KE
Data provided by Miss Ifimenka, Head of the Marketing Department, includes some of the same categories In some instances, however, the values are somewhat different

Released to network (kWh) - Electricity allocated to the distribution company's own customers, before the deducting the amount of losses

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Losses (kWh) - Energy that is not "billed" Losses include both technical (called "normative" losses, which are line losses, and financial losses, which arise from the failure to report this energy so that it can be billed

Billed energy (kWh) - Energy attributed to specific customers of KE, for which KE expects to receive payment Billed energy may be reported through metering or by the self-reporting of customers

Accounts receivable (ksom) - Accounts receivable consists of the value of billed energy that has not been collected Since outstanding bills are never written off as bad debt, we cannot readily determine the amount of recent entries into accounts receivable (In other words, we cannot tell how fast accounts receivable are growing) Accounts receivable has a number of days associated with it, but we do not know how it is determined

Commercial output (CO) (ksom) - This is the value of billed energy, calculated at the applicable tariff rates, including the discount rates

Average tariff (som/kWh) - This is the average rate for a kWh of billed energy, calculated for each distribution company, exports, and the total system [It can be further subdivided by customer class For example, Marketing calculates the average tariff for residential customers] The average tariff is a misleading indicator of the financial health of a company, because the collection rate for billings is so low The actual revenue collected (sales), divided by the billed energy is considerably below the average tariff When financial losses are taken into consideration, the revenue collected per kWh of energy *used by customers* (whether reported or not) is even lower

Cost of commercial output (ksom) - This is erroneously named it is actually the cost of producing the total amount of energy delivered to the network It has two components Cost of CO for generation and Cost of CO for transmission and distribution The first component equals the amount of electricity released to the network multiplied by the KE average cost of generating one kWh (3 09 tyiyn) The second component appears to be the total operating costs of each distribution company [1]

[1] The values for Cost of CO for transmission and distribution are taken from the table of Technical and Economic Indices I compared them to the operating costs I received from Mr Oukoulov, and they are sufficiently close that I cannot tell whether Mr Oukoulovs numbers include the transmissions costs or, conversely, if transmission costs must be added to Mr Oukoulovs numbers

Profit/loss as calculated by KE (ksom) - KE calculates profit or loss as the commercial output minus the cost of commercial output In other words, they calculate profit as the value of billed energy, less the total cost of production Since the percent of billings that are actually paid is quite small, they greatly overstate profit

Sale of products (sales) (ksom) - This equals the revenues received for energy The disparity between CO and sales is contained in accounts receivable

Profit/loss based on sales (ksom) - This equals sales minus the cost of CO, which is the total revenues minus total production costs It corresponds to the definition of operating income employed in the United States

Cost of sale of Products (ksom) - This pertains only to thermal energy

Data from summary reports received from Mrs Rejich, Chief Accountant of Kyrgyzenergo We received data concerning both the amount of tax billed and the amount of tax paid by each entity of Kyrgyzenergo

VAT - This was initially described as a 20% tax on sales However, after several questions had been answered, it appeared to be a tax on sales net of the cost of inputs I trust the second interpretation, because it is consistent with the assertion I have heard, that disaggregation of the companies will have no implications for the total tax on energy production, transmission, and distribution (The apportionment of the tax burden among the various companies, of course, will depend upon the wholesale price of electricity)

Road tax - Mrs Rejich characterized it as a tax of 8% of "generation sold, whether it is paid or not" I took this to mean that it is a tax on CO, whether or not it is sold However, from the Technical and Economic Indices report, I ascertained that it equals 8% of *sales*, i e , paid energy

Natural calamities tax - This is a tax of 1 5% of sales, "to prevent and fight natural calamities" This refers to floods, blizzards, and similar occurrences This tax does not appear on the Technical and Economic Indices report

Property tax - For completeness, I mention this 1 2% tax, although it does not appear in the Technical and Financial Model It appears in the Technical and Economic Indices report, but was not provided or discussed by Mrs Rejich I do not know the base for this tax, it is obviously something much smaller than sales

MEMO

DATE	October 20, 1997
TO.	Joellyn Murphy
FROM	Linda Kalver
SUBJECT	An illuminating colloquy with Miss Raisan, of the Planning and Economics Department of Kyrgyzenergo

I want to share this story with you, as it so clearly illustrates what we are up against This morning, Avtandil and I met with Miss Raisan, who had been asked by Mr Oukoulov to provide some data that we had requested and to answer our questions I posed the question that you and I had discussed, concerning the "cost of producing the commercial output (billed energy)", as shown in the report, "Technical and Economic Indicators of Kyrgyzenergo" You and I agreed that it was unlikely that Kyrgyzenergo knew its cost function well enough to distinguish the cost of producing its billed energy from the cost of producing its total energy (i e , billed energy plus losses)

Miss Raisan admitted that the value shown represented the cost of producing the total output, not just the cost of producing only the billed output I asked, "Then why don't you show it as the cost of producing the total output? There are costs associated with producing losses, and the revenues have to cover them "

She replied, matter-of-factly, "If they include losses in the calculation, it means that they won't make a profit "

DRAFT MEMO

DATE October 29, 1997

TO Joellyn Murphy

FROM. Linda Kalver

SUBJECT: Technical and Financial Model of Kyrgyzenergo Preliminary Results

Purpose of this memorandum

This memorandum presents preliminary results derived from the Technical and Financial Model The underlying data base includes data for the entire customer base of each company, but our analysis, and the discussion in this memorandum, focus on residential customers The issues addressed in this study include average residential tariff, profitability of each distribution company, and residential discounts

Average tariff

Kyrgyzenergo has asserted that the average tariff (tyiyn per kWh) paid by its customers has increased during recent years However, they calculate the average tariff as the ratio of billed revenues to the corresponding billed energy Both the numerator and the denominator are misleading indicators for two reasons First, much of the billed revenues are not collected, therefore, they do not contribute to covering the company's costs [1] Second, the energy used by customers includes a great deal of electricity that is not reported and, therefore, not billed This electricity is included in estimated losses as "commercial losses" However, any realistic estimate of total costs must include the cost of producing the electricity lost as well as the electricity billed

Accordingly, we have introduced the "average tariff based upon sales and used energy " This is calculated as the ratio of electricity sales (i e , revenue collected) to "used energy", defined as the billed energy plus the commercial losses Used energy is the energy produced for potential sale, whose cost must be covered by the revenues collected For each distribution company, the average tariff based upon sales and used energy is significantly lower than the average tariff calculated by Kyrgyzenergo, usually half or less For Naryn DC, the former is less than 1 tyiyn per kWh

[1] The method of maintaining records for accounts receivable appears to be incapable of providing insight as to how much of accounts receivable can realistically be expected to be collected

Profitability

The profitability of a company consists in the ability of its revenues to cover its costs

Calculations

For each company, I calculated

a) Used energy
b) Average tariff based upon used energy
c) Cost of generation, transmission, and distribution per kWh of used energy
d) Profit per kWh of used energy This equals (b) minus (c)

Results

Kyrgyzenergo compares the average tariff (based upon billed revenues) of each distribution company to the cost per kWh of generation, transmission, and distribution, and it asserts that every distribution company except Naryn and Osh is making a profit Recalculating cost in terms of used energy lowers the unit cost, but, in all cases, by less than recalculating the average tariff on the basis of sales lowers the unit revenue When profit is recalculated, thus, on the basis of sales, only Bishkek DC and Issyk-Kul DC are profitable

Note that the use of "unit" profitability is merely an expository device Profitability occurs if, and only if, the total revenues cover the total costs Our recalculation does not change the *total* costs, it does change the total revenue used in determining profit The fallacy in Kyrgyzenergo's calculations lies in the fact that, even when the official tariff rates cover the cost of one kWh, many kWh are not paid for

Residential discounts

The profile of residential customers incorporates the data most recently received from Miss Ifimenka, Head of the Marketing Department of Kyrgyzenergo, concerning the discount customers served by each distribution company[2] Using this profile and employing reasonable assumptions about usage, reporting of usage, and payment of bills by discount customers, I estimate the discounts by company I find that, in every distribution company, the commercial output ascribed to discount customers by this method is unrealistically large, relative to the number of discount customers, if the CO is believed to be sales (i e , paid revenue) rather than billed revenue Furthermore, in every distribution company, the average tariff for discount customers implied by my calculations

[2] The discounts for merit pensioner and rehabilitated pensioners given by Miss Ifimenka (50%) conflict with those found in the laws (25%) We have used the latter, but the calculations can easily be modified if Miss Ifimenka's figures are correct

exceeds the actual revenue per *used* kWh paid by the totality of residential customers (i e , customers with and without discounts)

Facts about residential usage and residential discounts

- It is our understanding that Kyrgyzenergo regards 150 kWh per month as a realistic benchmark level of usage for residential customers For example, lifeline rates apply to this level of usage

- Most of the discount categories apply to the first 150 kWh of usage each month [3]

- It is my understanding that official calculations of the revenues and the electricity associated with discount customers are based upon a "statutory" assumption of 150 kWh per month I do not know whether these revenues are included in billed revenues or paid revenues As is seen in the discussions of individual distribution companies, I compare the revenues of discount customers to both the billed and paid revenues for all residential customers

Assumptions for this analysis

- Every discount customer is assumed to use 150 kWh per month

- The revenue calculations are based upon the prevailing lifeline rates in 1996, which were (before the discount) 9 tyiyn/kWh for January-June and 12 tyiyn/kWh for July-December

- The commercial losses (e g , theft) associated with the residential customers of a distribution company are in proportion to their billed revenues (Alternative assumptions are plausible, and we will eventually assess the sensitivity of our results to this assumption We do not expect it to be great)

- At present, Kemin DC has been appended by Chu DC The cost data that we use includes the costs for Kemin DC under Chu DC, but the customer data received from the Marketing Department treats the two companies separately Accordingly, I have presented a separate discussion of Kemin DC regarding residential discount and non-discount customers In order to discuss unit costs and profitability, I have aggregated the customer and

[3] There are exceptions to this War invalids, who receive a 100% discount, simply do not pay bills In addition, energy sector employees receive a 50% discount on all their usage

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usage data for the two companies The discussion of costs and profitability appears under Chu DC

Calculations

For each company, I calculated

a) Number of discount customers as percentage of total residential customers
b) Number of 100% discount customers as percentage of discount customers
c) Number of 100% discount customers as percentage of total residential customers
d) Number of 50-100% discount customers as percentage of discount customers
e) Number of 50-100% discount customers as percentage of total residential customers
f) Electricity associated with discount customers (at 150 kWh per customer per month) This is identified with used energy, billed electricity, and paid electricity, in various contexts
g) Revenues corresponding to total electricity (f), at the discounted rates
h) Value of the discount This equals the total electricity (f) multiplied by the undiscounted lifeline rate, minus (g) the cost of that electricity at the discounted rates
i) Average tariff for discounted electricity, calculated as (g)/(f)

Analysis

While I was in Bishkek, I had numerous meetings concerning billed energy (kWh) and commercial output (CO - the cost of that billed energy) versus sales (the cost of energy sold) [4] In spite of these discussions, I still do not know how a residential customer reports usage except when he is showing up to present a discount coupon and pay Nonetheless, some of the data received from Marketing appear to have been calculated from neither billings nor sales but from statutory usage of 150 kWh per month

Accordingly, one goal of the analysis that follows is to determine whether my calculations could plausibly represent either actual sales or billed data consistent with total residential billed data for the same company, or if they are unrealistically large compared to any data reported by the company In particular, this means that we do not know whether the calculation (g) of the value of total electricity at the discounted rates (which, for simplicity, I refer to as the "CO of discount customers") is actually the CO or the sales

[4] Note that the *amount* of energy sold is not readily derivable from the data we have obtained

65

From the calculations above, and further comparisons with marketing data for residential customers, I estimated

- Total electricity associated with discount customers, as a percentage of total billed residential electricity
- CO for discount customers, as a percentage of residential sales
- Average tariff for residential energy, based upon actual usage and sales [5]

Results

The results suggest that the calculations of revenues paid by, and discounts enjoyed by, the discount customers do not correspond to sales For most companies, the data comport reasonably well with billed data, but this may be an accident stemming from the fact that a relatively small percentage of residential customers receive discounts By contrast, for the two companies for which discount customers represent over 70% of residential customers, Jalal-Abad and Naryn, the results are anomalous

A striking outcome for almost all companies is that, while the hypothetical average tariff for discount customers comports well with the average tariff (based on billed revenues and billed energy) for residential customers (i e , it is about 25% less), the former is vastly higher than the average residential tariff as calculated from sales and used energy

A discussion of the results for each company follows For expository simplicity, I speak of electricity usage, sales, billings, etc for discount customers as if they were data, which is reported in a consistent manner with the data for residential and total customers Please bear in mind that the "data" for discount customers arise from a hypothetical situation that we adopted in the belief that it presents a stylized version of reality the monthly usage was believed to be realistic, and the percentage discounts were believed accurate Most importantly, we believed that the data employed by Kyrgyzenergo for each distribution company's discount customers (if these data could be separated from the totals for residential customers) are based upon statutory usage of 150 kWh per month, the same as employed in our calculations When the statistics for the discount customers do not comport with the corresponding statistics for residential and total customers, this suggests a number of possibilities

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[5] Since commercial losses are not broken out for residential customers, we have assumed that residential customers share of commercial losses is equal to their share of billed energy (This assumption relates energy stolen to energy reported At a later date, we may make an alternative assumption, for example, we might relate energy stolen to energy billed but not paid, i e , a different proportion of total commercial losses) Using this assumption, it is straightforward to estimate their used energy

- The data for non-discount customers are inaccurate
- The data for discount customers are not reported as we believed
- The reported data for discount customers are based upon statutory usage, but they are so different from reality as to impact statistics for total residential customers

In the course of preparing this study and follow-up studies, we hope to determine more clearly the causes of such inconsistencies

Statistical overview and study results for each distribution company

Note on calculations for Chu DC incorporating Kemin

Calculations for Chu DC were complicated, because some of the original data included Kemin, and some did not Specifically, there is marketing data (usage and revenue) for Chu separately, but no cost data In order to provide maximum information, I presented separate calculations for Kemin whenever possible, these calculations included average tariff Therefore, I had to calculate used energy for Chu in two ways, one including Kemin and one excluding Kemin, and use each of them differently The average tariff based upon sales and revenue is calculated separately for Chu and Kemin, using the individual value of used energy for each company However, profit based upon sales and used energy as shown for Chu utilizes a weighted average of the average tariffs for Chu and Kemin, which incorporates the sales and the used energy of both companies Accordingly, in contrast to the profits shown for the other distribution companies, the profit shown for Chu is not equal to its average tariff minus its unit cost Rather, the revenue component is a weighted average of the average tariff for Chu and the average tariff for Kemin Its value can be calculated as the unit profit for Chu plus the unit cost No profit figures are shown for Kemin

Chu DC

Normative (line) losses for Chu DC account for 21 30% of total electricity released to the network, while commercial losses account for 27 20% Of the remaining electricity, which is billed to customers, 83 39% of the billed revenues (CO) are collected (sales), although 76 18% of this is in barter

The unit cost, according to Kyrgyzenergo's calculations, was 10 4 tyiyn per (billed) kWh (for Chu and Kemin combined) and the average tariff was 12 2 tyiyn per (billed) kWh for Chu and 14 6 tyiyn per (billed) kWh for Kemin The resulting unit profit was 2 4 tyiyn per kWh for Chu and Kemin combined I estimated the cost for each kWh used as 5 9 tyiyn The average tariff based upon sales and used energy was 6 7 tyiyn per kWh for Chu and 8 0 tyiyn per kWh for Kemin The unit profit, reestimated in terms of sales and used energy, changed from 2 4 tyiyn per kWh to 0 6 tyiyn per kWh

Residential billed electricity represents 46 90% of the total, although the billed revenues are only 29 80% of the total, because of the lower tariff rates for residential customers Residential sales, which are entirely in cash, represent only 14 89% of total sales, reflecting both the lower rates for residential customers and the lower rate of collection of their bills Only 41 57% of billed residential revenues (residential CO) are collected, indicating that the problem of collections is far more severe for residential customers than for the company on average Kyrgyzenergo calculates the average residential tariff (based upon billed revenues and billed electricity) as 7 8 tyiyn per kWh However, the average residential tariff based upon sales and used energy equals only 2 1 tyiyn per kWh

Only 9 19% of the residential customers of Chu DC receive discounts, although 77 06% of those receive discounts of at least 50% on the first 150 kWh of electricity use each month Their average discount is 49 55% If each discount customer *bills for* exactly 150 kWh per month, as assumed, discount customers contribute 3 65% (in kWh) to billed residential electricity, which seems low The CO for discount customers is 5 99% of residential sales This is somewhat higher than would be expected if the discount customers actually used and paid for all the electricity imputed to them However, the CO for discount customers is only 2 49% of residential CO, because less than half of residential billed revenues are collected

Assuming that the CO for discount customers equals sales to discount customers, their average tariff is 5 3 tyiyn If this were true, the average residential tariff as calculated by Kyrgyzenergo (based upon billed revenues and billed electricity) would be inaccurate, since the true value would be a weighted average of 3 65% of total kWh at 5 3 tyiyn with 96 35% of total kWh at the undiscounted rate of 10 5 tyiyn

Bishkek DC

Normative (line) losses for Bishkek DC account for 11 90% of total electricity released to the network, while commercial losses account for 17 61% Of the remaining electricity, which is billed to customers, 97 13% of the billed revenues (CO) are collected (sales), although 67 05% of this is in barter

When profit is calculated based upon sales, rather than upon billed revenues, Bishkek is one of only two distribution companies that are profitable (although less profitable than it appears to be under Kyrgyzenergo's calculations) The unit cost, according to Kyrgyzenergo's calculations, was 7 3 tyiyn per (billed) kWh and the average tariff was 14 5 tyiyn per (billed) kWh The resulting unit profit was 7 2 tyiyn per kWh I estimated the cost for each kWh used as 5 4 tyiyn The average tariff based upon sales and used energy was 11 3 tyiyn per kWh The unit profit, reestimated in terms of sales and used energy, was 5 9 tyiyn per kWh

Residential billed electricity represents 32 71% of the total, although the billed revenues are only 17 60% of the total, because of the lower tariff rates for residential customers Residential sales, which are entirely in cash, represent only 13 33% of total sales, reflecting both the lower rates for residential customers and the lower rate of collection of their bills Only 73 59% of billed residential revenues (residential CO) are collected, indicating that there is a problem in collecting revenues from residential customers, although the company overall is unique among the distribution companies in having an excellent rate of collection Kyrgyzenergo calculates the average residential tariff (based upon billed revenues and billed electricity) as 7 8 tyiyn per kWh However, the average residential tariff based upon sales and used energy equals only 4 6 tyiyn per kWh

Only 7 60% of the residential customers of Bishkek DC receive discounts, although 81 46% of those receive discounts of at least 50% on the first 150 kWh of electricity use each month Their average discount is 46 51% If each discount customer *bills for* exactly 150 kWh per month, as assumed, discount customers contribute 9 18% (in kWh) to billed residential electricity, which seems high The CO for discount customers is 8 96% of residential sales This is somewhat higher than would be expected if the discount customers actually used and paid for all the electricity imputed to them However, the CO for discount customers is only 6 60% of residential CO, because less than 75% of residential billed revenues are collected

Assuming that the CO for discount customers equals sales to discount customers, their average tariff is 5 6 tyiyn per kWh If this were true, the average residential tariff of 7 8 tyiyn per kWh as calculated by Kyrgyzenergo (based upon billed revenues and billed electricity) would be too low, since the true value would be a weighted average of 9 18% of total kWh at 5 6 tyiyn with 90 82% of total kWh at the undiscounted rate of 10 5 tyiyn

Osh DC

Normative (line) losses for Osh DC account for 16 65% of total electricity released to the network, while commercial losses account for 27 79% Of the remaining electricity, which is billed to customers, 79 11% of the billed revenues (CO) are collected (sales), although 83 04% of this is in barter

The unit cost, according to Kyrgyzenergo's calculations, was 9 6 tyiyn per (billed) kWh and the average tariff was 9 3 tyiyn per (billed) kWh The resulting unit profit was - 0 3 tyiyn per kWh I estimated the cost for each kWh used as 5 8 tyiyn The average tariff based upon sales and used energy was 4 9 tyiyn per kWh The unit profit, reestimated in terms of sales and used energy, was - 8 tyiyn per kWh

Residential billed electricity represents 32 31% of the total, although the billed revenues are only 19 59% of the total, because of the lower tariff rates for residential customers Residential sales, which are entirely in cash, represent only 16 98% of total sales, reflecting both the lower rates for residential customers and the lower rate of collection of their bills Only 68 57% of billed residential revenues (residential CO) are collected, indicating that the problem of collections is more severe for residential customers than for the company on average Kyrgyzenergo calculates the average residential tariff (based upon billed revenues and billed electricity) as 5 6 tyiyn per kWh However, the average residential tariff based upon sales and used energy equals only 2 6 tyiyn per kWh

60 85% of the residential customers of Osh DC receive discounts, and 42 81% of those receive discounts of at least 50% on the first 150 kWh of electricity use each month Their average discount is 36 59% If each discount customer *bills for* exactly 150 kWh per month, as assumed, discount customers contribute 62 40% (in kWh) to billed residential electricity, which is realistic However, the CO for discount customers is 107 32% of residential sales, which
implies that the discount customers do not pay for all the electricity attributed to them by the statutory approach This result underscores our uncertainty concerning the interpretation of data for discount customers If the data are self-reported, we do not understand why they would report energy usage that they did not intend to pay for If the data are statutory, we recommend that a more realistic method be adopted for estimating the usage of discount customers

Assuming that the CO for discount customers represents billed (not necessarily paid) energy for discount customers, their average tariff (as would be calculated by Kyrgyzenergo) is 6 7 tyiyn per kWh This is completely unrealistic, as it exceeds the average residential tariff (per Kyrgyzenergo) of 5 6 tyiyn per kWh, which includes both discount and non-discount customers By contrast, the average residential tariff (including discount and non-discount customers) based upon sales and used energy is 2 6 tyiyn per kWh This discrepancy reflects the considerable proportion of billed energy that is not collected and the substantial commercial losses (used energy that is not even billed), given the high proportion of residential customers that receive discounts, it also suggests that many discount customers likewise do not pay for their billed energy

Jalal-Abad DC

Normative (line) losses for Jalal-Abad DC account for 25 61% of total electricity released to the network, while commercial losses account for 10 71% Of the remaining electricity, which is billed to customers, 78 11% of the billed revenues (CO) are collected, although 79 66% of this is in barter

The unit cost, according to Kyrgyzenergo's calculations, was 10 1 tyiyn per (billed) kWh and the average tariff was 10 6 tyiyn per (billed) kWh The resulting unit profit was 4 tyiyn per kWh (including rounding) I estimated the cost for each kWh used as 7 6 tyiyn The average tariff based upon sales and used energy was 7 1 tyiyn The unit profit, reestimated in terms of sales and used energy, was - 6 tyiyn per kWh (including rounding)

Residential billed electricity represents 36 25% of the total, although the billed revenues are only 19 13% of the total, because of the lower rates for residential customers Residential sales, which are entirely in cash, represent only 14 05% of total sales, reflecting both the lower rates for residential customers and the lower rate of collection of their bills Only 57 35% of billed residential revenues (residential CO) are collected, indicating that the problem of collections is far more severe for residential customers than for the company on average

Residential billed electricity represents 36 25% of the total, although the billed revenues are only 19 13% of the total, because of the lower tariff rates for residential customers Residential sales, which are entirely in cash, represent only 14 05% of total sales, reflecting both the lower rates for residential customers and the lower rate of collection of their bills Only 57 35% of billed residential revenues (residential CO) are collected, indicating that the problem of collections is far more severe for residential customers than for the company on average Kyrgyzenergo calculates the average residential tariff (based upon billed revenues and billed electricity) as 5 6 tyiyn per kWh However, the average residential tariff based upon sales and used energy equals only 2 7 tyiyn per kWh

70 48% of the residential customers of Jalal-Abad DC receive discounts, although the majority of those are low-income customers, who receive a 25% discount Only 38 89% of discount customers receive discounts of at least 50% on the first 150 kWh of electricity use each month The average discount of all discount customers is 35 80% If each discount customer *bills for* exactly 150 kWh per month, as assumed, discount customers contribute 46 83% kWh to billed residential electricity, which seems low On the other hand, the CO for discount customers is 98 85% of residential sales, despite the fact that discount customers pay lower rates This implies that the discount customers are

not paying for 150 kWh per month, whether or not they actually use that much The CO for discount customers is only 56 59% of residential CO, which is still high but accords better with the assumption that the discount customers" CO reflects billed energy rather than energy sales

Assuming, for sake of argument, that the CO for discount customers equals sales to discount customers, their average tariff is 6 7 tyiyn per kWh This is completely unrealistic, as it exceeds the average residential tariff of 5 6 tyiyn per kWh, which includes both discount and non-discount customers By contrast, the average residential tariff (including discount and non-discount customers) based upon sales and used energy is 2 7 tyiyn per kWh This discrepancy reflects the large proportion of billed energy that is not collected as well as a high percentage of commercial losses (used energy that is not even billed), given the high proportion of residential customers that receive discounts, it also suggests that many discount customers likewise do not pay for their billed energy

Issyk-Kul DC

Normative (line) losses for Issyk-Kul DC account for 24 41% of total electricity released to the network, while commercial losses account for only 7 55% Of the remaining electricity, which is billed to customers, 79 98% of the billed revenues (CO) are collected (sales), although 62 89% of this is in barter

The unit cost, according to Kyrgyzenergo's calculations, was 8 7 tyiyn per (billed) kWh and the average tariff was 11 0 tyiyn per (billed) kWh The resulting unit profit was 2 3 tyiyn per kWh I estimated the cost for each kWh used as 6 8 tyiyn The average tariff based upon sales and used energy was 7 9 tyiyn per kWh The unit profit, reestimated in terms of sales and used energy, was 1 1 tyiyn per kWh

Residential billed electricity represents 49 89% of the total, although the billed revenues are only 36 65% of the total, because of the lower tariff rates for residential customers Residential sales, which are entirely in cash, represent only 18 44% of total sales, reflecting both the lower rates for residential customers and the lower rate of collection of their bills Only 40 25% of billed residential revenues (residential CO) are collected, indicating that the problem of collections is far more severe for residential customers than for the company on average Kyrgyzenergo calculates the average residential tariff (based upon billed revenues and billed electricity) as 8 1 tyiyn per kWh However, the average residential tariff based upon sales and used energy equals only 2 9 tyiyn per kWh

15 72% of the residential customers of Issyk-Kul DC receive discounts, and 42 17% of those receive discounts of at least 50% on the first 150 kWh of electricity use each month Their average discount is 39 28% If each discount customer *bills for* exactly

150 kWh per month, as assumed, discount customers contribute 7 28% (in kWh) to billed residential electricity, which seems low The CO for discount customers is 14 23% of residential sales This is somewhat higher than would be expected if the discount customers actually used and paid for all the electricity imputed to them (in other words, if the CO for discount customers were actual sales) The CO for discount customers is only 5 73% of residential CO, since less than half of residential billed revenues are collected These results suggest that CO for discount customers lies between billed revenue and to sales In other words, discount customers, like most residential customers, tend not to pay their bills

Assuming, for sake of argument, that the CO for discount customers equals sales to discount customers, their average tariff is 6 4 tyiyn per kWh If this were true, the average residential tariff of 8 1 tyiyn per kWh as calculated by Kyrgyzenergo (based upon billed revenues and billed electricity) would appear to be too low, since the true value would be a weighted average of 7 28% of total kWh at 6 4 tyiyn with 92 72% of total kWh at the undiscounted rate of 10 5 tyiyn

Naryn DC

Normative (line) losses for Naryn DC account for 25 28% of total electricity released to the network, while commercial losses account for 6 18% Of the remaining electricity, which is billed to customers, only 74 72% of the billed revenues (CO) are collected, and 56 43% of this is in barter

The unit cost, according to Kyrgyzenergo's calculations, was 12 7 tyiyn per (billed) kWh and the average tariff was 9 2 tyiyn per (billed) kWh The resulting unit profit was -3 5 tyiyn per kWh I estimated the cost for each kWh used as 10 6 tyiyn The average tariff based upon sales and used energy was 6 3 tyiyn per kWh The unit profit, reestimated in terms of sales and used energy, was -4 3 tyiyn per kWh

Residential billed electricity represents 51 77% of the total, although the billed revenues are only 25 99% of the total, because of the lower tariff rates for residential customers Residential sales, which are entirely in cash, represent only 5 83% of total sales, reflecting both the lower rates for residential customers and the lower rate of collection of their bills Only 16 77% of billed residential revenues (residential CO) are collected, indicating that the problem of collections is far more severe for residential customers than for the company on average Kyrgyzenergo calculates the average residential tariff (based upon billed revenues and billed electricity) as 4 6 tyiyn per kWh However, the average residential tariff based upon sales and used energy equals only 7 tyiyn per kWh

Naryn DC is unique in that 100% of its residential customers receive discounts

Accordingly, we can directly compare and contrast our estimates for the statutory usage with the data provided by Kyrgyzenergo 98 83% of the residential customers receive discounts of at least 50% on the first 150 kWh of electricity use each month (The overwhelming majority of Naryn's discount customers are mountain residents, who receive discounts of 50%) The average discount of discount customers is 50 22%

If each discount customer *bills for* exactly 150 kWh per month, as assumed, discount customers contribute 32 71% (in kWh) to billed residential electricity However, since all residential customers are discount customers, they must bill for *all* billed residential energy Our study considers only the first 150 kWh, to which the discounts apply, however, for the figures reported by Kyrgyzenergo to be accurate, the residential customers must be using at least 450 kWh per month, on average, which seems too high On the other hand, the CO (revenues) that we estimate for discount customers is 221 87% of residential sales, indicating that this estimate cannot possibly represent energy sales The CO for discount customers is only 37 20% of residential CO, because only a small percentage of residential billed revenues are collected We conclude that the hypothetical revenues we ascribe to discount customers, for the usage of 150 kWh per month, lies between the billed revenues and sales Taking 150 kWh as a reasonable benchmark, however, we are skeptical of the energy, billed revenues (CO) and sales reported by Kyrgyzenergo

If the CO for discount customers equaled sales to discount customers, their average tariff would be 5 2 tyiyn Since all residential customers are discount customers, this calculation can be compared directly with the average residential tariff of 4 6 tyiyn per kWh as calculated by Kyrgyzenergo The latter is implausible the only 1 03% of Naryn residential customers have discounts of 100% 97 80% enjoy discounts of 50% on at least 150 kWh per month[6], and only 1 17% receive discounts of 25% The average tariff should be at least half of 10 5 tyiyn, or 5 25 tyiyn, per kWh On the other hand, Naryn DC's average residential tariff based upon sales and used energy is only 71 tyiyn per kWh, reflecting the inability of Naryn DC to collect its billed revenues Since all residential customers of Naryn DC are discount customers, the conclusion to be drawn from our investigations is that discount revenues represent billings, whether collected or not, and that many discount customers do not pay their bills

6 As stated earlier, I believe that energy sector employees receive a 50% discount across the board, while customers in the other 50% categories receive the discount on only the first 150 kWh

Kemin DC

Normative (line) losses for Kemin DC account for 20 21% of total electricity released to the network, while commercial losses account for 28 63% Of the remaining electricity, which is billed to customers, 85 20% of the billed revenues (CO) are collected, although 77 51% of this is in barter

Unit costs for Kemin were not provided by Kyrgyzenergo, cost and profit calculations were performed for Chu and Kemin combined They are presented under Chu DC The average tariff, according to Kyrgyzenergo's calculations, was 14 6 tyiyn per (billed) kWh The average tariff based upon sales and used energy was 8 0 tyiyn per kWh

Residential billed electricity represents 30 36% of the total, although the billed revenues are only 16 85% of the total, because of the lower tariff rates for residential customers Residential sales, which are entirely in cash, represent 16 38% of total sales, reflecting the similar collection rates for residential customers and total Kemin customers 82 86% of billed residential revenues (residential CO) are collected, indicating that there is a problem in collecting revenues from all customers, although far lower than the problem in other distribution companies Kyrgyzenergo calculates the average residential tariff (based upon billed revenues and billed electricity) as 14 6 tyiyn per kWh However, the average residential tariff based upon sales and used energy equals only 8 0 tyiyn per kWh

Only 9 62% of the residential customers of Kemin DC receive discounts, and 64 33% of those receive discounts of at least 50% on the first 150 kWh of electricity use each month Their average discount is 50 48% If each discount customer *bills for* exactly 150 kWh per month, as assumed, discount customers contribute 8 01% (in kWh) to billed residential electricity, which is realistic The CO for discount customers is 5 16% of residential CO (billed revenues), which is reasonable if the CO for discount customers represents the total billed revenues (rather than paid revenues, which are, presumably, lower) The CO for discount customers is 6 23% of residential sales This is somewhat higher than would be expected if the CO for discount customers represents paid revenues, because the average discount is over 50% and most (82 86%) of residential billed revenues are collected

The average tariff for discount customers is 5 2 tyiyn per kWh, assuming that the imputed electricity usage is realistic If it were, however, the average residential tariff of 8 1 tyiyn per kWh as calculated by Kyrgyzenergo (based upon billed revenues and billed electricity) would be too low, since the true value would be a weighted average of 8 01% of total kWh at 5 2 tyiyn with 91 99% of total kWh at the undiscounted rate of 10 5 tyiyn

Talas DC

Normative (line) losses for Chu DC account for 20 00% of total electricity released to the network, while commercial losses account for 17 16% Of the remaining electricity, which is billed to customers, only 48 64% of the billed revenues (CO) are collected, of which 60 61% is in barter

The unit cost, according to Kyrgyzenergo's calculations, was 10 4 tyiyn per (billed) kWh and the average tariff was 10 5 tyiyn per (billed) kWh The resulting unit profit was 1 tyiyn per kWh I estimated the cost for each kWh used as 7 4 tyiyn The average tariff based upon sales and used energy was 4 0 tyiyn per kWh The unit profit, reestimated in terms of sales and used energy, was -3 4 tyiyn per kWh

Residential billed electricity represents 64 81% of the total, although the billed revenues are only 46 71% of the total, because of the lower tariff rates for residential customers Residential sales, which are entirely in cash, represent only 30 01% of total sales, reflecting both the lower rates for residential customers and the lower rate of collection of their bills Only 31 25% of billed residential revenues (residential CO) are collected, indicating that the problem of collections is even more severe for residential customers than for the company on average Kyrgyzenergo calculates the average residential tariff (based upon billed revenues and billed electricity) as 7 6 tyiyn per kWh However, the average residential tariff based upon sales and used energy equals only 1 9 tyiyn per kWh

Only 11 96% of the residential customers of Talas DC receive discounts, and 40 00% of them receive discounts of at least 50% on the first 150 kWh of electricity use each month Their average discount is 37 79% If each discount customer *bills for* exactly 150 kWh per month, as assumed, discount customers contribute 5 23% (in kWh) to billed residential electricity, which is lower than expected The CO for discount customers is 14 42% of residential sales but only 4 51% of residential CO These percentages make sense if the CO for discount customers corresponded to sales, because less than one-third of residential billed revenues are collected

Assuming that the CO for discount customers equals sales to discount customers, the average tariff is 6 5 tyiyn If this were true, the average tariff as calculated by Kyrgyzenergo (based upon billed revenues and billed electricity) for residential customers overall would be too low, since the true value would be a weighted average of 5 23% of total kWh at 6 5 tyiyn with 94 77% of total kWh at the undiscounted rate of 10 5 tyiyn

Data and definitions used in this study

The data and the calculations in this study that I regard as important include the following The titles shown correspond to row headings

Losses

- Normative or technical losses The table shows the total and technical losses estimated by the company Although engineers assert that an electric power system cannot function reliably if technical (line) losses exceed 15%, we see that only Bishkek DC has losses lower than 15%

- Commercial losses This is the difference between total losses and normative losses It represents the energy that is used but not accounted for (even as unpaid accounts receivable) Commercial losses are believed to be caused by theft of electricity from the system Only Naryn and Issyk-Kul have commercial losses below 10%, and they have normative losses above 24% They and Bishkek DC have the lowest total losses, ranging from 29-32%

Billed energy

Recall that this is the energy that is attributed (for billing purposes) to particular customers For industrial and commercial customers, it is recorded from meters For residential customers, it may also be read from meters, or it may be self-reported by the customer

Used energy

Recall that this is the energy that is actually used by customers, whether billed or not It equals the total energy released to the network, less the line losses Equivalently, it equals the energy billed plus the energy stolen (commercial losses) This is calculated directly from Kyrgyzenergo data

Commercial output (CO)

Recall that this is the value (at the average tariff) of billed energy

Sales

- Sales as percentage of CO This represents the ability of the company to collect its billed revenues This ranges from a low of 49% for Talas DC to a high of 97% for Bishkek DC

- Residential sales as % of Residential CO For each DC, this percentage is significantly lower than that for the company overall, showing that it is harder to collect revenues from residential customers than from industrial and commercial customers This seems surprising, because some of residential energy usage is self-reported (and potentially underreported) It is hard to imagine that a customer would report energy usage if he did not intend to pay for it We think this way because have been assuming that the amount of residential energy usage reported by meter readers is low compared to the amount that is self-reported Perhaps this is not the case we should investigate

- Sales, barter Barter accounts for more than half of every company's sales We should investigate the nature of barter goods and the accuracy with which their value is reported

Average tariff

-
- Average tariff, residential This is the same calculation as above, based upon Co and billed energy for residential customers, as reported by the Marketing Department

The attached tables

I have printed out a spreadsheet containing the data referenced in this memorandum As backup, I have also included spreadsheets corresponding to two alternative hypothetical cases

Case 1 Total losses are as reported by Kyrgyzenergo, technical losses are 12% In this case, commercial losses are higher than reported by Kyrgyzenergo This implies that used energy is higher Accordingly the average tariff based upon sales and used energy is lower than in the base case, and the company is less profitable

Case 2 Technical losses are 12% and commercial losses are 2% This represents the case in which management has successfully dealt with the problem of nonpayment In this case, all distribution companies except Naryn are profitable, and Naryn is close to showing a profit

Conclusions and recommendations

In view of these results, the tariff should be raised

As you know, I have not investigated Kyrgyzenergo's cost data in any great detail Nonetheless, I have received operating cost data from Mr Oukoulov and tax data from Mrs Rejich The following comments are conjectures, based upon general knowledge and limited specific experience When the issue of raising tariffs is addressed practically, a careful review of company costs will be essential

First, if commercial losses and/or technical losses were reduced and collections increased, as in the second alternative scenario, perhaps the enterprises would be profitable Our results show that, after the effect of three types of leakage (lost in transmission, used but not reported, and reported but not paid for), the amount of money paid by the people who pay is insufficient to cover costs If more people pay the same average amount of money for the same amount of used energy, more money will be collected This outcome would be preferable to increasing the rates

Second, the profits per kWh in the table have to be meet financial needs of the distribution company that go beyond merely covering its operating costs This model does not explicitly take account of either taxes or debt, let alone any dividends to investors I think that the expenses in the model are consistent with the data provided by Mr Oukoulov If so, they may include some tax components but not all of them, and they do not include taxes paid centrally

Finally, the actual numbers shown in these tables, even if the calculations are completely accurate, do not represent the situation that will obtain after privatization This is so because, as far as I can tell, the generation cost of CO reflected in these data are the average cost estimated by Kyrgyzenergo, without markups One of the activities that will be required as part of the privatization process will be the establishment of wholesale tariffs Even before privatization, an efficient internal transfer price should at least provide a return on investment for the generating and transmission companies As far as I know, the cost included in this model does not

I hope that the analysis presented in this memorandum will be a useful tool to the Government of Kyrgyzstan, the management of Kyrgyzenergo, and potential investors in the privatization process The results are unlikely to change substantively as the data and the methods are refined From the spreadsheets that underlie the present analysis, we can develop use-friendly models, in which the user can vary key parameters to determine the profitability of each distribution company [7] While the model is being developed (and

[7] One example is the setting of target levels for collection of billed revenues from residential customers and total customers Another example is the evaluation of wholesale prices for electricity, this price is a policy variable for Kyrgyzenergo and a state variable to each distribution company

before it is user-friendly), we can use it internally to advise the Government Accordingly, I think that the Government should be made aware of the development of this model and encouraged to promote both the model and the privatization effort

DRAFT MEMO

DATE December 8, 1997

TO. Joellyn Murphy
Avtandil Kalmanbetov

FROM· Linda Kalver

SUBJECT Comments on the Financial Model developed by State Energy Agency

I have reviewed the financial model developed by the State Energy Agency and documented in the report, "Financial Model of Restructuring of JSC 'Kyrgyzenergo'", dated November 21, 1997 I have some comments and questions concerning some of the concepts, the data, and the methodology employed I hope to meet with Ms Shigaibaeva today or tomorrow to discuss these matters

General Questions and Comments

Data

The data on which the forecasts are based are said to come from the document, "Foundation of Policy on Tariffs for Electricity and Thermal Energy for the Period of 1997-2000"

1 Do you mean both the actual data and the forecasts, or did SEA perform its own forecast?

2 If possible, please provide the most recent year of actual data that went into the forecast, in the same format as Annex 7

3 Is this data from 1996 or 1997? If 1997, how much actual data was included? How were the annual totals estimated?

Tariffs used in forecast

1 These tariffs are based upon the principle of "fair prices" Were the levels of the tariffs for each customer class determined by SEA or by Kyrgyzenergo, or by another party?

2 Did you run the model with other tariff levels that satisfied the principle of "fair prices"? If so, what results did you find?

Specific Questions and Comments

These questions refer to the text of the report and the annexes to the report The text is referenced by page number Data in the annexes are referenced by section number (in Roman numerals) and/or column number (in Arabic numerals)

Questions about the Text

1 The data on page 2 of the text are graphically represented in Annex 1 I compared these data with the data for Kyrgyzenergo in column 5 of Annex 7 Why is the total production (I) projected for 1998 less than that for 1997?

2 Is the source of data for accounts receivable by customer class (middle of page 2) the marketing department of Kyrgyzenergo?

3 In setting tariffs, did you take account of the higher rates of amortization that you project for 1998 and 1999?

4 On page 4, "Results of the 1st stage", #3, refers to the cost of distribution and sales of energy in regional companies Please confirm that these are the "auxiliary costs", which appears in Annex 7 (XI) For all regional companies (column 11), the cost for electric energy matches the value in the text However, for every distribution company (columns 6-10), the costs associated with thermal power are zero, accordingly, the sum (column 11) is also zero Please explain this discrepancy

5 On page 4, "Results of the 1st stage", #4, refers to the profits of distribution companies, which appears in Annex 7 (XIV) For all regional companies (column 11), the profits for electric energy are close to the value in the text, although it does not match exactly However, for every distribution company (columns 6-10), the profits associated with thermal power are zero, accordingly, the sum (column 11) is also zero Please explain this discrepancy

6 On page 4, "Results of the 1st stage", #6, refers to profitability, which appears in Annex 7 (XIV) (My questions about the concept and the calculation of profitability appears in the next section, Questions about Annex 7) The definition of profitability that you use appears to be Profits (XIV) divided by Auxiliary Costs (XI) However, under that definition, the profitability of 600720 ksom would be more than 22%, not 20% as stated Please explain this discrepancy

7 On page 5, "Aims of the Second Stage" are presented Is there a plan for achieving these aims? Please provide any documentation that exists

8 Section 5 says that consortia who invest in new construction "should be able to export 100% of produced energy at contract prices" (page 9) Does this mean that all new construction is expected to be used exclusively to generate electricity for export, or merely that it may be used exclusively for this purpose? In either case, it does not appear beneficial to the Kyrgyz economy to provide tax exemptions and other financial incentives to investors who (a) will make high profits from exporting electricity, (b) will compete with state-owned generation for the profitable export market, and (c) will not be required to help Kyrgyzstan satisfy its domestic demand for energy (at lower prices)

9 Section 6 says that the difference between "real cost" and the discount price are compensated from the republican and local budgets (for 13% of discount customers) and from JSC Kyrgyzenergo funds (for 87% of discount customers) (page 10) (a) Does this mean, literally, that the distribution companies receive cash payments from the aforementioned to compensate for the lower rates paid by the discount customers? Does this occur at present, or will this compensation be paid only to private investors? (b) Is the amount of compensation equal to only the difference between the cost of production and the discount tariff, without any allowance for profit?

Questions about Annex 7 - 1998 Projections

1 What are auxiliaries? (II) Only Kyrgyzenergo has them

2 What are auxiliary costs? (XI) (Total electric power cost is defined to equal auxiliary costs plus power purchase costs)

3 Why is profitability measured as a percentage of auxiliary costs?

4 What is meant by "shortage of useful energy supply"? (IV)

5 Assuming that all cost figures are correct, I have measured gross profit (XIV) as Paid commercial output (XV) minus Total costs (XI), rather than as Electric power sales (X) minus Total costs Under this measurement, all distribution companies (columns 6-10) except Bishkek (column 10) show a loss The total for the regional distribution companies (column 11) shows a loss

6 I compared the cost per kWh (XII) with the tariffs (VIII), and I observed that in each regional company (columns 6-10) the industrial customers are subsidizing the residential customers In Bishkek (column 10), they are subsidizing the agricultural customers as well

7 The residential income (X) is based upon residential supply (V) and the full tariff of 17 tyiyn (VIII), because the discounts for discount customers are to be paid from a central fund a) For each regional distribution company, please provide any estimates that have been made of the number of discount customers by discount category, the number of kWh to which discounts apply, the value of the discounts (ksom), or any other relevant data b) Will discount customers be required to pay the full tariff and be reimbursed by the fund? Will distribution companies charge discount customers the discounted rates and recover the difference from the fund? If neither of these, by what mechanism will the discounts be administered?

8 For each regional distribution company, please confirm that paid commercial output is based upon revenue or barter that is actually collected Is the difference between paid commercial output and "income" (X) completely accounted for by non-payments? If not, please explain the difference

MEMO

DATE December 10, 1997

TO. Joellyn Murphy
Aytandil Kalmanbetov
Marat Iskakov
Leszek Kasprowicz

FROM· Linda Kalver

SUBJECT: State Energy Agency Financial Model

These are my comments on the State Energy Agency Financial Model (SEA model) They reflect information received at the meeting Messrs Iskakov and Kasprowicz and I attended at the Agency yesterday afternoon Mr Arstand, Ms Shigaibaeva, and Ms Junusalieva of the Financial and Economic Department discussed the model What I call the State Energy Agency Financial Model is actually the product of a working group, representing SEA, the State Property Fund, Kyrgyzenergo, and the Ministry of Finance

General comments

I have no firsthand knowledge of Kyrgyzenergo's accounting systems However, I have dealt with numerous reports from several departments of Kyrgyzenergo, as well as related reports (such as the Form 1, which reports the value of assets, which I received from the State Property Fund), and I have found them to be generally consistent My concern is, rather, with the interpretation of the data SEA, consistently with Kyrgyzenergo, calculates statistics that are not found in Western financial reports and employs these statistics in a manner that are likely to mislead potential investors

We discussed and documented these issues in detail in October, when I was developing the USAID/Hagler Bailly model The SEA model incorporates the same elements of concern

In contrast to Western financial reporting, Kyrgyzenergo focuses on billed revenues, rather than on revenue collected (sales, in Western usage) They have, at various times, applied the word "sales" both to billed revenues and to collected revenues This is particularly vexatious in view of their difficulty in collecting the revenues owed to them (i e , their large accounts receivable) In addition to energy that is reported, billed, but not paid for, a substantial amount of energy is lost to line losses and commercial losses (theft) Therefore, the energy that is paid for must cover the cost of all energy produced, including the losses and the uncollected billed energy The calculations favored by Kyrgyzenergo obscure these considerations

In estimating profit, Kyrgyzenergo measures the revenue component by Commercial Output, i e , the billings for energy Moreover, they calculate "profitability" as the amount of profit divided by those costs other than the cost of purchasing electricity At present, energy is not purchased by the distribution companies, but SEA's forecasts for 1998 (after unbundling and, possibly, privatization of the distribution companies) also calculate profitability this way Since electricity purchase will constitute a large proportion of the distribution companies' costs, this calculation greatly distorts the "profitability" in the Western sense

Source of data, assumptions, and forecasts

According to SEA, the historical data and the forecast values used in the model came from Kyrgyzenergo, although there may be a few differences, where SEA disagrees with KE The assumptions are taken from the Tariff Policy The SEA model includes tariff levels, in addition to average tariffs, but I could not find the value of tariff levels in the Tariff Policy

MEMO

DATE: December 16, 1997

TO: Joellyn Murphy

FROM: Linda Kalver

SUBJECT: Results of Financial Model

Purpose of this memorandum

This memorandum summarizes the results of the Technical and Financial Model that I have been developing since October Its primary purpose is to discuss the way in which Kyrgyzenergo assess its profitability, and to contrast it with the analysis that would be performed in the West The key concepts include

(a) Kyrgyzenergo's definition of profit is based upon billed revenues, whether or not the money is eventually paid Obviously, this inflates the measurement of profit that they report

(b) Kyrgyzenergo uses the word "sales", on various occasions, to refer to both billed revenue (whether or not it is paid) and paid revenue (i e , the Western concept of sales)

(c) Kyrgyzenergo defines profitability as the ratio of profit (according to its own definition, (a)) to costs *other than purchased energy* In other words, it calculates profitability as the ratio of an inflated estimate of profit to a fraction of its total costs

All these measurements, if interpreted in the conventional Western manner, seriously overstate the financial health of Kyrgyzenergo The accompanying tables, which are outputs of the model, present Kyrgyzenergo's calculations, together with alternative calculations that are more consistent with Western standards of accounting and finance

Differences between the present memorandum and draft memo of October 29, 1997, *Technical and Financial Model of Kyrgyzenergo Preliminary Results*

In my memorandum of October 29, 1997, I presented detailed results, by distribution company These results are shown in the table, however, for the present purpose, I did not discuss the distribution companies individually In addition, the early version of the model included estimates of the billed revenues and the amount of discount associated with the residential discount categories We found the results inconsistent with the data for total residential customers, because, for several of the distribution companies, the billed revenues for total residential customers (which were provided by Kyrgyzenergo) were less than the estimated billings for only the discount customers We have concluded that, at this time, we lack sufficient understanding of the way in which Kyrgyzenergo measures the usage, billings, and sales associated with discount customers to make

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meaningful estimates of our own Accordingly, the second table attached to this memorandum presents data received from the Marketing Department of Kyrgyzenergo, summarizing the numbers of customers by category, including the discount customers In addition, it present simple statistical summaries of the data

Data used in this study

The data used in this study came from Kyrgyzenergo With the exception of the cost data, the data were taken and/or calculated from reports provided by Miss Ifimenka, Head of the Marketing Department These reports are the only source that I am aware of for detailed data about residential customers Since the Marketing Department provided no cost data, the cost data were taken from the Kyrgyzenergo report, *Technical and Economic Indices and Financial Results of Kyrgyzenergo* The latter report is the source of data for the State Energy Agency's financial model, and its data on energy is similar, but not identical, to the data I have used Although I would prefer to be completely consistent with the SEA model, I felt that I could make the most effective use of the residential data by employing billing and sales data (i e , energy-related data) from the same marketing reports that yielded the customer data

Definitions used in this study

Losses

- Normative or technical losses The table shows the total and technical losses estimated by the company Although engineers assert that an electric power system cannot function reliably if technical (line) losses exceed 15%, the Marketing Department data show that only Bishkek DC has losses below 15%

- Commercial losses This is the difference between total losses and normative losses It represents the energy that is used but not accounted for (even as unpaid accounts receivable) Commercial losses are believed to be caused by theft of electricity from the system Only Naryn and Issyk-Kul have commercial losses below 10%, and they have normative losses above 24% They and Bishkek DC have the lowest total losses, ranging from 29-32%

Billed energy

This is the energy that is attributed (for billing purposes) to particular customers For industrial and commercial customers, it is recorded from meters For residential customers, it may also be read from meters, or it may be self-reported by the customer

Used energy

This is the energy that is actually used by customers, whether billed or not It equals the total energy released to the network, less the line losses Equivalently, it equals the energy billed plus the energy stolen (commercial losses) Used energy is calculated directly from data in the Marketing Department reports

To estimate used energy for residential customers, we have assumed that the technical losses are divided among residential customers and non-residential customers in proportion to their billed energy

Average tariff

Kyrgyzenergo calculates the average tariff (tyiyn per kWh) as the ratio of billed revenues to the corresponding billed energy Both the numerator and the denominator are misleading indicators for two reasons First, much of the billed revenues are not collected, therefore, they do not contribute to covering the company's costs Second, the energy used by customers includes a great deal of electricity that is not reported and, therefore, not billed This electricity is included in estimated losses as "commercial losses" However, any realistic estimate of total costs must include the cost of producing the electricity lost as well as the electricity billed

Accordingly, we have introduced the "average tariff based upon sales and used energy" This is calculated as the ratio of electricity sales (i e , revenue collected) to "used energy", defined as billed energy plus the commercial losses Used energy is the energy produced for potential sale, whose cost must be covered by the revenues collected For each distribution company, the average tariff based upon sales and used energy is significantly lower than the average tariff calculated by Kyrgyzenergo, usually half or less

The residential average tariff is calculated in the same way, based upon the billings and the billed energy for residential customers The residential "average tariff based upon sales and used energy" is, likewise, calculated from the sales and used energy for residential customers

Commercial output (CO), or billed revenue

This is the monetary value of the billed energy, evaluated at the average tariff

Sales

- Sales as a percentage of CO This represents the ability of the company to collect its billed revenues The values range from a low of 49% for Talas to a high of 97% for Bishkek DC

- Residential sales as a percentage of residential CO For each distribution company, this percentage is significantly lower than for the company overall, showing that it is harder to collect revenues from residential customers than from industrial and commercial customers This seems surprising, because some of residential energy usage is self-reported and would appear to have greater potential to be underreported

- Sales, barter Barter accounts for more than half of every company's sales

We expect the present investigations of billing and collections will clarify some of the issues concerning sales

Profit

Kyrgyzenergo calculates the profit of each company by comparing the billed revenues to the total (operating) costs, by this measure it asserts that every distribution company except Naryn and Osh is making a profit By Western standards, however, only the paid revenues (i e , sales) count toward profitability By this standard, only Bishkek and Issyk-Kul are profitable

Kyrgyzenergo expresses profit per unit of billed energy it compares the average tariff (based upon billed revenues) to the (total) cost of generation, transmission, and distribution expressed per billed kWh Correspondingly, we have calculated profit per kWh of used energy This calculation lowers the perceived cost per unit, but, in all cases, by less than the recalculated average tariff lowers the revenue per unit

The use of "unit" profitability is merely an expository device Profitability occurs if, and only if, the total revenue covers the total costs Our recalculation does not change the total costs, it changes the total revenue used in determining profit The fallacy in Kyrgyzenergo's calculations lies in the fact that, even when the official tariff rates cover the cost of one kWh, many kWh are used but not paid for

Conclusions

The analysis discussed in this memorandum shows that most of the distribution companies are not now profitable However, when the model assumptions are varied to reflect decreased losses and/or increased ability to collect billed revenue, the companies become quite profitable

At the present time, we have not undertaken an investigation of costs It is possible that we will identify ways in which profitability can be increased through a decrease in costs

MEMO

DATE: January 4, 1998

TO Joellyn Murphy

FROM: Linda Kalver

SUBJECT: Exports

As we discussed while I was in Bishkek, it appears that Kyrgyzenergo's standard financial reports overestimate the profitability of exports This is so because the costs associated with exports are only the generation costs No technical losses or transmission costs are attributed to exports Accordingly, the profits from exports are overstated, while the profits from domestic transactions are understated by the same (total) amount

When we examine detailed cost data for generation and transmission, as we plan to do, we will estimate a realistic apportionment of costs to exports

We hope to develop a more realistic analysis of the profits derived from exports This analysis is necessary, in general, for setting cost-based tariffs for each customer class and, in particular, for determining policy concerning exports

MEMO

DATE January 4, 1998

TO· Joellyn Murphy

FROM Linda Kalver

SUBJECT. Accounts receivable

As we discussed while I was in Bishkek, it is impossible to assess accurately the prospects for profitability of the electric power sector without an understanding of Kyrgyzenergo's accounts receivable Accounts receivable arise from the billed revenues (commercial output) that is not actually received as revenue We are interested in knowing which customer classes are more, and which less, disposed to pay their bills Equally important is the length of time it takes each class, on average, to pay

I have seen various reports of accounts receivable, some provided directly by Miss Ifimenka, Head of the Marketing Department of Kyrgyzenergo, and others from Mr Kalmanbetov (the original source of which I do not know) I conclude that the available data may provide some disaggregation by classes but do not offer any information concerning the length of time between billing and payment The calculations in Kyrgyzenergo's reports relate the balance in accounts receivable to the corresponding amount of billed revenue Although Kyrgyzenergo measures accounts receivable in "equivalent days", this phrase means "the number of days' billings", the value equals the balance in accounts receivable divided by one year's billings, multiplied by 365 It has nothing to do with the length of time these bills have gone unpaid

For example, suppose that 90% of all customers pay their bills immediately, and 10% pay their bills exactly one month later Then the amount in accounts receivable is 1/12 of 10% of one year's billings, and the equivalent number of days is 3 04 (10*1/12*365) The average age of accounts receivable is 1/2 month Suppose, instead, that 95% of all customers pay immediately, while 5% pay exactly 2 months later In this case, the amount in accounts receivable is the same, 1/12 of 10% of annual billed revenues (5% from current month and 5% from previous month) However, the percentage of bills that are paid immediately has risen from 90% to 95% while, on the other hand, the length of time to collect bills that are not paid has increased The average age of accounts receivable is now 1 month In other words, Kyrgyzenergo's measure (equivalent days) is unchanged, but bills remain unpaid longer

I am trying to obtain data that indicates the length of time that bills remain unpaid, such data would have to be developed from individual customer records, although we would require only data that was completely anonymous and, to a considerable extent, summarized

Matt Chwalowski has been studying the billing and collection system of Kyrgyzenergo I hope that he will be able to provide some guidance concerning the availability (or the possibility of collecting) the data needed for this analysis

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MEMO

DATE· January 7, 1998

TO. Joellyn Murphy

FROM: Linda Kalver

SUBJECT Model runs under hypothetical assumptions

I have completed two hypothetical model runs that we discussed before I left Bishkek These runs, and the associated base case of each, are attached to this memo

Commercial assumptions Technical losses at 12%, financial losses at 2%, and collection of billed revenues is 95%

The base case is "our model", the one we presented to SEA Actual data are based upon 1996 When we changed the assumptions to reflect more aggressive management policy, not surprisingly, all distribution companies showed a profit (both "their way" and ours) Nonetheless, residential customers were still unprofitable

Assumptions governing the commercial case

- o Same average tariffs (total and residential) as in 1996 This reflects an unchanging customer mix
- o The ratio of billed residential energy to total billed energy is unchanged
- o The mix of sales -- barter, cash, residential -- is unchanged

(Note that one obvious consequence of these assumptions is that residential sales, as a proportion of residential CO, increases)

Assumptions about the discount The government does not reimburse the distribution companies for the discounts enjoyed by some of the residential customers

The base case is the SEA model for 1998 This is so because, through 1997, the distribution companies were not reimbursed for the discounts, the average tariff, CO, and all calculations of profits assume that the discount customers were billed at their discounted rates Beginning in 1998, however, the distribution companies are expected to receive the full tariff for each residential customer, with the government providing the amount of the discounts enjoyed by the discount customers

Assumptions governing the case in which the discounts are not reimbursed

- Each residential customer has the same usage Therefore, the amount of the discount can be estimated from the marketing data on the number of customers in each discount category [1]
- The billed revenues incorporate the discounts
- The amount of sales received in barter is unchanged, since these revenues are received from customers other than residential [2]

As a consequence, most of the distribution companies (and the total) become unprofitable by Kyrgyzenergo's calculations, and all are unprofitable by Hagler Bailly's calculations

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1 The CO, without deducting the discount, is estimated as SEA's forecast of billed residential energy, multiplied by the average residential tariff, 17 tyiyn per kwh The discount is estimated as a percentage of residential CO (% of customers at 100% discount*100%) + (% of customers at 50% discount*50%) + (% of customers at 25% discount*25%), which is subtracted from residential CO to yield the CO (billed revenue) in this case

2 This is what I have been told In fact, the residential sales for Oshenergo in 1996 were slightly higher than the cash sales (17,652 vs 17,635 ksom) I suppose these are the residential customers who pay with sheep or sugar

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MEMO

DATE February 17, 1998

TO Joellyn Murphy

FROM Linda Kalver

SUBJECT: Further results in the technical and financial model

After our telephone conversation yesterday, I revisited the model Beginning with the file I sent you, SEACOMM WK3, I incorporated the assumptions we discussed, and I produced a new workbook, SEACOML WK3, which is attached to this e-mail

Description of worksheets

- A Disaggregated data, for the eight existing distribution companies Not relevant to the analysis
- B The commercial case, under the desired assumptions
- C The base case, as presented to Kyrgyzenergo and SEA in December
- D The revised base case, consistent with the assumption that all commercial losses are associated with residential customers
- E A summary sheet of the average revenues, under various algorithms, for residential and overall

Assumptions you intended to incorporate in our analysis

- All commercial losses are attributed to residential customers
- In the commercial scenario, in which 95% of billings are collected, 95% of all residential and 95% of all non-residential billings, respectively, are collected, as sales

Base case assumptions as presented to Kyrgyzenergo and SEA

- Commercial losses are distributed to residential and non-residential customers in proportion to their billed energy

Commercial assumptions used previously

- 95% of total billings are collected, as sales
- Residential sales (ksom) as a percentage of total sales is the same as in 1996

The attached workbook presents the results of the revised assumptions

Implications for base case

Sheet C replicates the base case we present in December, which is the base case of SEACOMM WK3 Sheet D is a revised base case, in which all commercial losses are attributed to the residential customers There is no change in the average tariff (residential or total) as calculated by Kyrgyzenergo, because it is based upon billed energy The average realized tariff overall is unchanged, because it is based upon received revenues and total used energy (billed energy plus commercial losses), which are unchanged However, the average realized residential tariff decreases, because the used energy for residential customers has increased it is equal to the billed residential energy plus all (rather than a portion of) the commercial losses Therefore, the average realized residential tariff (residential sales divided by residential used energy) decreases

Implications for commercial case

The present results are the ones that you want to see The residential average tariff has countervailing influences, as compared to the earlier estimates the used energy has increased, leading to a decrease in average realized tariff, but the rate of collection of billings has increased The net result has been a dramatic increase in the realized average residential tariff

Comments

- In the commercial case, the average tariff, as calculated by Kyrgyzenergo, is the same for each distribution company as in the base case and the revised base case This is as is should be However, the total (column G) differs in the third place from the two base cases, it appears to be roundoff error

- As theft decreases, the the average realized tariff increases The maximum that this value could take (under the sort of analysis we are performing) is the average tariff as calculated by Kyrgyzenergo For the residential customers, this is considerably under the statutory tariff of 12 som/kwh (discounted) However, without heroic assumptions, we cannot but assume that both the billed/unpaid and the stolen kwh would have an average tariff equal to the average tariff reported by Kyrgyzenergo, corresponding to the average tariff that it bills

ANNEX 6

Kyrgyz Republic Government Order #331-p

September 1, 1997

To introduce a reasonable method of calculating a cash commodity produced by an energy sector, to impartially consider the performance on the regional level, to foster operation of the whole sector and its subsectors, to set reasonable tariffs for electric and thermal energy, and to subsequently implement denationalization of the Republic's energy sector

1 To form a Working Commission to develop a financial model of JSC Kyrgyzenergo Below is the list of people in the commission

Koichumanov T D	Minister of Finance of the Kyrgyz Republic, head of JSC Kyrgyzenergo's Board of Directors, head of the commission
Mateev U A	Director of the State Energy Agency under the Government of the Kyrgyz Republic, deputy head of the commission
	Commission members
Sartkaziyev B E	General Director of JSC Kyrgyzenergo
Chukin A T	Deputy Director of the State Property Fund of the Kyrgyz Republic
Vasilyev A A	Director of Bishkek Thermal Plant #1
Israilov A N	Director of Toktogul cascade of hydropower stations
Tynybekov A K	Director of Chu Distribution Company
Alykulov M A	Director of Osh Distribution Company
Botbayev B A	Director of "Energia" Research Technical Center
Ryjikh L I	Head accountant of JSC Kyrgyzenergo
Ryskulov N R	Head of Financial and Economic Department of JSC Kyrgyzenergo
Tashpolotov N R	Head of Financial and Economic Department of the State Energy Agency under the Government of the Kyrgyz Republic

2 The Working Commission shall submit appropriate proposals to the Government of the Kyrgyz Republic by September 15, 1997

A Jumagulov
Prime Minister

КЫРГЫЗ РЕСПУБЛИКАСЫНЫН ӨКМӨТҮ

ПРАВИТЕЛЬСТВО КЫРГЫЗСКОЙ РЕСПУБЛИКИ

БУЙРУК РАСПОРЯЖЕНИЕ

БИШКЕК ш., ӨКМӨТ ҮЙҮ от 1 сентября 1997 года № 331-р г. БИШКЕК ДОМ ПРАВИТЕЛЬСТВА

В целях введения обоснованной методики расчета товарной продукции, произведенной энергетическим комплексом, а также для объективного учета работы регионов, стимулирования работы всего комплекса и его подразделений, установления объективных тарифов за выработанную и отпускаемую электрическую и тепловую энергии и дальнейшего осуществления процесса разгосударствления энергетического комплекса республики

1 Создать рабочую комиссию по разработке финансовой модели АО "Кыргызэнерго" в следующем составе

Койчуманов Т Д	- Министр финансов Кыргызской Республики, председатель Совета директоров АО "Кыргызэнерго", председатель комиссии,
Матеев У А	- директор Госагентства по энергетике при Правительстве Кыргызской Республики, заместитель председателя комиссии
	Члены комиссии
Сартказиев Б Э	- генеральный директор АО "Кыргызэнерго",
Чукин А Т	- заместитель председателя Фонда госимущества Кыргызской Республики,
Васильев А А	- директор ТЭЦ-1, гор Бишкека,
Исраилов А Н	- директор Токтогульского каскада ГЭС,
Тыныбеков А К	- директор ЧуПЭС,
Алыкулов М.А	- директор Ош ПЭС,
Ботбаев Б А	- директор НТЦ "Энергия",
Рыжих Л И	- главный бухгалтер АО "Кыргызэнерго",
Рыскулов Н Р	- начальник финансово-экономического центра АО "Кыргызэнерго",
Ташполотов Н Р	- начальник финансово-экономического отдела Госагентства по энергетике при Правительстве Кыргызской Республики

2. Рабочей комиссии к 15 сентября 1997 года представить в Правительство Кыргызской Республики соответствующие предложения

Премьер-министр А.Джумагулов

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ANNEX 7

Kyrgyz Republic Government Resolution # 212

On Financial Model for JSC Kyrgyzenergo Restructuring

April 22, 1998

Under the Laws of the Kyrgyz Republic on Energy and Electricity and to implement the January 8, 1997 President's Decree "On Improvement of the Energy System Management" and the April 23, 1997 Government Resolution #239 "On Denationalization and Privatization Program for JSC Kyrgyzenergo," the Government of the Kyrgyz Republic resolves

1 To approve the attached financial model for JSC Kyrgyzenergo restructuring

2 To submit the financial model, approved by this Resolution, to the Kyrgyz Parliament for confirmation

3 To consider the financial model of JSC Kyrgyzenergo restructuring as an addendum to the Denationalization and Privatization Program for JSC "Kyrgyzenergoholding "

4 To establish that the financial model for JSC Kyrgyzenergo restructuring may be revised and improved in the process of restructuring

Jumaliev K
Prime Minister

КЫРГЫЗ РЕСПУБЛИКАСЫНЫН ӨКМӨТҮ

ПРАВИТЕЛЬСТВО КЫРГЫЗСКОЙ РЕСПУБЛИКИ

ТОКТОМ ПОСТАНОВЛЕНИЕ

1998-жылдын 22-апрели, № 212

"Кыргызэнерго" акционердик коомунун структурасын оптимизациялоо боюнча финансылык моделди жөнүндө

Кыргыз Республикасынын "Энергетика жөнүндө" жана "Электр энергетикасы жөнүндө" мыйзамдарына ылайык жана Кыргыз Республикасынын Президентинин 1997-жылдын 8-январындагы "Энергетика тармагын башкаруу системасын оптимизациялоо жөнүндө" жана Кыргыз Республикасынын Өкмөтүнүн 1997-жылдын 23-апрелиндеги № 239 "Кыргызэнергохолдинг" ачык акционердик холдинг компаниясын мамлекеттен ажыратуу жана менчиктештирүү программасы жөнүндө" токтомуна өзгөртүүлөр киргизүү боюнча Кыргыз Республикасынын Өкмөтү токтом кылат

1. "Кыргызэнерго" акционердик коомунун структурасын оптимизациялоо тиркемеси финансылык моделдин максаттуу жыйынтыгы болсун.

2. Ушул токтом менен жактырылган финансылык модель Кыргыз Республикасынын Жогорку Кеңешине бекитүүгө жиберилсин.

3. "Кыргызэнерго" акционердик коомунун структурасын оптимизациялоо тиркемеси финансылык моделдин максаттуу "Кыргызэнергохолдинг" ачык акционердик холдинг компаниясын мамлекеттен ажыратуу жана менчиктештирүү программасын толуктоочу документ катары эсептелсин.

4. "Кыргызэнерго" акционердик коомунун структурасын оптимизациялоо финансылык моделин структуралык өзгөртүүлөрдүн процессинде толуктоолор киргизүү жана аларды ишке ашырууга тыюу салынсын.

Премьер-министр К.Бакиев

КЫРГЫЗ РЕСПУБЛИКАСЫНЫН ӨКМӨТҮ

ПРАВИТЕЛЬСТВО КЫРГЫЗСКОЙ РЕСПУБЛИКИ

ТОКТОМ ПОСТАНОВЛЕНИЕ

от 22 апреля 1998 года № 212

О финансовой модели реструктуризации акционерного общества "Кыргызэнерго"

В соответствии с законами Кыргызской Республики "Об энергетике" и "Об электроэнергетике" и во исполнение Указа Президента Кыргызской Республики от 8 января 1997 года "О совершенствовании системы управления энергетической отраслью" и постановления Правительства Кыргызской Республики от 23 апреля 1997 года № 239 "О Программе разгосударствления и приватизации Кыргызской государственно-акционерной холдинговой компании "Кыргызэнергохолдинг" Правительство Кыргызской Республики постановляет

1. Одобрить прилагаемую финансовую модель реструктуризации акционерного общества "Кыргызэнерго".

2. Направить финансовую модель, одобренную настоящим постановлением на утверждение в Жогорку Кенеш Кыргызской Республики.

3. Считать финансовую модель реструктуризации акционерного общества "Кыргызэнерго" документом, дополняющим Программу разгосударствления и приватизации Кыргызской государственно-акционерной холдинговой компании "Кыргызэнергохолдинг".

4. Установить, что финансовая модель реструктуризации акционерного общества "Кыргызэнерго" в процессе реструктуризации может дополняться и усовершенствоваться.

Премьер-министр К.Бакиев

ANNEX 8

Financial Model of Kyrgyzenergo

Prepared by

Mr Ukulov
Department Head
Kyrgyzenergo

November 1997

CONCLUSION

The main purpose of the Program of denationalization and privatization of JSC Kyrgyzenergo is improvement of the energy sector efficiency of the republic, which means uninterrupted and reliable energy supply for disciplined consumers, saving and further development of the power system, increase of energy system's yield and increase of tax receipts

In accordance with the Program, in the course of transfer of social and municipal assets, including boiler-houses, to the local executive bodies the joint-stock company «Kyrgyzenergo» obtains the released funds in the amount of mln Som for 1998 However, it causes the state budget a problem as it has now to pay for the costs of these assets Taking into account the continuining deterioration of the power system of the republic and our Government's liabilities given to the international financial institutions, this transfer should be implemented immediately

Budget organizations should be provided with funds in the amount of thousand Som for 1998 and thousand Som for 1999 due to the expected tariff increase and provided that they keep the same consumption level According to the tariff policy, social protection of discount consumers requires thousand Som for 1998, thousand Som for 1999 and thousand Som for 2000

The Commission considers it necessary to pay attention to the following problems arising in the course of the implementation of « The Program »

Reorganization of the JSC Kyrgyzenergo into three enterprises dealing with generation, transmission and distribution of thermal and electric energy will cause additional expenditures of organizational and technical nature to restructure the management and monitoring systems

Calculations and analysis made in the course of elaborating of financial models of operation of the JSC Kyrgyzenergo and enterprises unbundled from its structure reveal the fact that the unbundling of the JSC Kyrgyzenergo, which at present operates as one unit, into companies generating, transmitting and distributing thermal and electric power does not give positive economic result for the energy system development The tariff for electricity for end consumers increases at 4 tyin because commodity is taxed 3 times for the emergency situations fund, for road maintenance and for making-up the VAT (which is not paid by residential consumers who make one of the end consumers group) Besides, operation of Kyrgyzenergo separate enterprises under the condition of full self - accounting during the first 6 months of 1997 showed that there might be a problem when they do not pay each other This leads to the spasmodic increase of accounts receivable (for example, in 1999 at thousand Som) The only way Kyrgyz National Grid can influence the regional distribution companies, when they hold up repayment for the energy received, is disconnection As the Kyrgyz National Grid is the owner of transmission network of 110 kV and higher, KNG is able to disconnect only these sub-stations which supply several distribution companies and

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large consumers It might cause a problem of "unfair disconnection", i e "illegal" disconnection of disciplined consumers, which is unacceptable

There might be another problem for the energy system as the ratio of generation, costs and thermal and electric power sales varies on season, then the taxable part increases during the first summer months, while in winter months (when the costs increase) the energy system operates without profit Thereby the tax increase on average makes thousand Som for year which will have negative effect on efficiency and viability of the energy system of the Republic

We also think that it is necessary to give the opinion of foreign advisers They consider that the main purpose of the unbundling is the transfer to the market-related (commercial) way of operation of separate companies The relations between these companies are to be based upon contracts which stipulate, in addition to all other things, fines and penalties and other conditions of contract violation In their opinion, in this case regional distribution companies, which at present are the main ring in the chain of commercial losses, will have to improve their operation efficiency and increase collection for the energy sales to follow the terms of the contracts with the JSC Kyrgyz National Grid, and KNG, in their turn, - with the generating companies

Problems of restructuring of JSC "Kyrgyzenergo" according to the financial model

Problems	Problem solving
1 Dividing JSC "Kyrgyzenergo" into 3 companies production, transmission and distribution, can cause following	
a) additional organizational-technical expenditures for reorganization of management and control systems	a) Such expenditures are predetermined, it is necessary to count them into at conducting restructuring and put them on expense of JSC "Kyrgyzenergo"
b) taxable base in the energy sector increases as the commodity is taxed three times to be paid to Natural Calamities Fund, "road" tax In 1999 costs increase by 181,5 mln som on electricity and 47,2 mln som on thermal energy because a part of VAT on inputs is not paid (electricity supply in the residential sector without VAT) Or increase tariffs by 3 tyin on electrical energy and by 17 soms on thermal energy)	b) Preparation of a proposal from the Government of Kyrgyz Republic to the Jogorku Kenesh about eliminating triple taxation
2 If a DC breaches the contract with JSC "Kyrgyz National Electric Network", the latter can disconnect the accurate consumers as it has only 110 kW network and substations In other words there will be unfair outages	2
3 Problems connected with a delay of payments from DC to JSC "NEN" and to JSC "Naryn Cascade" will lead to violation of stable procedure of electricity generation	
4 The state budget will pay high costs because of receiving social and residential assets from JSC "Kyrgyzenergo", implementation of tariff policy which builds a basis for the given financial model (to cover the costs caused by discount consumers and to provide funds for the budget organizations to pay for electric and thermal energy) - 710 mln som annually	
5 To reduce level of discount rate electricity consumption from 1200 kWh down to 150 kWh a month	