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Pre-Feasibility Study for Piatra Neamt Municipal Energy Efficiency Investment Project

PREPARED FOR

Harza Engineering and USAID Romania

Contract No. LAG-I-00-98-00002-00

Energy Efficiency Projects Selection Technical Assistance

PREPARED BY

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1 Executive Summary

1.1 Background

Under the USAID/Bucharest Energy Efficiency Projects Selection - Technical Assistance program, Electrotek Concepts, Inc. is supporting the Romanian energy sector with a focus on the improvement of public energy services (heating and lighting), and rehabilitating and modernizing of related municipal infrastructure. In October/November 2000, the Electrotek team met with municipal governments and management of district heating companies (DHC) in 17 Romanian cities to identify projects which would 1) generate sufficient cash flow to return investment in commercial terms, and 2) be secured and affordable within the annual budgets of the municipalities and the DHC.

The city of Piatra Neamt was chosen as one of three projects for implementation. The goal is to improve the overall operational efficiency and the heat supply capacity of the Piatra Neamt district heating system (generation and primary and secondary distribution networks) so that acceptable heat comfort levels and sufficient domestic hot water supply are available and affordable to all consumers. Technical measures include rehabilitation of 13 boilers with district heating networks and installation of individual heating substations.

The pre-feasibility analysis shows that the proposed project, which costs US$ 3.0 million, has reasonable economic indicators for district heating projects including a payback period of 4.6 years. The project is robust and appropriate for commercial financing. Project benefits are significant and will lead to more cost-effective heat supply, greater comfort in residential buildings, a more modern municipal infrastructure.

1.2 Project Sponsors

The municipal public service utility SC Aqua Color SA is the owner and operator of the district heating system interested in the renovation of its facilities, and therefore, it is logical to consider the Company as a leading project sponsor. However, the nature of relationships between Aqua Color and the Piatra Neamt Municipality including heat subsidies coming from the municipal budget and other political and social realities requires their direct and close cooperation in the project implementation.

Municipality

The municipality of Piatra Neamt (the capital of Neamt County) is located in the northeastern part of Romania and has a population of 124,000. The Municipality area is about 7,750 ha, or 30 square miles, of which 22% constitutes an urban zone. Situated at the junction of two rivers at an average altitude of 345 m and surrounded by four mountains, Piatra Neamt benefits from opportune nature: it is one of the major tourist attractions in this part of Romania. Besides tourism, a number of economic sectors contribute to the economy of the city: wood processing, hydroelectric power, chemical, textile and machine-building industries. Piatra Neamt follows the general Romanian demographic trend of the low birth rate and strong aging of population, although to a lesser degree than in other regions, and the size of work force has been declining since 1998. On the other hand, a number of major employers increased personnel, and after slight growth in 1999, unemployment rate dropped from 17.8% to 10.7% in July 2001.

Municipal Revenue. The Piatra Neamt budget is formed from two main sources of revenues: local revenues (fiscal and non-fiscal) and transfers from the national budget. There are also transfers from the

county budget, but they are not regular (in Piatra Neamt, they appear only in the budget for 2000) and depend on needs of the municipality and financial conditions of the county budget.

Local municipal revenues consist mainly of corporate and individual taxes, which within the last three years substantially changed in structure but continue to be important and amounted to 27.9% of total budget in 1998, 48.5% in 1999 and 42.2% in 2000. Fiscal revenues from individuals contain a number of different items: property taxes, fees for using state-owned land, fees for licenses and authorizations, judicial fees and other stamp duties. Also, all sources of personal income, with the exception of salary, currently are taxed and collected locally. Since companies and other legal entities generally do not pay income taxes to the municipal budget, the bulk of corporate tax revenues comes from corporate property taxes, namely taxes on land and taxes on buildings (5.84%, 5.41% and 9.31% of total revenues in 1998 through 2000 respectively).

Transfers from the national budget are a major part of municipal revenues: 72.1% in 1998, 47.4% in 1999 and 68.6% in 2000. The main part is the municipal share of the so-called "wage tax" - individual income tax of salaried employees withheld from paychecks and transferred to the local offices of Financial Administration. It accounted for 33.2% of the budget in 1998, 33.3% in 1999 and 52.3% in 2000. The rest is primarily heat subsidies for population and centralized investment subsidies.

In general, the shape of the revenue part of Piatra Neamt budget seems stable: even though the year 2000 ended with the 1%-deficit, total revenues increased from US$ 4.5 M in 1998 to US$ 6.09 M in 2000. At the same time total subsidies decreased from US$ 1.75 M to US$ 996 thousand. Heat subsidies stayed at the same level in hard currency equivalent, even with a significant growth of fuel prices.

Municipal Expenses. Piatra Neamt municipal expenses for 1998 – 2000 show that more than 55% of available funds go to public services and development. The rest is shared between administrative and social/cultural expenses. The Piatra Neamt City Council allocates necessary funds to obligatory items (education, heat subsidies for the population, etc.), and practical or social necessities (administrative costs, social assistance, etc.) and then directs the remaining funds to the most urgent current municipal needs. In 2000, expenses for public services and development received US$ 3.46 M, up from US$ 2.75 M and US$ 3.01 M in the years 1998 and 1999 respectively. The major share of this amount (13.6% of the total budget or US$ 835 thousand in 2000) is related to operational and capital costs of district heating networks, boiler houses and substations. Generally, this line would include all the operational and capital expenses that relate to district heating. The main part of this, or US$ 827 K, is heat subsidies from the national budget.

District Heating Company

SC Aqua Color SA, established in 1997 as a commercial company, delivers services of district heating and domestic hot water (DHW), water supply, and sewage (wastewater collection and treatment) to residents and businesses in Piatra Neamt.

Revenues from heating and DHW provide most significant contribution to compare with other activities. Furthermore, from 1998 to 2000 the portion of heat and DHW revenues grew from 59.6% to 71.2% of total operating revenues. At the same time portions of revenues from water supply and sewage decreased from 25.9% to 16.0% and from 9.6% to 8.9%, respectively.

Aqua Color is 100%-owned by the Piatra Neamt City Council and governed by the general assembly of shareholders who are the members of the City Council. Before 1997, this public service utility was a Regia Autonome, and municipal infrastructure was in direct ownership of the Municipality. After 1997 reorganization, the Piatra Neamt Municipality transferred the ownership of heating, water supply, and sewage assets to the Company for its operation.

As a regulated public utility, Aqua Color must have its tariffs approved by an independent public authority – the National Regulatory Authority in the Energy sector (ANRE) in the case of district heating or DHW and the Romanian National Office of Competition for other services. Residents pay for heat only at the level of the National Reference Price that covers just a part of Aqua Color's supply cost (the rest comes from the heat subsidies, which are provided by the state through the municipal budget and the local budget, if necessary). In fact, the population has difficulty paying even the subsidized price. There are provisions in a standard customer contract for late payment fees and possible disconnection for non-payment. In practice, these articles are not easy to enforce, which explains the persistent difficulties with collection.

Aqua Color might be a reasonable candidate for project sponsoring. Although total operating revenues decreased from US$ 7.7 M in 1998 to 5.8 M in 2000, the Company's profitability improved. In 2000 all Company's activities were profitable, and profit from operating activity increased from US$ 266 K to US$ 330 K. In the last three years the main problem for Aqua Color was collecting revenues from Residential Associations. However, the Company executed different measures for the improvement of collections, which lead to the reduction of receivables that are thirty days overdue from 60% in 1998 and 1999 to 43% at December 31, 2000. In 2000 accounts payable decreased in the US Dollar equivalent from US$ 1,674 K to US $1,323 K, or by 21%.

It is important to note that for several years Aqua Color has had active cooperation with Romanian Development Bank (BRD) and Romanian Commercial Bank (BCR). The Company successfully managed several one-year credit lines for investments and working capital increase. Currently, Aqua Color has agreements with BRD for investment and working capital credit lines in the amount of ROL 5 billion each. In addition, the Company has a credit line with BCR for $14 billion ROL that is used to cover working capital needs. During the meeting at the BRD branch the bank's manager expressed strong interest in the continuation of the long-term business cooperation with the Company.

1.3 Proposed Project

This project to upgrade 13 boiler houses (BH) and their distribution network as an initial part of a broader long-term district heating system rehabilitation program. Revenues from energy savings are sufficient to service the debt and finance additional improvements on a time-phased schedule to upgrade the remaining 53 boiler houses and networks. The project will improve the efficiency of heat supply from each of the 13 boiler houses and complete improvements in end-user heat consumption to provide affordable space heating and domestic hot water supply at a level comparable to western standards.

General System Conditions

Supply Side. The total installed thermal capacity for all 66 boiler houses is 333.57 gigacalories per hour (Gcal/h) or 387.9 megawatts thermal (MWth). Most of these BHs are fueled by natural gas, and only few utilize liquid fuel. Boiler houses are equipped with gas meters and heat meters. The boilers, with the exception of few recently installed ones, are locally made, old-fashioned and inefficient (model Metalica). The Company is doing its best to keep these old boilers in proper shape, but this task became too expensive since every year more and more funds are needed for maintenance and repair. Besides, despite all efforts of Aqua Calor, poor boiler design and obsolete technical arrangements at BHs limit operational efficiency of the system.

There is no chemical water treatment at boiler houses and untreated water is used as a heating media circulating inside boiler tubes, networks, and internal heating system of buildings. As a result, all boiler house tubes require complete replacement once every several years, very favorable chemical content of raw water notwithstanding. Almost all boiler houses are significantly oversized in term of the installed

capacity against the demands from connected buildings. At the stage of city development these BHs were intended for serving more buildings than eventually had been built.

The main environmental problem comes from the use of very simple gas burners installed at Metalica boilers. These burners don't provide proper mixing of natural gas with air, causing a reduction in combustion efficiency and excessive generation of carbon monoxide and nitrogen oxides.

Transmission and Distribution Networks. The transmission and distribution network of each boiler house consists of three pipelines in underground, non-accessible, concrete channels. Two pipes carry hot water for space heating (supply and return), and one pipe transports hot water for domestic use. Most pipes are 25 years old and all are oversized, with missing thermal insulation.

End-Use Conditions. A comparison of temperature of space heating water in supply and return pipes next to buildings indicates that radiators extract limited amount of heat. Recent measurements showed a temperature drop of 6-7°C instead of the usual 20°C. The small differential temperature between supply and return water causes an over-consumption of power for water pumping. Therefore, an upgrade of generation and transmission/distribution infrastructure will not improve consumer conditions without rehabilitation of heating systems inside the buildings.

Project Approach

This pre-feasibility study is based on the following assumptions, agreed upon by Electrotek and the Aqua Calor management:

- The long-term target of the Company is to upgrade all 66 systems, in order to provide all consumers with sufficient and affordable heat in the most efficient way.
- Due to limited amount of commercial financing that Aqua Calor could realistically secure for the project, only 13 local systems out of total 66 are proposed for upgrade within the framework of this pre-feasibility study. For each system, upgrade should include energy efficient measures for all system components (BH, transmission and distribution, and demand side).

Specific energy efficient measures for each section of heating system are:

Generation side (in each boiler house):

- Replacement of two the least efficient boilers with two that are highly efficient. During heating seasons these boilers will carry the base load, which is about 60% of maximum total space heating and domestic hot water demand.
- Upgrade of one or two of the most efficient of existing boilers with environmentally friendly burners, combustion and other controls. These boilers will carry peak load only or the remaining 40% of maximum total space heating and domestic hot water demand. The efficiency of upgraded boilers will be less than for new ones. Nevertheless, contribution of these boilers into the annual heat production will be limited and investment into this upgrade will be a fraction of the cost of new boilers installation. Therefore, this measure will improve project economics.
- Installation of chemical water treatment in each boiler house.
- Installation of a plate heat exchanger, separating the primary loop in the boiler house with the space-heating distribution loop.

Distribution network:

- Rehabilitation of three-pipe networks into two-pipe systems, with re-insulation of entire space heating pipes and partial replacement of worn-out sections;
- Removal of pipes for the domestic hot water.

Demand side:

- Flushing of each building heat extraction system (the municipal government suggested that the Company would complete this upgrade under a contract with residential associations);
- Flushing of each building heat extraction system. This measure should be funded by residential associations and may be implemented by Aqua Calor under special contract. The municipal government supported the implementation of this measure and asserted that residential associations will agree to it;
- Installation of individual heating substation (IHSS) in each building. Such IHSS would consist of:
  a) Control valve and pump for space heating,
  b) Plate heat exchanger, circulation pump and control for DHW loop.

  As a cost-saving measure single IHSS might be used for serving several closely located small buildings.
- Each building should have own heat meters, but funds for installation of these meters are not considered within this study.

The rehabilitation of the selected 13 networks should be completed during non-heating seasons of the years 2002 and 2003. During 2002, entire systems for networks # 2, # 3, # 14, # 22, # 23, and # 54 are upgraded. During 2003, remaining systems # 4, # 5, # 6, # 27, # 28, # 41, and # 51 are upgraded. The rationale for a two-year implementation schedule is: a) it is more affordable for the project sponsors, and b) it is easier from the logistical point of view.

The savings from the 13 networks upgrade should be sufficient to service the loan. As soon as debt service obligations are met, the project sponsors might consider utilizing saving for rehabilitation of the remaining networks.

Project Capital Cost and Savings

The project cost. The proposed design is based on well-known technical solutions. The costs of equipment, pipes, and construction are consistent with similar projects in Romania and other Eastern European countries.

The project savings and payback period. The summary of estimated savings and simple payback period are presented in Figure 1-1. An analysis of the specific savings indicates that:

- Energy efficiency improvements in heat generation and transmission/distribution provide annual savings of natural gas in the amount of US$ 644,282 or 90.7% of the total savings.
- The next essential input provides the savings in labor and maintenance (US$ 55,407 or 7.8% of the total)
- Savings in electricity consumption are only of US$ 10,760 or 1.5% of the total savings. This might seem as a small ratio, especially given that presently a lot of electric power is wasted for water pumping. On the other hand, now even the basic controls are missing, so implementation of the project will lead to the installation of additional electricity-powered devices and controls. Ultimately, this will result in a higher efficiency of the system as a whole, but most of the gain will appear as fuel rather than electricity savings.

Figure 1-1. Project Cost, Savings and Payback Period

	Savings						Investments with Contingencies and without VAT (US$)	Simple Payback Period (Years)
	Natural gas ($000 m^3)	(US$)	Electricity (MWh)	(US$)	Labor and Maintenance in 1999 (US$)	Total (US$)		
Network 2	388.126	$32,991	30.247	$1,361	$3,960	$38,312	$137,166	3.6
Network 3	413.592	$35,155	18.896	$850	$5,600	$41,605	$138,846	3.3
Network 4	347.060	$29,500	19.022	$856	$2,989	$33,345	$146,127	4.4
Network 5	456.547	$38,806	-9.787	-$440	$8,179	$46,545	$206,195	4.4
Network 6	434.925	$36,969	22.329	$1,005	$4,743	$42,716	$198,375	4.6
Network 14	872.618	$74,173	21.525	$969	$6,340	$81,481	$291,916	3.6
Network 22	843.436	$71,692	52.711	$2,372	$2,804	$76,868	$314,929	4.1
Network 23	552.861	$46,993	23.200	$1,044	$2,836	$50,874	$218,803	4.3
Network 27	795.377	$67,607	-4.844	-$218	$2,999	$70,388	$317,581	4.5
Network 28	613.287	$52,129	19.464	$876	$1,088	$54,093	$270,493	5.0
Network 41	608.462	$51,719	34.597	$1,557	$5,709	$58,985	$274,701	4.7
Network 51	526.734	$44,772	1.458	$66	$6,566	$51,404	$268,228	5.2
Network 54	726.758	$61,774	10.298	$463	$1,594	$63,832	$273,100	4.3
Total	**6,778.06**	**$644,282**	**189.972**	**$10,760**	**$55,407**	**$710,448**	**$3,056,459**	**4.3**

Natural gas ($US/000 m^3) 85
Electricity ($US/MWh) 45

Average exchange rate in the year 1999 *14.630 000 ROL/$US*

1.4 Financial Plan

Type and Amount of Financing Required

Under the base case, the total project cost is US$ 3,090 K without value added taxes (VAT). Expected total financial resources include debt financing in the amount of US$ 2,140 K from lending institutions and US$ 951 K from the project sponsors, including US$ 33,682 for interest payments during the construction period. The estimated debt-to-equity ratio is 69:31 (Figure 1-2).

Figure 1-2. Project Cost and Proposed Financial Scheme

Project Cost		
Base project cost	$ 3,056,459	
Capitalized interest during construction	$ -	
Interest exceeding savings during construction	$ 33,682	
Principal paid during construction	$ -	
Additional working capital during construction	$ -	
Total Project Cost	**$ 3,090,141**	
Base Capital Structure		
Debt	$ 2,139,521	70.0%
Equity	$ 916,938	30.0%
Total Investments	**$ 3,056,459**	100.0%
Financial Scheme		
Total loan requested	**$ 2,139,521**	69.2%
Project sponsor's contribution		
Investments	$ 916,938	
Interest during construction	$ 33,682	
Total project sponsor's contribution	**$ 950,619**	30.8%
Other contributions	$ -	0.0%
Total Investments	**$ 3,090,141**	100.0%

Financing Sources and Risk Sharing

Obstacles for structuring long-term project financing under the current economic, financial institutional and legal environment in Romania are the following:

- It is difficult to secure commercial bank loans with 3 to 5 year maturity without external credit risk mitigation and loan security.
- The IFC, which focuses mainly on private sector project financing, is not very interested in the improvement of municipally owned facilities.
- Financial schemes with foreign vendor's credits or Eximbank participation are realistic, but they often require 100%-banking guarantee or some minimal level of project sponsors credit rating confirmed by international rating agencies.

Although there is a possibility to utilize a newly created World Bank/GEF energy efficiency fund, this fund is not specifically focused on municipal projects and, additionally, its planned financing transactions might be too small for the current project. Nevertheless, participation in the fund, at least as a co-financer, would be desirable for risk mitigation.

Initial discussions with a number of commercial banks indicate that:

- Some Romanian and international commercial banks are interested in long-term project financing under the condition of credit risk sharing.
- Detailed project financial and risk analysis and disclosure of the financial indicators of the project sponsors increase probability of the deal success.

- External mitigation of the credit risk should significantly facilitate financial deal structuring by municipalities and municipally owned companies.

Considering all of the above, the following financial schemes with five-year maturity should be viable:

Scheme 1. Favorable Development
Sources of debt financing

- Principal Financing – US$ 1,926 K (90% of the total debt) from commercial lenders with DCA Guarantees covering up to 50% of the funding or up to US$ 963 K
- Co-financing – US$ 214 K (10% of the debt) from the World Bank/GEF Fund

Risk sharing

- U.S. Government - 45%
- Commercial lenders – 45%
- World Bank/GEF Fund – 10%

Maturity

- Five years.

Scheme 2. Intermediate Development
Sources of debt financing

- Principal Financing – US$ 2,139 K (100% of the total debt) from commercial lenders with DCA Guarantees covering up to 50% of the funding or up to US$ 1,070 K.

Risk sharing

- U.S. Government - 50%
- Commercial lenders – 50%

Maturity

- Five years.

Scheme 3. Pragmatic Development

Sources of debt financing

- Principal Financing – US$ 2,139 K (100% of the total debt) from commercial lenders.

Risk sharing

- Commercial lenders – 100%

Maturity

- Five years.

1.5 Project Cash Flow Analysis

The base case assumes that the debt financing will be in US dollars with a fixed interest rate. The applied current interest on outstanding loan principal is 12%, which is 8% above the current very low six-month LIBOR. The interest rate is paid monthly without a grace period, and the loan principal is paid in equal parts. The five-year loan term includes the one year and six months of the construction period (Figure 1-3).

Figure 1-3. Project Evaluation Period and Loan Conditions

Evaluation Period		
Current year		2001
Construction begins	(da/mo/year)	1-Apr-02
Construction ends	(da/mo/year)	30-Sep-03
Operation begins	(da/mo/year)	1-Oct-02
Operation ends	(da/mo/year)	30-Oct-17
Loan conditions		
Total disbursement	(US$)	$2,139,521
Disbursement begins	(da/mo/year)	1-Apr-02
Interest payment begins	(da/mo/year)	30-Apr-02
Payment on principal		
Begins	(da/mo/year)	30-Oct-03
Maturity	(da/mo/year)	31-Mar-07
Number of payments		27
Payment amount	(US$)	$79,242
Interest Rate	(%)	12.00%

The cash flow analysis indicates the payback period for the whole project is 4.6 years; the financial internal rate of return (IRR) for cash flows before financing is 25%. Assuming a fixed discount rate of 15%, the net present value (NPV) is US$ 1,241 K or 40% of the total project cost. Projects for networks # 2, 3 and 14 have simple payback periods less than 3.6 years (Figure 1-4), payback periods of other eight projects do not exceed 4.6 years, and the longest simple payback period of the investment package is 5.2 years. These results indicate that proposed measures are feasible for district heating rehabilitation projects (see Figure 1-5).

Figure 1-4. Project Cost, Savings and Capital Budgeting Indicators

Investments (US$)	**Savings** 2002 (US$)	2003 (US$)	2004 (US$)	2005 (US$)	2006 (US$)	**IRR** (%)	**NPV** (US$)	**Payback Period** (Years)
3,056,459	**141,188**	**495,962**	**710,448**	**710,448**	**710,448**	**25%**	**1,241,267**	**4.65**

Figure 1-5. Simple Payback Period of the Investment Package Components

Networks	Savings (US$)	Investments (without VAT) (US$)	Simple Payback Period (Years)
Network 2	$ 38,342	$ 137,166	3.6
Network 3	$ 41,624	$ 138,846	3.3
Network 4	$ 33,364	$ 146,127	4.4
Network 5	$ 46,535	$ 206,195	4.4
Network 6	$ 42,739	$ 198,375	4.6
Network 14	$ 81,502	$ 291,916	3.6
Network 22	$ 76,920	$ 314,929	4.1
Network 23	$ 50,897	$ 218,803	4.3
Network 27	$ 70,383	$ 317,581	4.5
Network 28	$ 54,113	$ 270,493	5.0
Network 41	$ 59,020	$ 274,701	4.7
Network 51	$ 51,406	$ 268,228	5.2
Network 54	$ 63,842	$ 273,100	4.3
Total	**$ 710,687**	**$ 3,056,459**	4.3

1.6 Project Risks

Sponsor's Risk. The project sponsor's risk includes risks related to the financial performance of both Aqua Color and the Municipality. A comprehensive analysis of the risks related to different revenue sources and expense items of the Piatra Neamt budget and financial position and performance of Aqua Color is beyond the scope of this work. Nevertheless, sections 2 and 3 provide the disclosure of the Municipality and Aqua Color financial statements for last three years, which demonstrate reasonable assets to secure the debt financing.

There are a number of risks associated with the municipal budget, but most of them are not too significant. The main conclusion is that with the implementation of the project and realized savings in heat subsidies, the Piatra Neamt budget will have a significant amount of funds freed up, enough to back up any debt guarantee or ensure the debt service (if the council decides to take the loan).

The most important risks from Aqua Color are related to the issue of customer retention. However, promising trends of the Company's financial position and performance provides an opportunity to stabilize sales and show a sustainable financial position at the end of the construction period, if Aqua Color achieves the following goals:

- Increase of the quality of services provided to customers;
- Reduction of the operating costs.

Finally, two additional important considerations, which substantially ameliorate the sponsor's risk, should be noted. First, the proposed financial schemes provide the security of the loan through the recourse on the project cash flow by establishment of an escrow account for payments of the most reliable Aqua Color customers. Second, the detailed project cash flow analysis on a monthly basis before maturity demonstrates the very strong financial viability of the project. Information presented below confirms the

robustness of the project under different circumstances relating to the project implementation and the contention that the project sponsor's risk is irrelevant.

Risk of Heat Tariff Policy Changes. This energy efficiency project is not economically viable if state authorities cannot guarantee the current level or structure of tariffs throughout the period of the loan. Therefore, if the project proceeds, it means that there is some specific understanding or agreement with national regulatory authorities, which will make the risk of tariff policy changes moot.

Completion Risk. The completion risk includes the following risks:

- *Cost-overrun risk* is not crucial, since the proposed technologies and costs are well known worldwide. However, consequences of the cost-overrun were estimated including technical and price contingencies in the computation. Results of the this scenario show that including 3% of the technical contingency and 8% of the price contingency does not deteriorate substantially financial indicators of the project. The IRR is 22%, the NPV is US$ 923 K and the payback period is 5.1 years.
- *Start up delay risk* is minimized by the use of well-known technologies and the periodic, planned equipment installation over two years. The risk is also reduced by the turnkey contract with adequate incentives for on-time completion. Cash flow analysis indicates that a three-month delay does not get worse considerably capital budgeting indicators: the IRR is 23%, the NPV is USD$ 1.100 K, and the payback period is 4.6 years. Although, the start-up delay leads to the additional working capital in the amount of US$ 29 K to pay interest in November-December 2002, savings in January 2003 provide not only interest payment, but also return the working capital and give a surplus in the amount of US$ 85 K.
- *Approval and regulatory risk* is minimal. Most approval and permits have to be provided by the local authorities that are also interested in the fast project development.

Operating Risk. Although Aqua Color owns heat and DHW assets, has considerable experience in operating the district heating system and is very interested in the proper operation of new equipment, training is very important for this risk to be low. The other concern is related to the timely preparation of internal heating systems within apartment buildings for heat extraction from upgraded networks (primarily, cleaning and flushing of radiators). This concern should be addresses by obtaining preliminary agreements with the Residential Associations and incorporating the preparation into the project implementation schedule.

The assumption of a decrease in savings of 5% does not deteriorate substantially capital budgeting indicators: the IRR is 23%, the NPV is US$ 1,037 K, and the payback period is 4.9 years. In addition it is important to note that that the project base line was estimated during the heating season 2000/2001, which was warmer than the average heating season. Therefore, the assumption of the decrease of estimated saving by 5% is conservative, and the scenario demonstrates the project feasibility.

Electricity and Fuel Price Change Risk. In the base scenario, prices for electricity and natural gas in US dollars are stable over the project evaluation period. However, changes in electricity and gas prices can occur. An analysis with a decrease of electricity prices by 10% and natural gas prices by 6% results in a project with the IRR of 23%, the NPV of USD$ 1,013 K, and the payback period of 4.9 years.

Worst Case Scenario. Analysis of a "worst case" project scenario assumes a one-month construction delay, a 6% cost overrun, a 2.5% savings decrease over the evaluation period, reduces of electricity and natural gas prices by 5% and 3%, respectively. Results indicate the IRR of 21%, the NPV of US$ 782 K and the payback period of 5.2 years.

1.7 Project Benefits

Rehabilitation of the 13 local heating systems could provide various benefits for the city economy and population. In addition to the main goal of improving operating efficiency and quality of service for these 13 upgraded systems, these supplementary benefits will include:

- Reduced long-term cost of heat supply;
- Significant environmental improvements, mainly reductions in emissions of SO_2, NO_x and greenhouse gases from the boiler stacks;
- Technology transfer;
- Management capacity building.

The most significant benefit is revenue that will be generated by the project after the loan repayment. Project monetary savings are large due to the extensive operating efficiency improvements. This revenue can be used by Aqua Color to fund re-investment into upgrade of additional local heating networks. This alternative eventually upgrades all 66 networks with a relatively small investment, i.e., savings from the initial 13 network upgrades funds the phased upgrade of the remaining 53 networks.

1.8 Conclusions and Next Steps

Conclusions

The project is feasible and has promising capital budgeting indicators for district heating rehabilitation projects including a payback period of 4.6 years. The project is appropriate for commercial financing. Expected project benefits are significant and will lead to a more cost-effective heat supply, greater comfort in residential buildings, and more modern municipal infrastructure.

Recommended Next Steps.

Step 1: Approve Project and Select Financial Schemes

Specific technical measures and the project sponsor are identified. Aqua Color negotiates the tariff level for return of investments with ANRE. The project sponsor agrees on a financing scheme.

Step 2: Market Project to Lenders

Aqua Color identifies a lender and negotiates terms and conditions of financing including the loan security package. The Company clarifies the requirements for loan documents.

Step 3: Prepare Security Package for Project Financing

Aqua Color provides collateral acceptable by lenders, and the Municipality provides guarantees of the loan repayment.

Step 4: Develop Detailed Business Plan and Other Loan Documentation

Aqua Color finalizes the project technical design, prepares an implementation schedule, and prepares loan documents including a detailed business plan.

Step 5: Establish Project Management Team and Responsibilities for Implementation

A Project Management Committee is formed. Dedicated technical and financial staff is identified. Specific tasks required to implement the project are identified and delegated to the designated staff.

Step 6. Specify, Procure and Install Equipment

Detailed specifications are developed for specific equipment and modifications. Buildings and facilities are audited, vendors identified, and a tender offered. After award, an implementation schedule is agreed upon. Local or regional vendors are identified to install, commission and test the equipment to insure high-quality results and to provide a warranty for the work.

Step 7: Monitor and Verify Energy Cost Savings

A Monitoring and Verification (M&V) plan is developed to measure energy and cost savings. This plan also identifies monitoring equipment and assigns M&V tasks to specific members of the Project Management Committee. Savings for specific measures are verified on a monthly basis during the first year of the project and less often (every 3 months) afterwards. Energy savings information and data are forwarded to designated financial staff, so they can calculate energy cost savings due to the project.

Step 8: Provide Debt Service and Utilize Extra Savings

The energy cost savings is calculated. Depending on the financing approach that is used, the municipality may choose to set aside this amount in a special escrow account to provide for debt service.

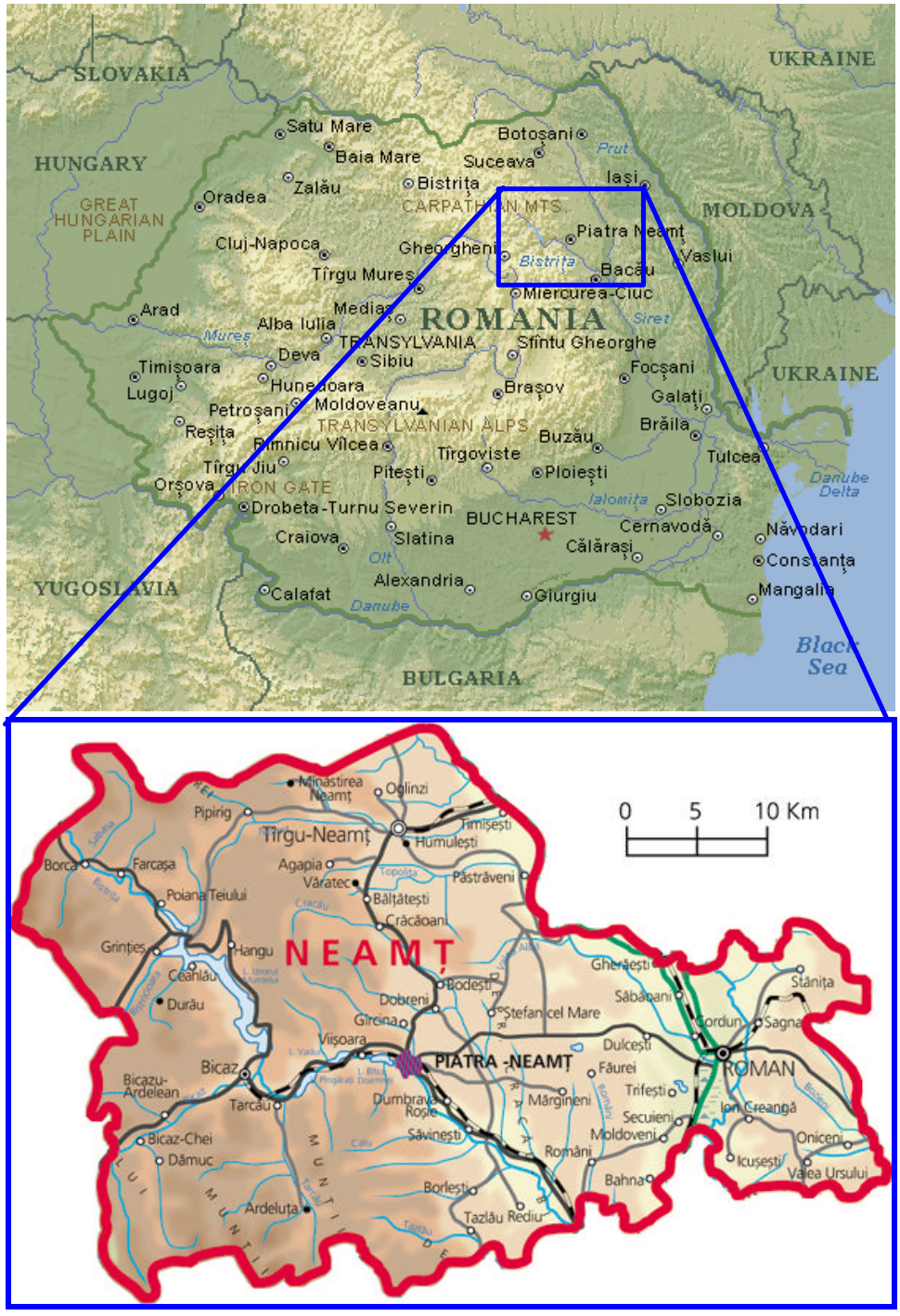
Step 9: Ensure Further Rehabilitation of the District Heating System

Aqua Color, the Municipality and owner associations reach agreement on flushing and cleaning internal heating networks inside the buildings connected to upgraded networks. Secured spaces are allocated inside the buildings for plate heat exchangers (PHE). Dedicated district heating company personnel are given continuous access to this equipment.

2 Municipality

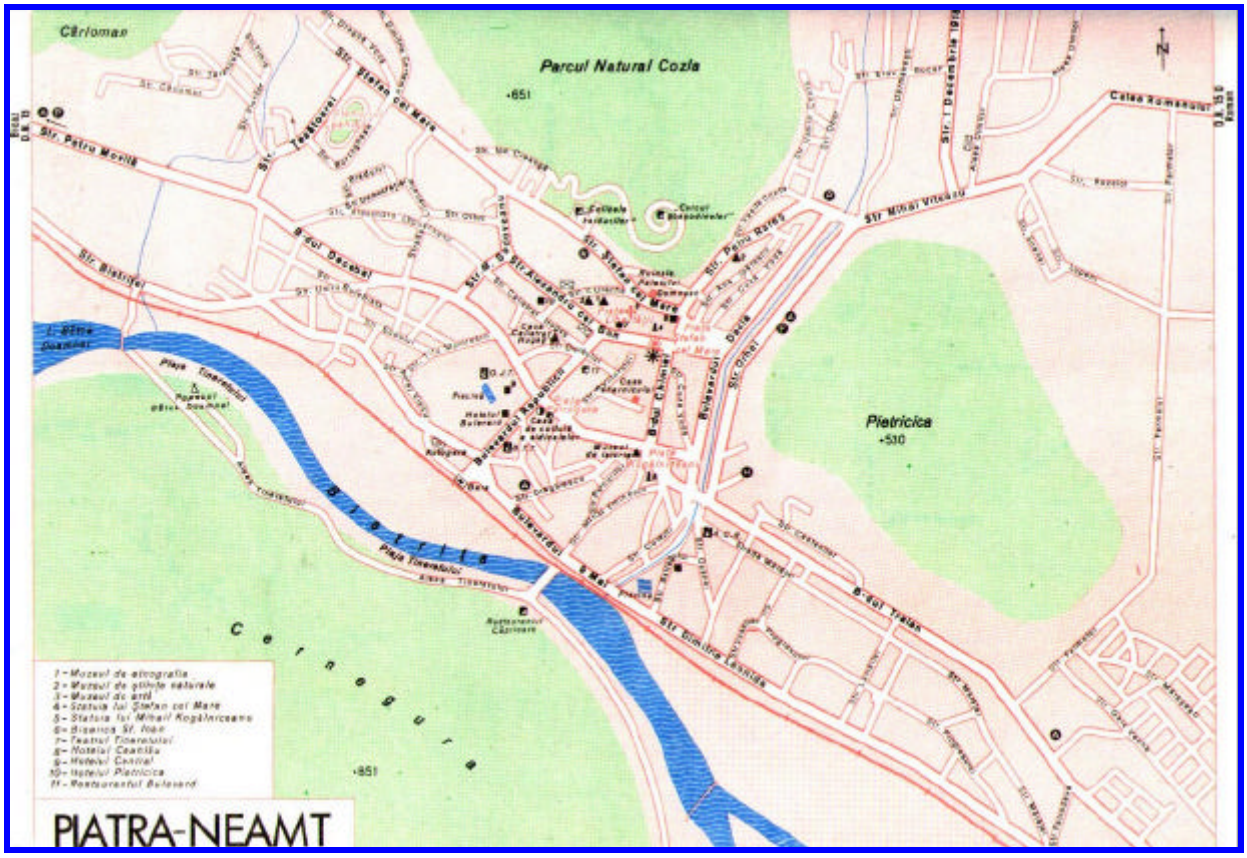
2.1 General Information

Figure 2-1. Map of Romania and Neamt County



The municipality of Piatra Neamt is situated in the Northeastern part of Romania (Figure 2-1) at the junction of two rivers, Cuejdi and Bistrita, and has a population of 124,189. Surrounded by mountains Pietricica (532 m), Cozla (850 m), Carloman (617 m), and Cernegura (851 m) at an average altitude of 345 m, it benefits from opportune nature. The city is the most important urban center of Neamt County and its capital. The municipality area is 7,747 ha, or just below 30 square miles (Figure 2-2), 46 % of which are forests, 32% are agricultural land, and 22% constitute urban zone.

Figure 2-2. Map of Piatra Neamt



The city is one of the major tourist attractions in this part of Romania. It is first documented in the 15th century as Piatra lui Craciun, or Camena, a market town where fairs were held. In the center of the city there is the Church of St. John built by Stephen the Great of Moldavia in 1497-98, a classic example of ornate Moldavian architecture. The Bistrita Monastery, founded at the beginning of the 15th century by Prince Alexander the Good and rebuilt in 1554 by Prince Alexander Lapusneanu, is 8 km (5 miles) west of Piatra-Neamt and is another of numerous landmarks of the Neamt County. The city houses a state Youth Theatre, the County library, the County museum of natural science, an archaeological museum of Neolithic pottery, the Art Museum, a House of Culture, Children Palace, Youth Club, art galleries and other cultural institutions. An artificial lake Izvorul Muntelui that lies to the northwest of Piatra Neamt is a favorite recreational site of the local population.

Piatra Neamt municipality has one hospital, 24 medical clinics and 17 pharmacies. There are also 4 medical units for children care and one for adults, as well as a nursing home. The education system includes 34 kindergartens, 24 primary and secondary schools and 10 high schools. Eight kindergartens function in Piatra Neamt.

Besides tourism, some other economic sectors contribute in a big extent to the Piatra Neamt economy: wood processing industry, hydroelectric power (there is a number of plants on the Bistrita river), chemical, textile and machine-building industries. Six banks represent the banking sector of Piatra Neamt.

Following the general Romania demographic trend of the low birth rate and strong aging of population, the area presents a slow decline in both general number of inhabitants and labor force (Figure 2-3). Nevertheless, the early data for 2001 indicates slight increase of population (to 124,607), considerable drop in unemployment rate (to 10.7%) and most dramatic increase in the number of employed.

Figure 2-3. Piatra Neamt Population and Employment Indicators

	1998	1999	2000	2001 (as of June 20)
Population	125,070	124,588	124,189	124,607
Of which employed	50,646	41,657	39,426	63,471
Unemployment rate	16.5%	17.8%	13.0%	10.7%

The Neamt County Labor Agency that provided data for 2001 explained that improvement in the Piatra Neamt job market situation is caused by the specific measures that were taken by the government to reduce unemployment rate. Starting in July 2001, according to this Agency, there will be additional measures implemented:

- amounts allocated for program supporting small and medium enterprises for 2001 will increase to 41 billion ROL compared to 6 billion ROL in 2000;
- funding of retraining of redundant staff will increase to 2.6 billion ROL compared to 1.25 billion ROL last year;
- subsidies to young university graduates within the framework of the Government Ordinance # 35/1997 will reach 4 billion ROL in 2001 up from 1.23 billion ROL in 2000;
- financing for development from the World Bank will be secured on the level of 10,8 billion ROL in 2001 instead of 200 million ROL previously.

As was mentioned before, business activity in Piatra Neamt is quite diverse, as can be seen in Figure 2-4, with trading and services constituting the majority of enterprises but such industries as artificial fiber manufacturing or metal works being notably represented as well.

Figure 2-4. Main Areas of the Business Activities for Economic Entities in Piatra Neamt.

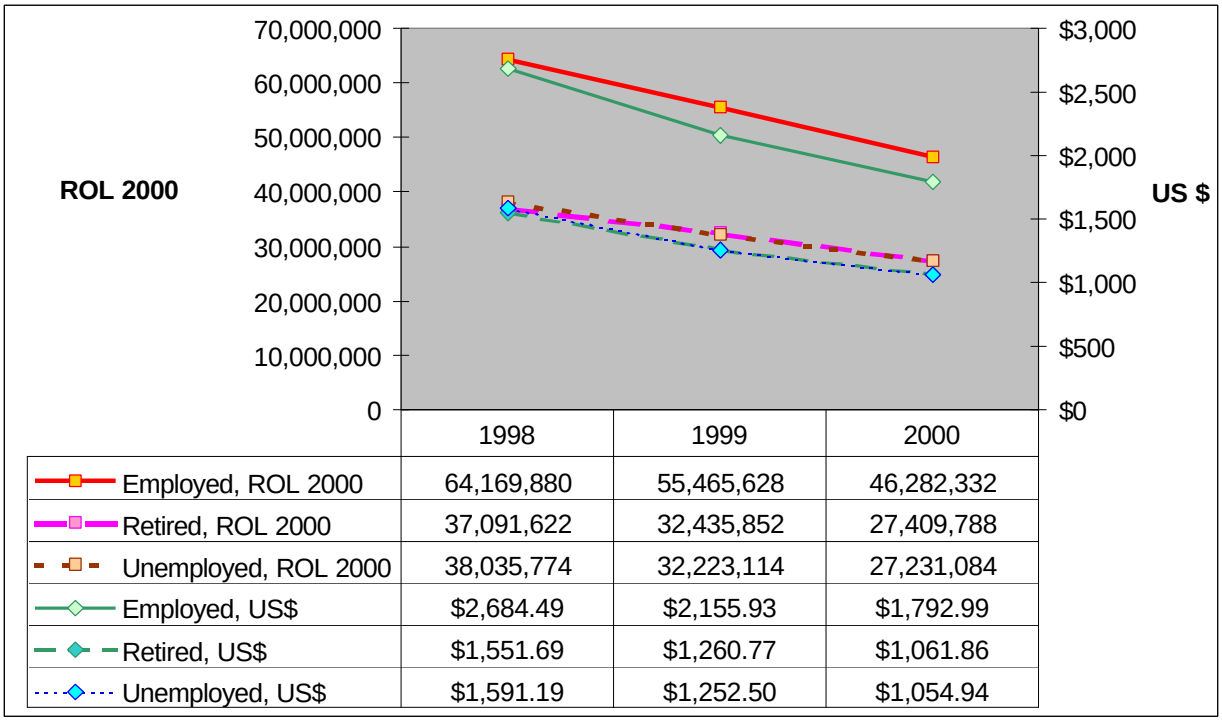
Activity	Number of economic entities
Retail and wholesale trading	1631
Services	263
Artificial fibers and garments	133
Civil and industrial construction	131
Transport	79
Food and beverages	76
Wood processing	69
Metal works	24
Publishing and related activities	22
Furniture manufacturing	21
Fertilizers	1
Agricultural equipment	1

Data supplied by the City Hall of Piatra Neamt indicates regular increase of average annual income for the city residents in nominal Lei (Figure 2-5). The more specific analysis, though, shows that population income has not kept in step with inflation (Figure 2-6), with the average income of an unemployed declining the most (28.4% from 1998 to 2000) and income of retirees declining the least (26.1%). Comparison of income in different years converted in hard currency shows the same trend, only a bit more pronounced (decline from 1998 to 2000 of 33.2%, 31.6% and 34.0% in the average income of an employed, retired and unemployed person, respectively).

Figure 2-5. Average Annual Income per Capita in Piatra Neamt (in Nominal Romanian Lei)

	1998	1999	2000
Average annual income per capita, ROL	21,849,720	30,885,228	33,304,104
Average annual income, ROL, for			
an employed person	29,462,268	39,421,200	46,282,332
a retired person	17,029,848	23,053,200	27,409,788
an unemployed person	17,463,336	22,902,000	27,231,084
Annualized inflation rate	40.6%	54.8%	40.7%

Figure 2-6. Average Annual Income per Capita in Piatra Neamt (in Iinflation-Adjusted Romanian Lei and US$)



	1998	1999	2000
Employed, ROL 2000	64,169,880	55,465,628	46,282,332
Retired, ROL 2000	37,091,622	32,435,852	27,409,788
Unemployed, ROL 2000	38,035,774	32,223,114	27,231,084
Employed, US$	$2,684.49	$2,155.93	$1,792.99
Retired, US$	$1,551.69	$1,260.77	$1,061.86
Unemployed, US$	$1,591.19	$1,252.50	$1,054.94

Likewise, general indicators of business activity in Piatra Neamt are contradictory. On one hand, from 1998 to 2000 the revenues of state-owned companies have declined (by 35% in nominal ROL and by 70% in inflation-adjusted ROL), and their income taxes dropped by 44.5% and 74.5% respectively (calculations based on Figure 2-7). On the other hand, total revenues of private and mixed-ownership companies are increasing, and even after adjustment for inflation they register 9% growth. Moreover, income taxes for private and mixed-ownership companies from 1998 to 2000 increased more than twice (by 124.2%), indicating growth of the average profit margin for Piatra Neamt businesses. This and many other things suggest that the precipitous decline in production and economic development, which was obvious for the last decade not only in this region but in Romania in general, is coming to an end, if is not yet reversed.

Figure 2-7. General Indicators of Buisness Activity in Piatra Neamt (thousand ROL)

	1998	1999	2000
Companies, private or mixed ownership			
Total Revenues	3,500,297,636	5,226,260,148	8,310,205,431
Income taxes	55,837,073	76,814,827	125,422,615
Property taxes	2,919,454	5,758,846	12,276,428
Companies, state ownership			
Total Revenues	177,961,231	107,602,455	115,394,993
Income taxes	2,358,439	1,010,902	1,308,592
Property taxes	1,746,305	1,138,554	1,680,951

Among major employers of Piatra Neamt there is a number of stable and growing companies (Figure 2-8). But the vast majority of residents are working in small firms, nearly all of which employ just several people.

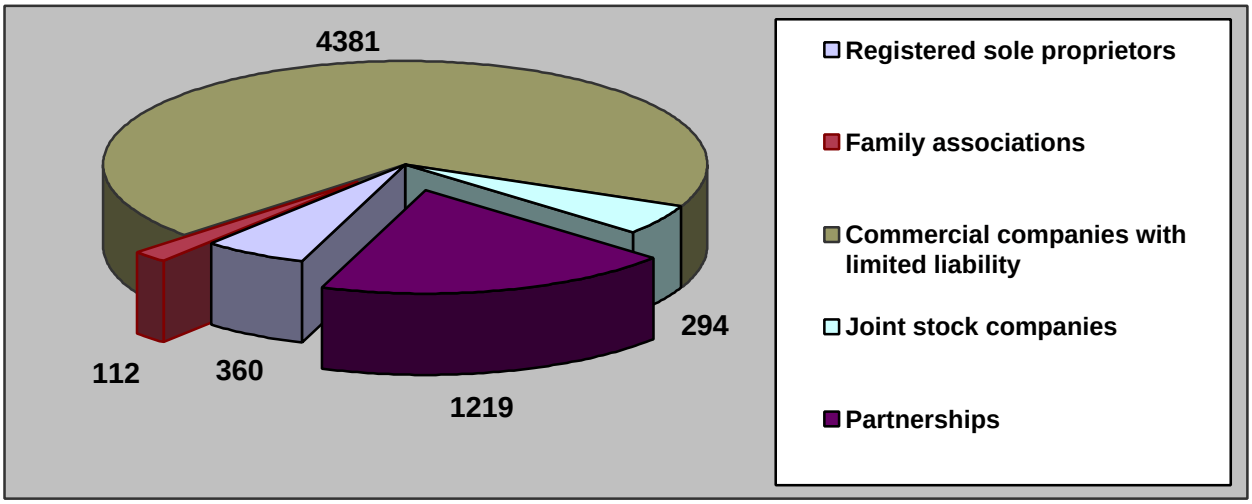
Figure 2-8. Major Employers in Piatra Neamt

Company	Business Description	Ownership	Number of Employees		
			1999	2000	2001
SC FIBREX NYLON SA	Artificial fibers and chemical compounds production	Private	3000	3500	3800
SC EMA SA	Knitting	State owned	1200	1210	1250
SIL PETROFOREST	Logging and Wood processing	Private	1000	1120	1200
SC MECANICA CEAHLAU SA	Agriculture equipment and spare parts production	Private	980	1000	1100
SC AZOCHIM SA	Fertilizers production	Private	800	860	900
SC PAMEX SA	Furniture production	Private	500	520	550
RIFIL SA	Fibers and garments production	Joint venture (Romanian-Italian)	400	420	450
SC PETROCART SA	Cardboard and special paper stock production	State owned	400	430	450
SC ZONOCERAM SA	Brick and tile production	Private	300	320	350
SC IMOB SA	Furniture production	Private	280	300	320
SC MONTANA SA	Dairy production	State owned	300	310	320
SC TRANSMOLDAVIA SA	Transportation company at the county level	Private	250	270	300
SC COMES SA	Machines and equipment	State owned	200	220	250
SC ZIMCA	Brewery	Joint venture (Romanian-German)	100	105	120
SC PERGODUR SA	Paper production	State owned	100	110	115

This is typical for Romanian cities and is in line with the breakdown of Piatra Neamt business entities by legal type (Figure 2-9) that shows significant shares of sole proprietors, partnerships, family associations and commercial companies with limited liability (the last being a legal structure that is adequate for a major business but tends to be used mostly by small firms with few employees). The total number of economic entities registered in Piatra Neamt municipality is about 6,400, of which 68.8% are companies with limited liability, while 26.6% is comprised of family associations, sole proprietorships and partnerships. Less than 5% are represented by joint stock companies. Most of the small enterprises are

service or trading companies. Their great number counterbalances instability of their individual performance, so as a whole this sector of the local economy performs more or less steadily.

Figure 2-9. Types of Economic Entities Registered in Piatra Neamt



2.2 Institutional and Legal Framework

Romania is getting initial experience with decentralized national governance. While Article 119 (Chapter V, Section 2) of the Constitution of Romania states that public administration is "based on the principle of local autonomy and decentralization of public services," local governing bodies still have restricted legal authority and even that formal authority is de facto limited by the central government's control over a major part of financial resources. There have been continuing efforts to amend the laws and fiscal policies to make local administration more effective and sustainable; namely, these were the explicit goals of the Local Public Finance Law # 189 of 14/10/1998 and of the recently adopted new Law # 215 of April 23, 2001. Nevertheless, a number of persistent contradictory regulations and economic practices make the process very slow.

The somewhat contradictory and deficient state of the legal framework and practices is not unique to the issues of local public administration; in general, legislative process in Romania is often inconsistent. According to the Romanian Constitution, the only legislative authority in Romania is the Parliament, and therefore only the Parliament can pass **Laws** (the Government has legislative initiative, i.e. it may only propose specific draft laws or legislative suggestions to the Parliament). On the other hand, in order to insure implementation of the internal and external policies and public administration in general, the Romanian Government can issue **Decisions** and **Ordinances**. Decisions are issued in order to organize the execution of a specific law already passed by the Parliament. Ordinances can be of regular and **emergency** types; both are issued only in periods when the Parliament is not in session and/or for extremely urgent problems. An ordinance must be approved by the Parliament and transformed into a law as soon as possible. In reality, though, an ordinance may be valid for years before the Parliament takes it under consideration. This practice of ruling the country through ordinances is in fact the most controversial legal aspect of the recent governments Romania has had. There is no formal limitation for the issues addressed by an ordinance or the way it solves a problem and no previous law is necessary. Therefore, there are currently numerous ordinances that are practically laws in scope and in function, although the Parliament hasn't approved them yet.

To further detail the provisions of a law, government decision or ordinance, the specific Ministries may issue **Orders** and **Norms**. Similarly, national bodies (like the recently constituted ANRE) may issue **Decisions, Orders** and **Instructions** or **Norms**. There is no legal limitation for the scope of such low-level legislative acts either. In fact, in Romania often the most important legislative act is a Norm (or Order) because it deals with the day-to-day activity and could turn upside down every provision of the higher-level laws. So the theoretical chain "law - government decision - government ordinance - order of a Ministry" occasionally has missing links or even is pulled from the wrong end.

The country consists of 40 counties that have 262 towns, of which 79 are municipalities, and 2,686 communes composed of more than 13,000 villages (the capital city of Bucharest also has the status of a county). The counties are administered by county councils and their chairmen. Additionally, to each county the central government appoints prefects, who represent its interests at the local level and who oversee county and municipal activities, mainly from the point of view of their compliance with the national legal framework. According to the new Law on Local Public Administration, a county council has many prerogatives, the major of which are:

- elaboration and implementation of goals, strategies, and programs and to facilitate the social and economic development of the county;
- general administration of the public and the private domain of the county;
- ensuring the material and financial conditions for the implementation of cultural, educational, and social programs;
- coordination of the activity of local councils at the county level to provide efficient delivery of public services.

From the point of view of this study, it is important that a county council develops and approves the budget of the county, including allocation of the transfers from the state budget among the county cities and villages, authorizes construction, modernization and maintenance of all the infrastructure of the county, can help cities and villages with infrastructure-related problems and is in charge for environmental protection programs.

The council's President, Vice-Presidents and several other councilors form a so-called "permanent delegation" – they are salaried employees whose full-time occupation is work in the county council. Other members of the county council have separate jobs; they are not engaged in the work of the county council full-time, although they are paid for performing the duties in the council. The permanent delegation develops the agenda of the council meetings, prepares draft decisions or other relevant documents and oversees the implementation of the council's decisions. The number of members of a county council depends on the county population and ranges from 31 (population up to 350,000) to 37 (population over 650,000); according to the new law the number for the Neamt County should be 31.

Municipalities and communes are governed by mayors and local councils, which are elected for four-year terms in direct local elections (last elections to the local councils, as well as mayoral elections, were held on June 4, 2000). The number of members of each local or county council is also determined by the population of the locality and may vary from 9 to 31. The Piatra Neamt City Council has 23 members representing six different parties: three persons from Democratic Party (DP), two persons from the National Peasant Christian Democratic Party (NPCDP), six members of Social-Democratic Party (SDP), three Great Romania Party (PRM) members, two from the Alliance for Romania (AfR), two with National Liberal Party (NLP) and five independent (the full list of members see in the Informational Attachment **A**). The mayor and one vice-mayor represent SDP and the second vice-mayor - the Alliance for Romania.

The City Council consists of five permanent commissions: the commission for studies, social-economical prognosis, budget, finance and administration of the public and private property of the municipality; the commission for organization and town planning development, implementation of public works, environmental protection, preservation of architecture and historical monuments; the commission on

public services and trade; the commission for scientific activities, education, health, culture and social care, sport, tourism and citizens' rights; and the commission in charge for local public administration, legal advice, preservation of public order, ensuring citizens' rights and liberties. There is no permanent chairman of the local council: the chairmanship rotates monthly among the chairs of the commissions

The rights and responsibilities of the local council and the City Hall are determined by the Law on Local Public Administration # 69 of November 26, 1991 (in particular, by Art. 44 (1), (2)) with later amendments to it, mainly in the Law # 24 of April 12, 1996 and the Art. 38 of the new Law on Local Public Administration that came into force on April 23, 2001. To the most part, they mirror the rights and responsibilities of a county council, only at the local level. Main issues addressed by a local council are approval of the local budget, establishment of local taxes and fees, management of the public and the private domains of the town; decisions on issuing concessions of the public services or renting the public property of the town, and approval of the investments of local interest and providing the means to build, maintain and improve the local infrastructure. Regular meetings of the local council for the discussion of general issues occur monthly and typically have an agenda with several items. Meetings of the commissions happen twice a month. If there is an urgent problem, the mayor can call an extraordinary meeting of the city council.

Any member of the council, acting alone or on behalf of a citizen, can put forward a proposal for action or discussion on the local council. A proposal then is directed to the relevant commission or commissions. The commissions may request information and documents and address questions to the Mayor, vice-mayors, Secretary of the Municipality and directors or heads of departments and units within the City Hall. After the approval vote by the commission, a proposal goes for a vote on the full council meeting. The discussion of a proposed decision at the Council meetings is preceded by the presentation of a project justification by its sponsors and of endorsement reports by the responsible commissions. In case the Council decides to reconsider draft decisions, these will be sent back to the responsible commission and the department of the City Hall that deals with that issue. After this process is completed, the revised draft decisions will be included on the agenda of next meeting of the Council. Issues related to the local budget and citizen complaints are discussed in public.

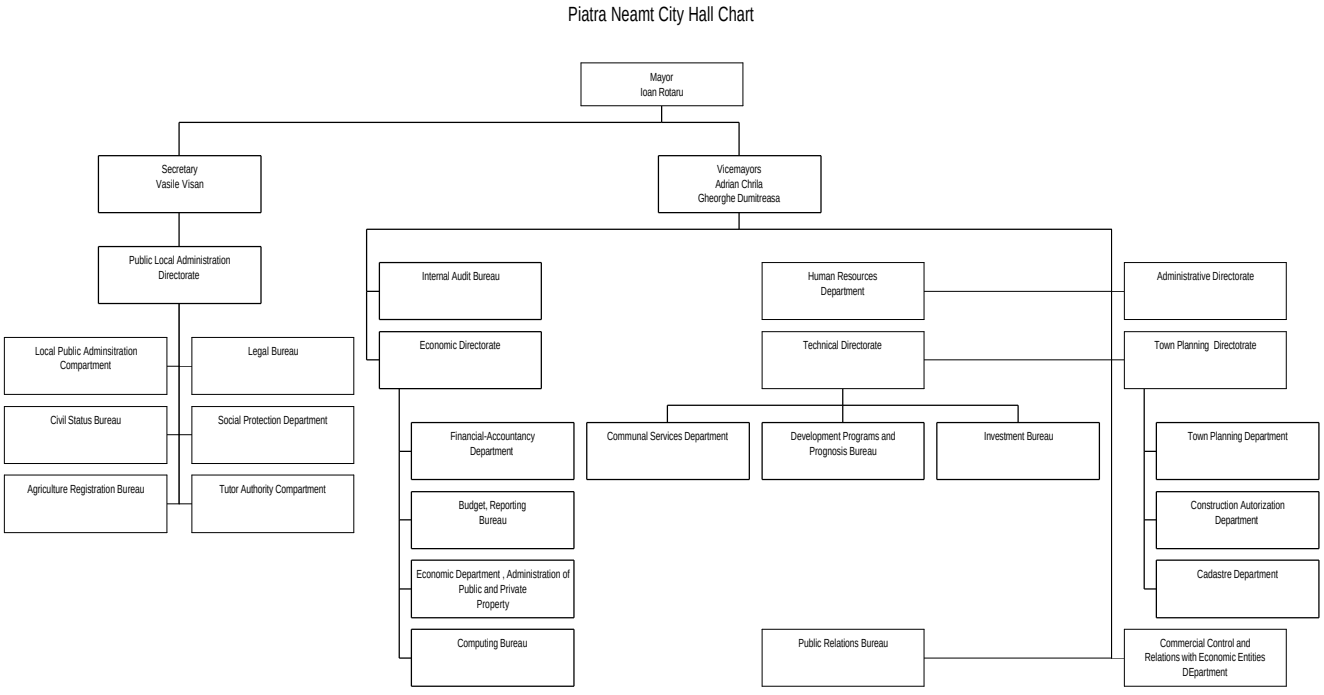
Also, a proposal is considered by the legal advisor of the City Council, who is appointed by the county prefect and, despite its misnomer title, represents the interests not of the city council but of the national government. If legal advisor does not approve a proposal and the council disagrees with the decision of the legal advisor, it can appeal the decision to the county prefect and then to the Administrative Court. For ordinary issues, the quorum requirement is 2/3 of the council, and majority needed for approval of ordinary proposals is half from present votes plus one. If an issue concerns local budget or local taxes, majority requirement changes to half plus one vote out of the full number of counselors. If an issue concerns local development (as the term is defined by the legal advisor) or the internal or external associations (i.e., involves cooperation with other local councils), majority requirement changes to 2/3 votes out of full number of counselors.

There are only two issues that are formally scheduled for voting: local budget and local taxes. All other issues are discussed and voted on ad hoc. Local taxes for the next year have to be approved annually before November 30. Local budget has to be approved after the national and county budgets. The procedure for development and approval of the local budget is long, slow and most of the time late. The first version of a local budget for the current year is supposed to be approved by October 25 but is often finalized later (a draft should be developed in the City Hall and proposed by the mayor to the local council). After approval in the council, the draft budget goes to the county council. After receiving proposals from all the locales, county council develops county budget that is submitted to the national government. After receiving input from all counties, the central government develops a national budget for the country and get an annual Law on the budget approved in the Parliament (usually, it happens by March –April but can be seriously delayed: in 1997 the budget law was approved on April 26 and in 1999 on March 6, while in 2000 on May 2 and in 1998 only on June 02; the budget law for 2001 was

completed in April). This law, which contains the amended budget figures for every county, triggers the second round of adjustments to county budgets. When the amended county budgets are approved, local councils have to reconsider their own budgets in order to accommodate the latest changes. Therefore, the final version of a local budget emerges sometime in the summer, half through the year for which it is developed. Meanwhile, the City Hall has to operate on one twelfth of the last year budget monthly (this amount is transferred from the state budget to the special line of a local budget). This creates considerable uncertainty that further limits decision-making on the local level.

Even though formally the jurisdiction of local councils and City Halls is determined by numerous legal acts, in practice there is no fixed list of obligations for local authorities, and their rights and responsibilities can be influenced by a number of laws and regulations of different origin. First of all, an annual budget law can modify the scope of authorized or disallowed expenditures for a local budget. Then, other laws or ordinances can impose additional burdens – e.g., the Law on Education # 84 of July 24, 1995 as amended by the Law # 98/2001 of March 26, 2001 specifies that local budgets bear all expenses for primary and secondary education with the exception of teachers salaries, and Emergency Ordinance # 162 of October 28, 1999 dictates that local budgets have to pay district heating bills for households with low income. Finally, there are continuous changes in rules and regulations related to taxes and fees, both national and local, so the revenues of the local budget are subject to the same uncertainty as the expenses.

Figure 2-10. Organization Chart of the Piatra Neamt City Hall



The Figure 2-10 presents the organization chart of the Piatra Neamt City Hall. The mayor, two vice-mayors and secretary, with the staff subordinated to the mayor, form the City Hall of the Municipality, which is a permanent public institution that implements the decisions of the City Council and finds solutions to everyday problems of the local community. The City Hall staff is divided into directorates, departments and units. The mayor, as a person responsible for the local public administration, is in charge with the entire activity of the City Hall in accordance with the Art. 67 of the Law on Local Public Administration # 215/2001. Vice-mayors coordinate the specialized departments of the City Hall, in accordance with the organization chart and the decisions of the mayor.

2.3 Municipal Budget

Revenues

Structure of local budgets is unnecessarily complicated: the income part of the municipal budget in detail disclosure form consists of 94 rows, and expense part of 336 rows. A budget is usually funded by a great number of different sources regulated by even greater number of legal acts, while most of them represent a very small percentage of the total budget revenues. Specifically, municipal budgets are formed from three main sources of revenues: local revenues (fiscal and non-fiscal), transfers from the county budget, and transfers from the national budget. Within these subdivisions, revenue sources also differ by nature (taxes, fees, subsidies or transfers) and purpose (general use funds or special destination revenues, which can be so detail as to include a separate line like "Revenues from renting, selling and giving concession on the goods under the management of public hospitals"). This complexity not only impedes dependable financial planning and forecasting by the local authorities but also invites collection difficulties and enforcement problems.

Figure 2-11. Main Indicators of the Piatra Neamt City Budget. Revenues

	1998			1999			2000		
	('000 ROL)	(US$)	(%)	('000 ROL)	(US$)	(%)	('000 ROL)	(US$)	(%)
OWN REVENUES									
Tax revenues									
Taxes from population, including	4,650,535	$ 423,739	9.58%	23,511,295	$ 1,285,824	23.06%	28,005,376	$ 1,084,933	17.82%
Locally collected individual income taxes	2,784,333	$ 253,698	5.74%	5,902,815	$ 322,823	5.79%	1,729,452	$ 66,999	1.10%
Individual property taxes	934,254	$ 85,126	1.92%	16,245,506	$ 888,461	15.93%	25,767,420	$ 998,234	16.39%
Other taxes and fees from the population	125,715	$ 11,455	0.26%	1,362,974	$ 74,541	1.34%	508,504	$ 19,700	0.32%
Taxes from legal entities, including	2,889,241	$ 263,257	5.95%	5,517,221	$ 301,735	5.41%	14,640,691	$ 567,183	9.31%
Corporate property taxes	2,889,241	$ 263,257	5.95%	5,517,221	$ 301,735	5.41%	14,640,691	$ 567,183	9.31%
Income tax on autonomous regies subordinated to the local authority	-	$ -	-	-	$ -	-	-	$ -	-
Agriculture income tax	-	$ -	-	-	$ -	-	-	$ -	-
Other locally collected taxes and fees	866,819	$ 78,981	1.79%	1,696,846	$ 92,800	1.66%	4,389,980	$ 170,069	2.79%
Total tax revenues	8,406,595	$ 765,977	17.32%	30,725,363	$ 1,680,359	30.14%	47,036,047	$ 1,822,184	29.92%
Non-tax current revenues									
Profit from autonomous regies subordinated to the local authority	-	$ -	-	-	$ -	-	-	$ -	-
Revenues from public institutions	1,323,110	$ 120,557	2.73%	2,204,315	$ 120,553	2.16%	1,581,249	$ 61,258	1.01%
Miscellaneous revenues	1,439,230	$ 131,137	2.97%	1,848,021	$ 101,068	1.81%	3,083,410	$ 119,452	1.96%
Total non-tax current revenues	2,762,340	$ 251,694	5.69%	4,052,336	$ 221,621	3.97%	4,664,659	$ 180,710	2.97%
Revenues from equity	1,720,498	$ 156,765	3.54%	859,410	$ 47,001	0.84%	2,957,214	$ 114,563	1.88%
Revenues with special destination	-	$ -	-	13,815,385	$ 755,558	13.55%	11,689,604	$ 452,857	7.44%
TOTAL OWN REVENUES	**12,889,433**	**$ 1,174,436**	**26.56%**	**49,452,493**	**$ 2,704,539**	**48.51%**	**66,347,524**	**$ 2,570,314**	**42.21%**
REVENUES FROM OTHER SOURCES									
Municipal share of individual income tax collected through Financial Administration	16,400,000	$ 1,494,305	33.79%	33,912,791	$ 1,854,678	33.26%	56,644,353	$ 2,194,412	36.03%
Allocations from the county budget	-	$ -	-	-	$ -	-	4,200,000	$ 162,709	2.67%
Subsidies, including									
Heat subsidies from the state budget	11,445,234	$ 1,042,846	23.58%	3,095,000	$ 169,264	3.04%	21,344,000	$ 826,870	13.58%
Investment subsidies from the state budget	7,800,000	$ 710,706	16.07%	11,289,757	$ 617,433	11.07%	-	$ -	-
Subsidies from other budgets	-	$ -	-	-	$ -	-	4,358,457	$ 168,847	2.77%
Total subsidies	19,245,234	$ 1,753,552	39.65%	14,384,757	$ 786,697	14.11%	25,702,457	$ 995,718	16.35%
Financial revenues									
Investment loans	-	$ -	-	4,000,000	$ 218,759	3.92%	4,300,000	$ 166,583	2.74%
Short-term (operating) loans	-	$ -	-	198,881	$ 10,877	0.20%	-	$ -	-
Other financial revenues	-	$ -	-	-	$ -	-	-	$ -	-
Total financial revenues	-	$ -	-	4,198,881	$ 229,635	4.12%	4,300,000	$ 166,583	2.74%
TOTAL REVENUES FROM OTHER SOURCES	**35,645,234**	**$ 3,247,857**	**73.44%**	**52,496,429**	**$ 2,871,011**	**51.49%**	**90,846,810**	**$ 3,519,421**	**57.79%**
TOTAL REVENUES	**48,534,667**	**$ 4,422,293**	**100.00%**	**101,948,922**	**$ 5,575,549**	**100.00%**	**157,194,335**	**$ 6,089,735**	**100.00%**
Exchange Rate ROL/US$	*10,975*	*at December 31*		*18,285*	*at December 31*		*25,813*	*at December 31*	

The taxation system has dramatically changed in Romania since the end of the socialist regime in 1989. The current legal framework is defined by more than a dozen of laws and even greater number of ordinances and decrees enacted since early 90s[1]; many of them are contradictory, so the system still is in

[1] Main legal acts that define Romanian taxation system are: Law # 12 of January 30, 1991 on excess profits tax; Law # 73 of July 12, 1996 on profits tax as amended by Emergency Ordinance # 83 of December 23, 1997, Government Ordinance # 40 of January 30, 1998, Emergency Ordinance # 47 of April 20, 1999, Emergency Ordinance # 139 of September 14,

the state of constant flux. For an outsider, it is very difficult to discern or predict a consistent thrust of the reforms. One must assume they are undertaken with the intention of making the whole system more simple and transparent, but the efforts often result in increased, not reduced confusion and uncertainty.

Analysis of the Piatra Neamt budget revenues for the last three years (Figure 2-11 and a more explicit table in Attachment **B**) shows that relative importance of different sources slightly changed from year to year. Again, it is difficult to deduce from changes a rational trend – it's more likely that they are the result of the interplay by a variety of random factors.

Among own tax revenues of the Municipality, taxes from population and taxes from legal entities, located and registered in the city, represent roughly comparable shares: the former increased form 9.58% in 1998 to 23.06% in 1999, then dropped again to 17.82%, while the latter in 1999 decreased to 5.41% from 5.95% in 1998, then have grown to 9.31% in 2000.

Figure 2-12. Major Corporate Taxpayers in Piatra Neamt. Total Amount of Local Corporate Taxes ('000 ROL)

Company	1998	1999	2000
State-owned companies			
AGROINDUSTRIALA PIATRA NEAMT SA	87,880	85,798	103,873
AVICOLA SA	379,985	378,766	378,766
CARPIN SA	401,124	279,966	555,613
MECANO STAR SA	91,184	131,465	220,537
PERGODUR SA	275,822	N/A	248,436
Companies with private and mixed ownership			
EMA SA	44,872	35,069	350,881
MECANICA CEAHLAU	94,998	91,511	174,499
MOLDOCOR SA	63,559	123,613	137,230
MONTANA SA	190,082	373,917	674,083
PAMEX SA	72,644	98,842	83,312
SEF PETROFOREST	114,585	481,237	1,103,857
ZIMCA SA	49,876	57,353	151,129
ZONOCERAM SA	29,836	65,332	177,000
TOTAL	**1,896,447**	**2,202,869**	**4,359,216**

The bulk of corporate tax revenues comes from corporate property taxes, namely taxes on land and taxes on buildings (3.97%, 3.68% and 7.01% of total revenues in 1998 through 2000 respectively, see Attachment B). Next is the corporate tax on means on transportation (it is based on the displacement

2000, and Emergency Ordinance # 246 of November 20, 2000; Law # 32 of March 29, 1991 on wage and salary tax, as modified by Government Ordinance # 62 of August 28, 1997 and Government Ordinance # 6 of January 23, 1998; Government Ordinance # 15 of August 19, 1992 on local taxation and Law # 27 of May 17, 1994 on local taxation, as amended by Government Ordinance # 61 of August 28, 1997, Emergency Ordinance # 84 of December 23, 1997, Emergency Ordinance # 62 of December 28, 1998, Emergency Ordinance # 15 of March 2, 1999, Emergency Ordinance # 27 of March 25, 1999, and Law # 67 of April 27, 2000. Other relevant acts of less significance - like Law # 34 of May 30, 1994 on agricultural income tax and amendments to it; Law # 147 of July 13, 1998 on entertainment tax, or Governmental Ordinance # 82 of December 23, 1997 on excise tax and other indirect taxes and fees - are too numerous to describe here.

volume of the internal combustion engine plus on type of a vehicle or boat) and then the advertisement tax (based on the size of the advertisement sign and its location). All other taxes and fees from legal entities (like entertainment tax, stamp duties, charges for licenses and different permits) make up a negligible part of the budget.

In accordance with the aforementioned specific structure of business entities in Piatra Neamt, most of corporate taxes are paid by a limited number of major companies (Figure 2-12), which makes collection process more manageable and revenues more predictable.

It is important to notice that companies and other legal entities, located and registered in a city, do not pay any part of their income taxes to the municipal budget, either directly or indirectly (via transfer from the national budget). The only exception pertains to Autonomous Regies, which are kind of state-owned corporations that perform essential public function (like public utilities) and therefore are regulated in a special way. This business form, patterned after the French model, was introduced in Romania by the Law on State Owned Enterprise Restructuring, # 15 of August 8, 1990 but started to emerge in earnest after the Government Ordinance # 69 of 24 August 1994. The municipality is financially responsible for the local Regie's operating results and can exercise corporate governance over it: board members are appointed by the local council, enterprise managers are appointed by the municipality.

In accounting terms, Autonomous Regies follow the general rules for commercial entities, but they are treated separately on the issues of profit tax and distribution of net profit. Profit tax of a local Autonomous Regie is paid to the respective local government budget as a direct tax. Then, according to the Government Ordinance # 23 of July 26, 1996, net profit is divided the following way: 10% constitute a profit share of employees, and from 50 to 90% goes to the local budget as a non-fiscal revenue (it is the local council which determines the percent of net profit to be transferred to its budget within this range). The share of net profit not transferred to the local authority is to be dedicated by the Autonomous Regie to development or investment purposes. Piatra Neamt municipality used to have an Autonomous Regie that provided the city with heat, hot water, sewage and other services, but in 1997 it has been transformed into a commercial company SC Aqua Calor SA (more on specifics of Autonomous Regies and the legal status of Aqua Calor see below). Accordingly, after the transformation there are no entries in municipal budget on the lines for income tax or share of the profit from Autonomous Regies.

Structure of the budget revenues from the population is even more complicated. There are about a dozen taxes or fees that a person has to pay: property taxes (tax on buildings based on their value, separate tax on land under them based on its area, and tax on personal means on transportation), fees for using state-owned land (market use fees), fees and charges for licenses and authorizations of different kind, judicial fees and other stamp duties.

The most convoluted situation is with individual income tax. Currently, all sources of income for a person, with the exception of salary, are taxed and collected locally. There are separate taxes for income of professionals (freelancers), artisans and family associations[1], for income from rent and sub-renting[2], for income from royalties, copyrights, patents and other forms of intellectual property[3], tax on income related to getting awards, bonuses and earnings in kind[4], income from activities performed under concessions and franchise agreements, etc.

1 These kinds of income are taxed at progressive rate from 15% to 35% for professionals and from 10% to 54% for artisans and family associations.

2 This is a flat tax of 15% payable quarterly in equal installments.

3 This tax is calculated on the year-to-day basis on the same progressive scale as the tax for professionals and is withheld by the payer at each payment. Income from inventions and innovations is taxed at flat rate of 20%.

4 This is a 10% tax.

Individual income tax of salaried employees (which is often called salary or wage tax) is treated differently. It is withheld by an employer from the paycheck of its staff and is transferred to the local offices of Financial Administration (representative branches of the national Ministry of Finance). This tax used to go directly to the national budget and then to come back to local authorities in the form of different subsidies and transfers, mostly as special allocations with prescribed spending, and these transfers were often late or contingent on the solvency of the national budget. In order to increase local independence, the government passed the Law on Local Public Finance (Law No. 189 of 14 October 1998), Article 8 of which stipulated that a share of the salary tax has to go to the local budgets directly and immediately from the local offices of Financial Administration. The tax is split the following way: 50% goes to the state budget, 40% to the budget of the municipality and 10% to the budget of the respective county. This provision was supposed to bring some certainty to municipal budget planning and execution, and to a significant degree it succeeded: payments from local branches of Financial Administration proved to be much more dependable than transfers before. Nevertheless, the solution is still not ironclad. The same Article 8 specifies that the quotes can be annually modified by the state budget law. And indeed, budget laws of the next years changed the municipal share of these taxes from 40% in 1998 to 35% in 1999, then back to 40% in 2000 and down to 36.5% in 2001, making any municipal long-term budget planning very difficult.

The share of salary tax is a very important source of the municipal budgets. In Piatra Neamt, it accounted for 33.79% of the budget in 1998, 33.26% in 1999 and 36.03% in 2000. Though these proceeds cannot be formally considered “own revenues”, in practice, since they are diverted to the municipal budget directly from the local branch of Financial Administration and immediately at the time of the salary tax collection, they are more reliable than almost any other external or even some internal revenues.

The disparate treatment of individual earnings obtained through salary and other sources of income was supposed to end with the passage of the Government Ordinance 73 of 27 July 1999 that introduced the new system of taxation called the Annual Global Income Tax for individual income tax collection. This ordinance defined the general term "income" and determined the different categories of income such as wages, rents, etc., as well as the different categories of taxpayers and the incomes that are to be exempted from taxation. The Annual Global Income Tax shall be determined based on the yearly income statement that all taxpayers (except those whose income consists only from salary and for whom the income statement is submitted by their employers) must submit to the local fiscal authorities according to the previous Government Ordinances 82/1998, 78/1998 and 68/1998. The tax rate ranges from 18% to 40% depending on the individual’s total annual income. The shares of the new Global Income Tax will go to municipal and county budgets under the same terms and conditions that shares of the former salary tax were subject to.

The law on Global Income Tax came into force on January 1, 2000, but its practical implementation was delayed by continuous changes and amendments to it brought by Emergency Ordinance 87 of 29 June 2000, Emergency Ordinance 235 of 24 November 2000 and, most recently, Emergency Ordinance 46 of 23 March 2001. Since many issues related to the tax were still not finalized, taxpayers were allowed to delay their 2000 income tax statement until May 31, 2001.

It is difficult to predict the effect that impending enactment of the Global Income Tax system will have on municipal budgets. On the one hand, giving fiscal authorities jurisdiction over different income taxes that used to be collected by the local administration holds the promise of increased collection rate and better enforcement. On the other hand, some of these taxes not only change from own municipal revenues to transfers from local branches the treasury, but become a subject to sharing with the state and county budgets according to the ratios that can be easily amended every year. Most likely, the effect of the new system will be minimal due to the simple fact that locally collected individual income taxes of all kinds used to amount to one sixth of the municipal share of the salary tax, so any changes to this part of the budget are likely to be not too substantial.

Overall, the revenue part of Piatra Neamt budget seems quite stable and secure: total revenues steadily increased from US$ 4.42 M in 1998 to US$ 5.58 M in 1999 and then to US$ 6.09 M in 2000, growing from US$ 35 per capita to the typical for Romania level of US$ 49 per capita. Meanwhile, the share of subsidies in total revenues decreased from 39.65% in 1998 to 16.35% in 2000; the share of local revenues increased from 26.56% in 1998 to 42.21% in 2000, and the share of revenues that can be considered dependable (own revenues plus municipal share of individual income tax collected through local Financial Administration) has grown from 60.35% in 1998 to the quite high level of 78.24% in 2000.

Expenses

As was pointed out above, there is no fixed list of obligatory spending items for a municipal budget, and a municipality can be burdened with or, conversely, relieved of some economic liabilities by the passage of a new law, governmental ordinance or even an order of a Ministry. Nevertheless, analysis of the Piatra Neamt municipal budget expenses for 1998 – 2000 (Figure 2-13 and more specific Attachment **C**) shows fairly consistent pattern of allocations among major types of expenditures: more than half of available funds go to the public services and development (59.10%, 55.08% and 56.22% in 1998 through 2000 respectively) and the rest shared mainly between social/cultural and administrative expenses.

Figure 2-13. Main Indicators of the Piatra Neamt City Budget. Expenses

	1998			1999			2000		
	('000 ROL)	(US$)	(%)	('000 ROL)	(US$)	(%)	('000 ROL)	(US$)	(%)
EXPENSES									
Executive authorities	6,765,937	$ 616,486	13.24%	11,444,026	$ 625,870	11.45%	21,572,992	$ 835,741	13.58%
Social and cultural expenditures									
Education	6,266,583	$ 570,987	12.26%	11,423,447	$ 624,744	11.43%	9,460,420	$ 366,498	5.95%
Health	2,254,330	$ 205,406	4.41%	1,940,000	$ 106,098	1.94%	1,607,204	$ 62,263	1.01%
Culture, religion and sport and youth activities	291,071	$ 26,521	0.57%	1,001,491	$ 54,771	1.00%	3,046,274	$ 118,013	1.92%
Social assistance, allowances, pensions, and other similar expenditures	2,661,937	$ 242,545	5.21%	3,246,697	$ 177,561	3.25%	10,632,260	$ 411,896	6.69%
Total social and cultural expenditures	**11,473,921**	**$ 1,045,460**	**22.44%**	**17,611,635**	**$ 963,174**	**17.62%**	**24,746,159**	**$ 958,670**	**15.58%**
Public services and development									
Street maintenance and repair	4,179,250	$ 380,797	8.18%	9,677,744	$ 529,272	9.68%	24,052,174	$ 931,785	15.14%
Street lighting	1,819,510	$ 165,787	3.56%	1,379,729	$ 75,457	1.38%	3,094,841	$ 119,895	1.95%
Street cleaning	2,231,097	$ 203,289	4.36%	3,326,762	$ 181,939	3.33%	3,330,565	$ 129,027	2.10%
Parks, public gardens and leisure areas	2,127,194	$ 193,822	4.16%	3,398,805	$ 185,879	3.40%	5,114,815	$ 198,149	3.22%
Dwellings	-	$ -	-	36,310	$ 1,986	0.04%	10,099,344	$ 391,250	6.36%
Water supply, treatment and pumping stations	1,802,000	$ 164,191	3.53%	30,000	$ 1,641	0.03%	337,052	$ 13,057	0.21%
District heating networks, boiler houses and substations	9,392,794	$ 855,835	18.37%	18,050,257	$ 987,162	18.06%	21,544,000	$ 834,618	13.56%
Sewage	175,227	$ 15,966	0.34%	214,959	$ 11,756	0.22%	8,898	$ 345	0.01%
Introduction of natural gas in municipalities	-	$ -	-	-	$ -	-	-	$ -	-
Other actions for public services and development	8,484,036	$ 773,033	16.60%	18,952,884	$ 1,036,526	18.96%	21,741,460	$ 842,268	13.69%
Total public services and development	**30,211,107**	**$ 2,752,720**	**59.10%**	**55,067,450**	**$ 3,011,619**	**55.08%**	**89,323,148**	**$ 3,460,394**	**56.22%**
Agriculture and forests	-	$ -	-	285,636	$ 15,621	0.29%	-	$ -	-
Transport and communications	2,083,840	$ 189,872	4.08%	1,394,405	$ 76,260	1.39%	2,905,000	$ 112,540	1.83%
Expenditures with special destination	-	$ -	-	12,865,130	$ 703,589	12.87%	12,625,098	$ 489,098	7.95%
Financial expenditures									
Interest payments accrued due to the loans from the treasury fund	-	$ -	-	-	$ -	-	-	$ -	-
Repayment of the principal amount for the loans from the treasury fund	581,703	$ 53,003	1.14%	-	$ -	-	-	$ -	-
Total financial expenditures	**581,703**	**$ 53,003**	**1.14%**	-	**$** -	-	-	**$** -	-
Other expenditures	3,827	$ 349	0.01%	93,453	$ 5,111	0.09%	1,510,530	$ 58,518	0.95%
TOTAL EXPENSES	**51,120,335**	**$ 4,657,889**	**100.00%**	**99,971,450**	**$ 5,467,402**	**100.00%**	**158,870,183**	**$ 6,154,658**	**100.00%**
TOTAL REVENUES	**48,534,667**	**$ 2,992,408**	**100.00%**	**101,948,922**	**$ 2,676,250**	**100.00%**	**157,194,335**	**$ 3,235,792**	**100.00%**
SURPLUS / DEFICIT	**-2,585,668**	**$ -235,596**	**-5.33%**	**1,977,472**	**$ 108,147**	**1.94%**	**-1,675,849**	**$ -64,923**	**-1.07%**
Exchange Rate ROL/US$	*10,975*	*at December 31*		*18,285*	*at December 31*		*25,813*	*at December 31*	

It is difficult to find many positive trends in the Piatra Neamt budget figures. The share of administrative expenses in the budget consistently remains high (13.24%, 11.45% and 13.58% in the years 1998 to 2000 as compared to a typical level of 7% - 10% in other Romanian cities). Social and cultural expenses of almost every kind are decreasing (from total of 22.44% in 1998 to 15.58% in 2000, with spending on education going down from 12.26% to 5.95% and spending on health dropping from 4.41% to 1.01%; the latter decreased not only in hard currency equivalent but even in nominal Romanian Lei). The municipal expenses on transport and communications are also decreasing while expenses related to such items as

agriculture and forests or are insignificant (0.29%) and change from year to year with no obvious pattern. On the bright side, the share of funds for social assistance, allowances and pensions has grown from 5.21% to 6.69%. Another positive development is the elimination of financial expenditures since 1999, which is related to paying of the loans from the treasury fund that the Municipality had to take in previous years. Finally, one should note relatively high percentage of funds directed on such not-obligatory, quality-of-life type expenditures as "parks, public gardens and leisure areas" (4.16%, 3.40% and 3.22% of the budget in 1998 through 2000).

The values for different public services and development expenses, which change from year to year but in total amount to basically the same percentage of the municipal expenses (55.08% - 59.1%), indicate constantly increasing amount spent on street maintenance and repair (from 8.18% to 9.68% and to 15.14% in the years 1998 – 2000 respectively) and slightly declining share (from 8% to 4%) for street cleaning and lighting. Another major line of expenses for public services and development is called "District heating networks, boiler houses and substations". Generally, this line would include all the expenses, operational and capital, that relate to district heating. In case of Piatra Neamt, the figures on this line reflect mainly heat subsidies passing through from national budget to the public service utility (plus some additional amounts from the local budget, particularly substantial in 1999). Changes of these numbers (from 18.37% in 1998 down to 18.06% in the nest year and then to 13.56% in 2000) do not convey any meaningful tendency since they are determined by the relative dynamics of fuel prices versus approved tariff levels.

There is another considerable budget line – "Other actions for public services and development" that represent 16,60%, 18.96% and 13.69% in the year 1998 – 2000. Investments made under this line include such items as rehabilitation of the Central Market and construction of a number of residential buildings (these and other direct investments of the City Hall for the last year are presented in the Figure 2-14).

Figure 2-14. The Direct Investments from Own Sources of the Piatra Neamt Budget in 2000

Description	Amount ('000 ROL)
Wastewater treatment unit	337,052
Modernization of streets	5,998,418
Natural gas distribution network extension works	856,507
Environmental warehouse	3,664,458
Central Market rehabilitation	1,359,687
Apartment buildings at Calea Romanului	1,958,711
Social dwellings Avicola	9,920,184
Studies, endowments, other investments	1,612,681
TOTAL	**25,707,698**

The comprehensive analysis of the risks related to different revenue sources and expense items of the Piatra Neamt budget is beyond the scope of this work. It is safe to assume that the risks of adverse changes to the corporate and personal property taxes should be relatively low; risks related to the municipal share of the personal income tax are unclear due to introduction of the Global Income Tax system (these risks should be mitigated by the current optimistic trend and forecasts of unemployment level in the region); risks related to the timely transfers of heat subsidies are moderate. The main conclusion is that the Piatra Neamt budget, which within last three years has been growing in both

nominal Romanian Lei and hard currency equivalent, has a significant amount of funds allocated to non-obligatory items that should be sufficient to back up a reasonable debt guarantee or ensure the debt service (if the council decides to take the loan).

Additional Considerations

Financial performance of the Municipality has been very uneven. In 1998, the revenues fell short of expenses by shocking 5.9%, the year 1999 was finished with 1.94% surplus, and in 2000 the Municipality again ended up with 1.07% deficit. On the other hand, Piatra Neamt City Hall diminished its reliance on external borrowing: since 1998, the Municipality has not taken any treasury loans.

The issue of municipal assets that would be available as collateral for future loans needs additional examination. The City Hall has not indicated any private property of the Municipality as available for use in the loan security package but one can assume that for a city of the size and location of Piatra Neamt the value of such assets should be considerable. On the other hand, the legal status of most such assets, most likely, will not be clear and, generally, legal difficulties of utilizing land and real estate as collateral in Romania are such that they effectively restrict the use of this instrument to domestic lenders only.

3 Public Service Utility

3.1 General description

As a commercial company, SC Aqua Calor SA was established in 1997, though the same people and facilities have worked to provide Piatra Neamt with urban communal services for years. In accordance with the continuing changes of Romanian legal framework, the formal status of the entity that delivered to Piatra Neamt residents and businesses the services of district heating, water supply and sewage have changed a number of times.

Initially, after the collapse of the socialist regime, there was an attempt to introduce locally controlled and financed entities that would run on the purely economic principles and at the same time would serve vital public interests – Autonomous Regies. This attempt was not completely successful. Numerous legal issues related to Autonomous Regies have never been settled. As originally formulated, Autonomous Regies owned their assets and had the right to freely possess, use or dispose of them in accordance with the law and the terms of their charters. At the same time, this independence was illusory, since on any significant issue an Autonomous Regie was controlled by a local, county or national "managerial body" (council or ministry) that created the Regie. In addition, there were various problems with differentiating county authority as opposed to local authority in managing Regies, so even when the administration of a Regie and the local council were in agreement, a decision could be hindered by the county authority.

Government Ordinance #69 of 26 August 1994 tried to clarify the legal status of Regies by defining as local those serving municipalities with more than 30,000 inhabitants and dealing with delivery of water, district heating and urban transport services, in addition to construction and maintenance of local housing, roads, bridges and public areas. A single Regie was supposed to perform all of the above functions in municipalities with a population of less than 300,000, while the bigger municipalities could have up to two Regies, and the city of Bucharest could have three. Still, the problem related to the ownership of public assets, that most Regies operated with, were never fully resolved, their decision-making was hamstrung, and performance of many Regies remained unsatisfactory. Therefore, on June 16, 1997 by Emergency Ordinance # 30 the Romanian Government prescribed within six month to liquidate those Regies that were insolvent and to reorganize the other into commercial companies that would later undergo the privatization process. Therefore, the Autonomous Regie in Piatra Neamt became a commercial company SC Aqua Calor SA. Usually, during such transition the assets of municipal infrastructure, which used to be under the ownership of an Autonomous Regie, should have gone back into public domain and became inalienable public property under the Law on Public Property # 213 of November 17, 1998. A local council then would give the assets to a public service utility into concession. But the situation in Piatra Neamt is not typical. SC Aqua Calor was established in 1997 as a joint stock company and operates under the authority of the Local Council of Piatra Neamt. The assets remain the property of the company, while the Company equity is entirely in the possession of the municipality of Piatra Neamt as legal entity. The single shareholder of the company is the municipality of Piatra Neamt represented by its Local Council. The General Assembly of Shareholders consists of five members of the local council and it designates the Company Board. The Board of Administration has five members, and its president is the Director General of the Company. The Economic and Technical Directors, appointed by the Director General, perform the executive management (see Figure 3-1).

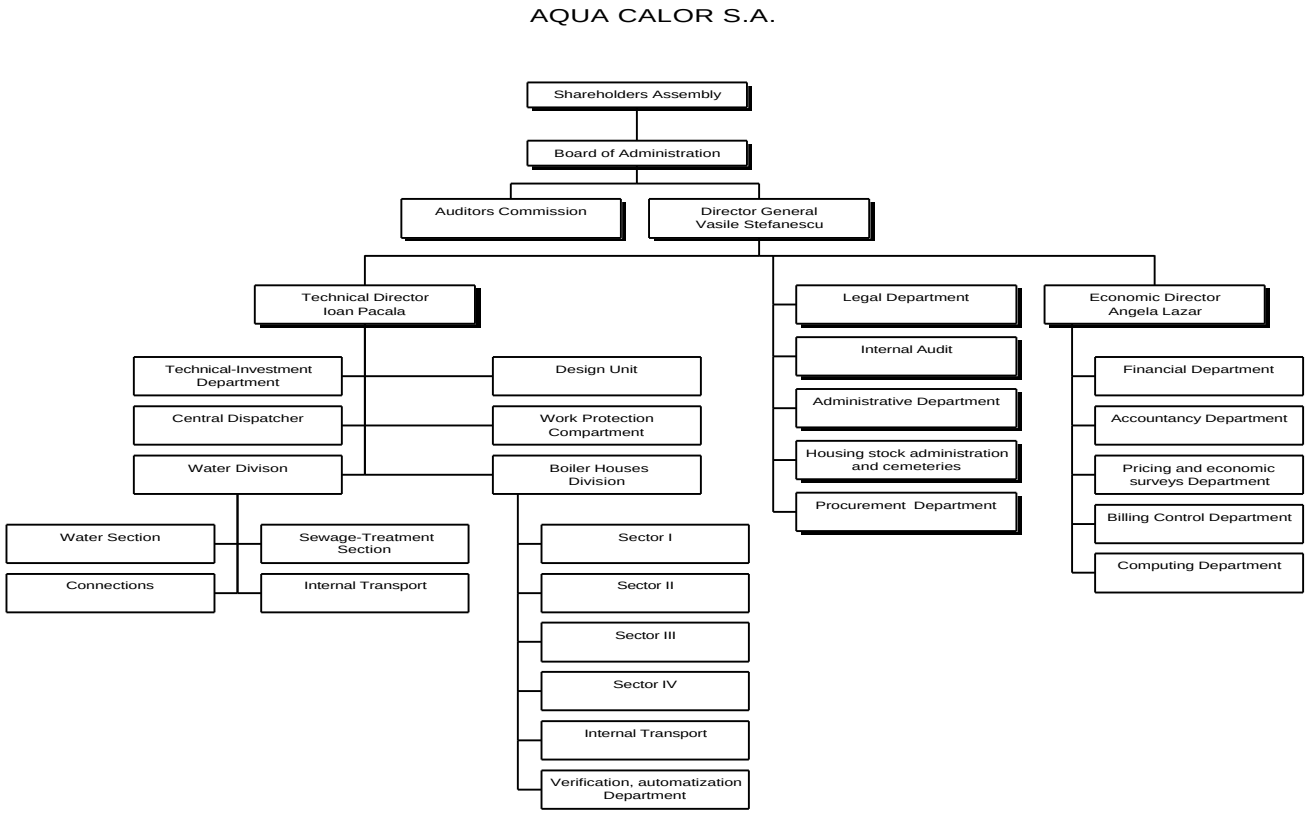
Figure 3-1. Senior Management of Aqua Calor

Name	Current Position	Responsibilities	Occupied since	Education	With the Company since	Previous Position	Occupied from
Vasile Stefanescu	Director General	Overall management of the company	1991	Engineer	12 years	S.C. Mecanica SA Ceahlau; Technical director	1989
Ion Pacala	Technical Director	Production and technical activity	1991	Engineer	11 years	S.C. Mecanica SA Ceahlau; Engineer	1980
Angela Lazar	Economic Director	Financial and commercial activity	1994	Economist	10 years	SC Aqua Calor; Head of financial department	1991

Aqua Calor currently has 718 employees, of which 369 are direct production workers, 139 people are involved in repairs and maintenance, 101 are occupied with indirect works, and 109 represent technical-administrative staff. During winter season, the number of staff increases by additional 120 persons, who are employed in heat production and supply.

As one can see from its organization chart (Figure 3-2), the Company structure has seven levels: shareholders assembly, board of administration, director general, executive directors, heads of departments, divisions, heads of sections and sectors, heads of units. The Technical Director coordinates the production in the two major divisions: The Boiler Houses Division (dealing with district heating and domestic hot water delivery) and The Water Division (charges with potable water distribution, sewage collection and treatment). The Boiler Houses Division consists of four geographically established sectors (Centru, Precista, Darmanesti, Maratei) and two supporting units subordinated to the head of division. Engineers, under-engineers and 4 foremen coordinate the production activities. The Water Division consists of Water Section, which includes 2 sectors of water collection and lab and workers units for distribution and storage; Sewage-Treatment Section, which is formed of the wastewater treatment unit and sewage networks; and supporting Connections and Internal transport units, which are subordinated to the head of division. Separate branches represent other functions (internal audit, legal, and financial or accounting departments). The Economic Director is in charge for finance and accounting, computing, customer billing and contracting activity. One notable entity in the structure of Aqua Calor is the Housing Stock Administration that manages the construction and sale of apartment building that the Company undertakes on behalf of the Municipality (more on that below).

Figure 3-2. Organization Chart of Aqua Calor



3.2 Main Business Activities

Since the time it was a Department of municipal services and then Regia Autonome, Aqua Calor used to perform a number of business activities, from providing the residents and commercial customers of Piatra Neamt with district heating and domestic hot water to garbage removal, street cleaning or even transportation. Public transportation was transferred to a separate company in 1995; garbage collection is performed by a commercial entity since Aqua Calor transformation from Regia Autonome into commercial company in 1997.

Now, in addition to three main business activities (district heating and DHW, water supply, and sewage collection / wastewater treatment), Aqua Calor is engaged in the following auxiliary works:

1. maintenance and repair of the networks inside the customer premises, including emergency services (under service contracts with Residential Associations and other customers)
2. management of the public housing stock for the Municipality,
3. operating public bath,
4. maintenance of the municipal cemetery,
5. growing flowers in a greenhouse with heating on biogas,
6. technical consulting.

Among these auxiliary activities, the most important in terms of the volume and impact on Aqua Calor income statement and balance sheet is the management of residential housing stock and other public property assets.

District Heating and Domestic Hot Water.

Providing district heating and DHW is, doubtless, the main part of Aqua Calor business, at least if to judge by its share in operating revenues and expenses (71.3% and 71.9% in 2000, respectively). Overwhelming majority of Aqua Calor heat customers is households who contract with the Company either directly, as individual homeowners, or indirectly, through apartment building associations. Although the number of contracts with residential customers is only 324, or 32%, out of the total 1,004 (see Figure 3-3), their share in heat revenues amounts to 88.1% and their consumption of heat measured in gigacalories is even higher – 90% of the total (Figure 3-4; all the numbers cited for the year 2000). In addition to residents, Aqua Calor supplies heat to private and mixed-ownership companies, schools, health and other budgetary organizations.

Figure 3-3. Structure of Aqua Calor Customers by Category (Number of Agreements and Percentage Share in the Volume of Delivered Heat)

Heat	1998		1999		2000		2001 (forecast)	
	(#)	(%)	(#)	(%)	(#)	(%)	(#)	(%)
Residential, of which	**324**	**90.15**	**291**	**90.16**	**281**	**90.05**	**266**	**N/A**
Apartment building associations	214	N/A	197	N/A	207	N/A	216	N/A
Individual households	110	N/A	94	N/A	74	N/A	50	N/A
Companies, private or mixed ownership	**633**	**3.82**	**659**	**3.60**	**637**	**3.64**	**634**	**N/A**
Budgetary organizations, of which	**47**	**6.03**	**46**	**6.24**	**46**	**6.31**	**46**	**N/A**
Schools	12	N/A	12	N/A	12	N/A	12	N/A
Total	**1,004**	**100**	**996**	**100**	**964**	**100**	**946**	N/A

A closer look at the figures 3-3 and 3-4, though, reveals a disturbing picture: the amount of heat delivered to the customers, as well as the heat revenues in hard currency equivalent, are steadily declining - from 461,341 Gcal in 1998 to 348,164 Gcal in 2000, or the drop of 24.5%. To some degree, in the year 2000 the decrease could be explained by the unusually warm weather. But in all likelihood, the trend has more to do with the high cost of service, rising price of fuel, and continuing inefficiency of the system.

Figure 3-4. Delivery of Heat to Aqua Calor Customers

Heat	1998		1999		2000	
	(Gcal)	(%)	(Gcal)	(%)	(Gcal)	(%)
District Heating						
Population	238,993	51.80%	227,954	54.98%	204,866	58.84%
Economic entities	16,623	3.60%	13,448	3.24%	12,027	3.45%
Budgetary organization	22,321	4.84%	21,274	5.13%	18,060	5.19%
District Heating Total	**277,937**	**60.25%**	**262,677**	**63.36%**	**234,954**	**67.48%**
DHW						
Population	176,892	38.34%	145,834	35.17%	108,650	31.21%
Economic entities	1,015	0.22%	1,497	0.36%	634	0.18%
Budgetary organization	5,497	1.19%	4,589	1.11%	3,926	1.13%
DHW Total	**183,404**	**39.75%**	**151,921**	**36.64%**	**113,210**	**32.52%**
Heat Total	**461,341**	**100.00%**	**414,598**	**100.00%**	**348,164**	**100.00%**

The picture is even clearer and more alarming from the data for so-called "cut-offs" – requests by customers to be disconnected from the heating network (Figure 3-5). In case of individual apartments within an apartment building, Aqua Calor does not have to satisfy such requests (also often it does when the technical conditions permit), but in case of individually owned separate houses, economic entities in detached buildings or a decision by an residential association as a whole, there is nothing the Company can do to prevent the disconnection and loss of the customer. For population, heat supply is at least subsidized by the government (see below on heat tariffs and subsidies). But for independent economic agents and budgetary organization, which must pay the full price, Aqua Calor heat supply more and more often proves to be not affordable, so they are forced to do without it or find other solutions.

Figure 3-5. The History of Cut-Off Requests by Aqua Calor Customers

Cut-off Requests	1998		1999		2000		2001 (forecast)	
	(#)	Heat Demand Reduction (Gcal)	(#)	Heat Demand Reduction (Gcal)	(#)	Heat Demand Reduction (Gcal)	(#)	Heat Demand Reduction (Gcal)
Population	3	18	697	4,883	5,196	36,365	1,125	7,875
Economic entities	10	135	40	540	48	648	29	392
Budgetary organizations	2	295	3	773	11	5,336	4	1,200
Total	**15**	**448**	**740**	**6,196**	**5,255**	**42,349**	**1,158**	**9,467**

These indicators underscore a very serious problem for Aqua Calor: the retention of customers. On one hand, the Company management estimates that heat demand for the next three years will register a small increase. Indeed, one can easily find some positive signs in the current situation: at the moment, there are 300 apartments under construction that will be connected to the DH network and in the nearest future another 200 apartments will be constructed by the National Dwelling Agency. Further, over 1,000 more applications for dwellings from young families are registered in Piatra Neamt, and renovation of the housing stock is on the agenda of the local and central authorities. In accordance with the present regulations, the municipality of Piatra Neamt has a detailed urban plan and forecasts regarding its development that for the coming years foresee no significant changes in the structure and number of population. On the other hand, the dynamics of the cut-off requests in the past do not support this favorable prognosis, so in reality it may prove too optimistic.

As a public service utility, the Company has captive clientele and no direct competitors (other than its own inefficiency). But Aqua Calor must dramatically improve its performance, both in terms of cost-effectiveness and the quality of service, otherwise it risks loosing even such usually inert customers as residential. The good news is that the installation of new, more efficient boilers will provide an opportunity for the Company to sequentially upgrade its infrastructure, modernize technology and improve performance, thus keeping the customers it has now or even regaining some that recently left.

Other Major Municipal Services.

In addition to heat, Aqua Calor also supplies Piatra Neamt with potable water and maintains the sewage collection and treatment infrastructure. Also, as was described above, the Company has a number of auxiliary business activities. Revenues and expenses of these activities are insignificant as compared to the main services, with the exception of the management of residential building and public property assets. The volume of services in physical or monetary units and the structure of customers for each service for the last three years are represented in the Figure 3-6.

Figure 3-6. Delivery of Other Municipal Services to Aqua Calor Customers

Other Major Services	1998		1999		2000	
	(unit)	(%)	(unit)	(%)	(unit)	(%)
Water supply, m^3						
Population	15,282	83.93	12,607	82.60	9,233	74.88
Economic entities	2,138	11.74	1,606	10.52	1,592	12.91
Budgetary organizations	787	4.32	1,050	6.88	1,506	12.21
Water Total	**18,207**	**100.00**	**15,263**	**100.00**	**12,331**	**100.00**
Sewage, m^3						
Population	11,192	81.85	9,904	81.57	8,322	76.89
Economic entities	1,814	13.27	1,352	11.14	1,285	11.87
Budgetary organizations	668	4.89	885	7.29	1,216	11.24
Sewage Total	**13,674**	**100.00**	**12,141**	**100.00**	**10,823**	**100.00**
Other Activities, '000 ROL						
Population	869,233	36.21	2,233,881	57.98	2,801,297	57.56
Economic entities	1,465,284	61.04	1,516,812	39.37	1,924,478	39.54
Budgetary organizations	66,089	2.75	101,872	2.64	141,209	2.90
Other Activities Total	**2,400,606**	**100.00**	**3,852,565**	**100.00**	**4,866,984**	**100.00**

For all services the population is the main customer (the population's share in the services exceeds 74%). Among "Other Activities", economic entities used to be the major customer (61% of total revenue volume in 1998), but by now they also have yielded leading role to the population (57% in 2000). The physical volume of all services indicates the same downward trend as the district heating and DHW. Despite the slight growth of the revenues in Romanian Lei, the amount in hard currency equivalent actually declines with about the same rate as the physical volume, which means that the tariffs for water supply, sewage and wastewater treatment in Piatra Neamt get adequately adjusted for inflation.

3.3 Tariff Setting Procedures

Tariff Setting Procedures for District Heating and DHW

As a regulated public utility, Aqua Calor must have its tariffs for municipal services approved by an independent public authority (Law # 21 of 1996, or Law on Competition; also, Law # 88 of May 25, 1999). Initially, Romanian national Office of Competition used to be such authority for all Aqua Calor activities, but in October 1998 the Romanian Government by the Emergency Ordinance # 29 (later approved by the Law 218 of June 2, 2000) created a separate legal entity – National Regulatory Authority in the Energy sector (ANRE), which after March 1999 has taken over the task of approving tariffs for heating and DHW. ANRE is an autonomous public institution that "creates and applies the system of obligatory regulation on a national level, necessary for the efficient functioning of electricity and heat market in order to ensure competition, transparency and consumer protection" (Article 3).

In 1999 rising cost of fuel and other expenses that brought about high heat tariffs forced the Romanian Government to address the consumer protection problem. This was done by issuing the Emergency Ordinance # 162 of October 28, 1999 "On the establishment of the National Reference Price for heat delivered to the population through centralized systems and on financial help to disadvantaged categories of the population". The Ordinance ended the previous practice of restricting the level of heat tariffs for producers (see, for example, the Government Decision # 239 of May 29, 1997) and established the maximum national level at which Romanian residents could be charged (National Reference Price). If the actual production and distribution costs of a public service utility were higher than this price, the utility still could have the tariff approved, but the difference was supposed to be covered by the subsidies from national and local budgets. Thus, the Ordinance introduced a new non-targeted subsidy – national subsidy for heat. In addition to this non-targeted subsidy, there were established new targeted subsidies for the households with very low incomes that were supposed to cover a part of the heat tariffs even below the National Reference Price and were to come from local budgets (Art.11). These low income subsidies were established based on annual Household income and require submitting special applications (currently in Piatra Neamt there are 11500 families that receive such subsidies). The level of the National Reference Price was calculated as the average of local heat prices for producers that use natural gas plus related distribution tariffs (Art.2). The first level of the National Reference Price was established as 230,000 ROL/gigacalory (Government Decision # 879 of October 28, 1999).

The current predicament with heat subsidies creates a number of contradicting motives and incentives for main players: municipalities, public service utilities, the national government, and ANRE. Since the national government shoulders the burden of heat subsidies, it is logical that heat tariffs get approved not by local but by the national regulatory agency (ANRE). On the other hand, it should be much more difficult for located in Bucharest ANRE staff than for some municipal or county regulators, intimately familiar with the local specifics, to judge how justified requested tariffs are. In a way, the situation creates perverse incentives for municipalities, which own the public service utilities, not to scrutinize the behavior and business practices of these utilities but to approve and consent to overblown tariff requests in the hope of obtaining additional subsidies from the national budget. At the same time, even after the tariff is approved, a municipality never can be sure that it will receive heat subsidies from the central

budget in full. As stated in the Article 4 of the Emergency Ordinance # 162, "the difference between the bigger local price and the national price of reference shall be covered as follows:

a) from the State Budget within the limits of the approved sums destined for such cases;

b) from the local budgets (from the local income) for the part which was not covered by the State Budget."

It means that whatever shortage in heat subsidies is left after national budget appropriation, a municipality will have to cover it from local funds. Indeed, the practice of several last years indicates that as fuel prices rise, the national government is able and willing to support smaller and smaller share of heat subsidies. It is quite obvious that the total elimination of centralized heat subsidies is the question of "when", not "if".

Formally, the Law # 88 of 1998 and subsequent regulations stipulate the procedure of reexamination (change in structure) and adjustment (change in value) for heat tariffs and other regulated tariffs and prices. As a rule, reexamination is made every three years but in special cases (restructuring of the utilities or structural modifications to the costs if these modifications result in variations of more than 5%), reexamination is allowed more often, but no sooner than three months after the last. Adjustment of prices and tariffs may be done monthly if any of the adjustment parameters has changed more than 5% and if the resulting impact of the modifications of all the adjustment parameters is more than 5%. The adjustment parameters are:

a) the exchange rate ROL/USD as calculated by the National Bank of Romania;

b) consumer price index published by the National Commission on Statistics;

c) fuel prices;

d) prices for electricity and water.

The procedure for heat tariff approval starts with Aqua Calor. Economic Director and accounting department of the Company, based on the data provided by the technical and other departments, prepare a justification for the tariff modification, based on the specific consumption of raw materials, costs of utilities calculated on the basis of the applicable norms, and other expenses in the course of production. The application for heat tariff modification, signed by the Director General of Aqua Calor and endorsed by the local authority, is submitted to ANRE. There is no formal procedure for tariff consideration by ANRE. Sometimes just submitting the documents is enough; sometimes getting a tariff adjusted requires several additional submissions and discussions with ANRE staff. The Figure 3-7 indicates the history of changes to Aqua Calor heat tariffs.

Figure 3-7. The History of the Approved Heat Tariffs of Aqua Calor (ROL/Gcal)

Date approved	Population – Natural Gas	Economic Entities -Natural Gas	Population and Economic Entities - Liquid Fuel	Effective National Reference Price
November 01, 1997	74,120	162,400	233,100	80,000
May 25, 1998	82,500	168,250	237,000	80,000
August 03, 1998	102,920	-	-	87,000
October 14, 1998	121,450	158,650	254,300	89,000
March 01, 1999	155,100	202,750	325,000	95,500
June 07, 1999	260,000	260,000	419,250	156,500
November 01, 1999	268,000	268,000	637,800	230,000
September 29, 2000	360,000	541,000	825,000	230,000
February 14, 2001	366,300	657,301	1,260,500	350,000
May 17, 2001	594,000	594,000	1,301,000	350,000

Calculations of the tariff are quite simple (see Figure 3-8), but justification of each cost item may be detailed. The list and structure of allowable expenses were approved by the Government Emergency Ordinance # 7 of March 30, 1998 and later (after creation of ANRE) amended by the Government Emergency Ordinance # 150 of September 28, 2000. Most of the operating expenses are well defined, documented, and reported and therefore are not subject for long discussions. The quantity of heat delivered is slightly more difficult to prove, especially in cities where there is no comprehensive measuring of heat flow, which are most of Romanian cities. In such cases, the amount of heat supply is calculated based on the amount of fuel used and the efficiency of the system. This last parameter is also open to discussions and negotiations, with ANRE trying to use the standard (normative) efficiency of the equipment and companies arguing that the equipment has deteriorated and now operates with considerably higher losses.

Tariff structure includes profit margin, but there is no formal regulation on what this margin should be, and this item is usually the subject of strenuous negotiations between a public service utility and ANRE. The common level is 5%, but if ANRE wants to support a company that, for instance, is investing its funds into some network upgrade or rehabilitation, such company can temporarily get a higher profit margin – 8% or even 10 %.

Figure 3-8. The Structure of Allowable Expenses for Tariff Calculation

I. Total Cost (A+B)
- A. Operating Expenses (1+2)
  - 1. Material costs (1.a+1.b)
    - a) Variable material costs
      - (1) Electricity
      - (2) Other variable costs
    - b) Fixed material costs
      - (1) Raw materials, materials
      - (2) Non-technological fuel
      - (3) Depreciation
      - (4) Royalties
      - (5) Current repairs
      - (6) Repairs undertaken by third parties
      - (7) Studies and research
      - (8) Other services provided by third parties
        - collaborations
        - commissions and honoraria
        - public relation and protocol services
        - business trips and meetings
        - mail and telecommunication
      - (9) Other fixed costs
      - (10) Costs related to modernization and upgrade of the metering system
  - 2. Labor costs
    - a) Salaries
    - b) Social security tax
    - c) Required contributions to unemployment fund
    - d) Required contributions to health, risk, education and other funds
    - e) Other costs related to employees
- B. Financial costs
  - 1. Loan interests
  - 2. Bank commissions and fees
  - 3. Cost resulting from the fluctuations of the currency exchange rates

II. Profit

III. Revenues from heat supply activity (I+II)

IV. Quantity of heat delivered

As Figure 3-8 demonstrates, there are allowable financial expenses in the structure of tariff calculation. These financial expenses can include loan interests but do not provide Aqua Calor with any means to undertake upgrade and rehabilitation of its system. Even though depreciation of the assets is included in the cost structure (item I.A.1.b.3), the reality of high inflation coupled with slow and incomplete reevaluation of the assets results in the situation when accumulated depreciation is not enough to replace the assets that have passed their useful life. And the development of the system, as opposed to direct and urgent replacement of failing parts, is not provided for at all.

Tariff Setting Procedures for Other Public Services

A situation with tariffs for other Aqua Calor services is very similar to the one described above with only the difference that these other tariffs are finally approved not by ANRE but by the Office of Competition. They are also periodically adjusted to the current level of inflation and changes in the costs incurred. The Company Board of Administration, on the basis of the justification forwarded, approves prices and tariffs for "Other activities".

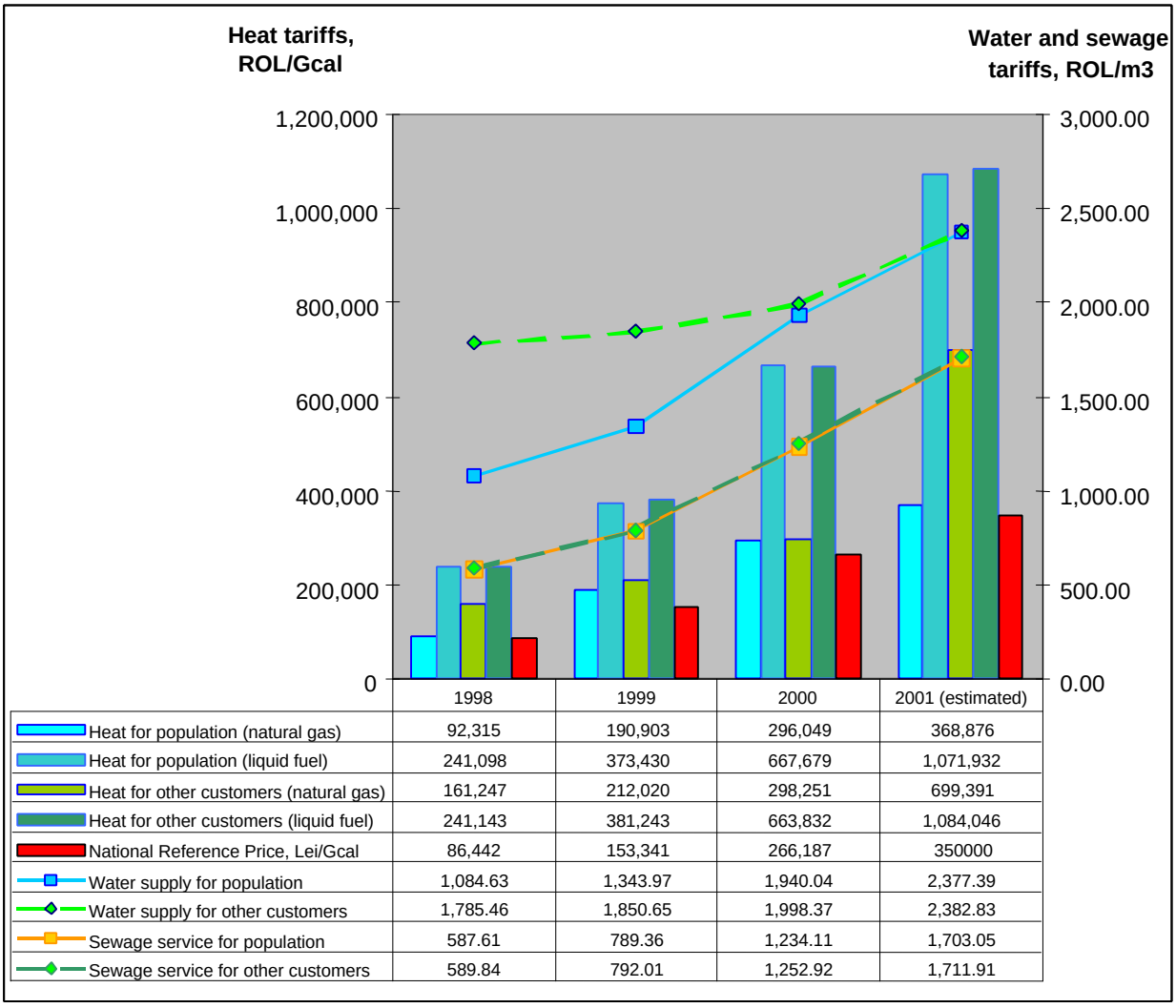
The accounting department monitors the economic result of each activity. To request a change of tariffs, the accounting department develops a spreadsheet in which it includes all the production data for the last three months and the previous year, breakdown of customers (population and other consumers), types of expenditures, number of employees involved in each activity and resulting revenues and profit or loss. The same breakdown is presented for the current level of tariff and for requested tariff.

Figure 3-9. The History of the Approved Water and Sewage Tariffs for Aqua Calor, ROL/m^3

Date approved	Water Supply, Population	Water Supply, Economic Entities	Sewage, Population and Economic Entities
November 01, 1997	920	1,560	490
February 1, 1998	1,000	1,700	535
April 01, 1998	1,090	1,850	580
July 01, 1998	1,145	-	618
October 19, 1998	-	-	650
February 01, 1999	1,220	-	695
May 6, 1999	1,380	-	760
October 15, 1999	1,610	-	1,055
February 10, 2000	1,850	-	1,215
July 01, 2000	2,201.69	2,201.69	1,445
January 17, 2001	2,404.22	2,404.22	1,742.87

The history of changes for these tariffs is indicated in the Figures 3-9. Analysis of the trends shows that during two years from the summer of 1998 to the summer of 2000 tariff for water service for population increased 1.92 times, for other customers – 1.19 times; tariff for sewage collection and wastewater treatment grew 2.34 times. For comparison, an official Romanian data for the same period of time indicated inflation about 90%, and currency exchange ratio from Romanian Lei into US Dollars increased 2.59 times. In other words, the growth of the tariffs for municipal services to population was faster than the official inflation data, but slower than the rise of currency exchange rates. Tariffs for non-residential customers grew slower, probably because they were higher to start with. In general, this was a reasonably slow growth if compared to some other Romanian cities (for average annual growth of different tariffs, see Figure 3-10). Still, analysis of profitability by activity indicated that in 2000 all activities were profitable. In 1998, Aqua Calor incurred losses on heating and sewage activities that were offset by profit from water supply; in 1999 both heating activities and water supply became profitable.

Figure 3-10. Average Annual Tariffs for Aqua Calor Services



	1998	1999	2000	2001 (estimated)
Heat for population (natural gas)	92,315	190,903	296,049	368,876
Heat for population (liquid fuel)	241,098	373,430	667,679	1,071,932
Heat for other customers (natural gas)	161,247	212,020	298,251	699,391
Heat for other customers (liquid fuel)	241,143	381,243	663,832	1,084,046
National Reference Price, Lei/Gcal	86,442	153,341	266,187	350000
Water supply for population	1,084.63	1,343.97	1,940.04	2,377.39
Water supply for other customers	1,785.46	1,850.65	1,998.37	2,382.83
Sewage service for population	587.61	789.36	1,234.11	1,703.05
Sewage service for other customers	589.84	792.01	1,252.92	1,711.91

3.4 Contractual Arrangements with Customers and Billing

Contract Delivery of Heat and Other Municipal Services

In accordance with the general Romanian law, relationships between a public service utility and its customers should be governed by specific contracts the form and substance of which are left to the discretion of the parties. Nevertheless, ANRE has developed, among others, a standard framework contract for heat supply (ANRE decision # 70 of December 1999). Aqua Calor uses a single typical contract, approved by the Neamt County Office for Consumer Protection, that covers services of space heating and preparation of DHW, drinking water supply and wastewater collection and treatment and in main features is very similar to framework contract suggested by ANRE. Customers almost never make changes to this boilerplate text.

Each economic entity, budgetary organization or individual household residing in a detached house is a separate customer that signs a contract with Aqua Calor. In the case of people living in apartment buildings, a residential association is the legal entity that signs the contract.

The contract pays most attention to technical issues. Its main thrust is to ensure that the system is appropriately operated by both the supplier and consumer, that no unauthorized alteration of the system occurs, and that technical staff has unhindered access to the relevant installations for inspection and maintenance (Article 4c). According to Article 3, the supplier has the obligation to provide a suitable thermal comfort for the consumer, to ensure the appropriate operation of the measuring devices and to allow the consumer to have access to meters. The consumer rights are not explicitly enumerated in a separate paragraph (as it is with the consumer obligations), but in general they are encompassed in a number of articles scattered in the text. The contract also specifies economic sanctions Aqua Calor can apply to non-paying or late-paying customers, up to suspension of the service delivery (Article 13).

Billing Procedure

According to the practice, as well as to the standard contract, there is monthly billing for all customers. According to the Article 5, the quantity of consumed heat is calculated based on the reading of meters installed at consumer site; if these do not exist, on the basis of the meters at the boiler house, in which case the total is allocated among different consumers connected to this boiler house proportionally to heated surface. The quantity of heat used to prepare DHW is determined by reading meters installed at the gate of the boiler house (the total is allocated taking into consideration the number of hours of supply and number of residents in a household). The quantity of consumed drinking water is based on the reading of meters that are installed at the consumer site (apartment, entrance, building), and the surplus registered by the general meter of the building in comparison with the secondary meters is divided among all consumers of the building, including economic entities (Article 6). Finally, Article 7 defines the quantity of sewage as 100% of the total water consumption (domestic cold and hot water).

When no meters are present, economic entities and other customers are billed for services according to paushal system (depending on the kind of activities) and agreement with the Company (Ministry of the Public Works Order # 29N from 1993). Heat supply to residents and organizations subordinated to local councils is estimated differently. Specifically, total quantity of heat supplied $\mathbf{Q_{total}}$ is determined by the calculation:

$$\mathbf{Q_{total} = C_c \times P_i \times N_{eff}}, \text{ where}$$

$\mathbf{C_c}$ is fuel consumption measured in volume;
$\mathbf{P_i}$ is the lowest heat content of the fuel according to the analysis presented by the supplier;
$\mathbf{N_{eff}}$ is actual average efficiency of the system established by the regular measurements.

For the bills not paid in the following 30 days from the issuing of the bill, the penalty is calculated 0.2% per day for the delayed payment applied to the unpaid value (according to the Law # 198 of November 17, 1997). Presidents of the associations might come to the Company or billing centers to get the bills and then collect the money from the households and deliver it to Aqua Calor. Individual residential customers receive a written notice and get a receipt when they pay the bill at a Company's billing center.

Collection Rate

According to contract, an invoice is due 30 days after the date of its issue, and the late payment fee in the amount of 0.2% for each day of delay, beginning with the 31st day after the invoice date, should automatically incur. Formally, the delinquent is a customer who has not paid the bills for the services received in accordance with the contract (Article 13). The Company usually sends a notice to delinquent customers reminding them that they have to pay their bill. over the next 10 days, otherwise they will be disconnected from the network. If the amounts owed, including penalties, are not paid in 45 days since the payment deadline, the Company can suspend the delivery of the services and to proceed to recover damages in Court. After the sentence is given, the execution debt enforcement of the customer will be implemented.

In practice, though, these rules rarely get enforced. If commercial entities do not pay, it is relatively easy to sue them or to stop delivery of heat. With residential customers, Aqua Calor enforcement options are severely limited by the fact that the Company has contract not with individual households but with Residential Associations that consist of both well-paying and delinquent customers. Accordingly, there is no technical possibility to cut off just non-paying (but not all) households in the apartment building, and there are serious social and moral dilemmas with imposing on all households the collective punishment of heat cut off for financial transgressions of just few. The Company usually doesn't sue individual customers even in detached houses since cost of legal transactions is too high.

Nevertheless, Aqua Calor has some options. The Company can invoice Residential Association for overdue amounts. When Association sues its members, Aqua Calor comes to the foreclosure as one of the debtors. But the percentage of the debt retrievable via this procedure is very low. The Company still uses this tool, but more for psychological reasons, in order to get customers' attention. Another measure often taken by Aqua Calor is to suspend the delivery of hot water to late payers (space heating continues, party for technological reasons - to prevent freezing) or, next year, start supply of heat later than to others. Now Aqua Calor has four teams working on notifying all debtors of they overdue amount and imminent cut-off of the services; applying this pressure somewhat allows to curb non-payments.

All the above reasons explain persistent difficulties with collection. It is very hard to estimate the collection rate correctly, since it depends on the season and many other factors. The best available estimation of the situation with collection can be done on the basis of the data for late payments in the last two month of years 1998 – 2000 (Figure 3-11) and on the analysis of accounts receivable that is done below (see Figure 3-17 and related discussion).

Figure 3-11. History of Late Payments to Aqua Calor
(Total of Bills that are Issued before November 1 and Not Paid by the End of the Year)

	1998		1999		2000	
	#	'000 ROL	#	'000 ROL	#	'000 ROL
Residential, of which	119	7,175,910	126	10,812,408	166	23,585,982
Apartment building associations	110	7,174,498	119	10,809,083	148	23,534,469
Individual households	9	1,412	7	3,325	18	51,513
Companies, private or mixed ownership	49	497,113	67	473,057	50	457,803
Budgetary organizations, of which:	15	8,412	13	1,013	14	2,195
Schools	8	631	6	725	9	1,099
TOTAL	**183**	**7,673,864**	**206**	**11,286,477**	**230**	**24,045,980**

3.5 Financial Factors (Creditworthiness)

Revenues

Revenues of Aqua Color substantially increased from ROL 84,168 M in 1998 to ROL 123,140 M in 1999 and ROL 150,851 M in 2000 (Figure 3-12). The growth of revenues reflects the increase of tariffs for heat, and other services caused primarily by very high inflation in Romania and the decline of the

purchasing power of Romania Lei (Romanian Lei to US Dollar exchange rate was 10,975, 18,285 and 25,813 at December 31, 1998, 1999 and 2000, respectively). As shown in the section 3.2, heat sales in 2000 declined to 348,164 Gcal from 414,598 Gcal in 1999 and 461,341 Gcal in 1998 (total drop of about 24.5%). Revenues in US Dollar equivalent reflected this trend and decreased from US$ 7.7 M in 1998 to US$ 5.8 M in 2000.

Figure 3-12. Income Statements for 1998-2000

	1998			1999			2000		
	('000 ROL)	(US $)	(%)	('000 ROL)	(US $)	(%)	('000 ROL)	(US $)	(%)
Operating Revenues									
District heating and DHW									
Revenues excluding subsidies	42,892,566	$ 3,908,206	51.0%	66,106,574	$ 3,615,344	53.7%	88,735,670	$ 3,437,635	58.8%
Heat subsidies	7,280,873	$ 663,405	8.7%	19,050,789	$ 1,041,881	15.5%	18,896,238	$ 732,043	12.5%
Total District heating and DWH	50,173,439	$ 4,571,612	59.6%	85,157,363	$ 4,657,225	69.2%	107,631,908	$ 4,169,678	71.3%
Heat-unrelated activities									
Water supply	21,797,711	$ 1,986,124	25.9%	21,977,331	$ 1,201,932	17.8%	24,127,789	$ 934,715	16.0%
Sewage	8,040,467	$ 732,617	9.6%	9,894,852	$ 541,146	8.0%	13,411,171	$ 519,551	8.9%
Other	2,540,853	$ 231,513	3.0%	4,197,172	$ 229,542	3.4%	5,072,312	$ 196,502	3.4%
Total heat-unrelated activities	32,379,031	$ 2,950,253	38.5%	36,069,355	$ 1,972,620	29.3%	42,611,272	$ 1,650,768	28.2%
Other Revenues	1,615,794	$ 147,225	1.9%	1,912,848	$ 174,291	1.6%	608,132	$ 55,411	0.4%
Total Operating Revenues	84,168,264	$ 7,669,090	100.0%	123,139,566	$ 6,734,458	100.0%	150,851,312	$ 5,844,005	100.0%
Operating Expenses									
District heating and DHW	50,960,878	$ 4,643,360	63.1%	79,552,078	$ 4,350,674	67.3%	102,342,305	$ 3,964,758	71.9%
Heat-unrelated activities									
Water supply	16,691,885	$ 1,520,901	20.7%	21,088,728	$ 1,153,335	17.8%	22,727,935	$ 880,484	16.0%
Sewage	8,392,794	$ 764,719	10.4%	10,855,531	$ 593,685	9.2%	12,578,337	$ 487,287	8.8%
Other	3,143,480	$ 286,422	3.9%	5,302,337	$ 289,983	4.5%	4,696,399	$ 181,939	3.3%
Total heat-unrelated activities	28,228,159	$ 2,572,042	34.9%	37,246,596	$ 2,037,003	31.5%	40,002,671	$ 1,549,710	28.1%
Other Operating Expenses	1,583,410	$ 144,274	2.0%	1,468,428	$ 133,798	1.2%	-	$ -	0.0%
Total Operating Expenses	80,772,447	$ 7,359,676	100.0%	118,267,102	$ 6,467,985	100.0%	142,344,976	$ 5,514,469	100.0%
Operating Income									
District heating and DHW	(787,439)	$ (71,748)		5,605,285	$ 306,551		5,289,603	$ 204,920	
Heat-unrelated activities									
Water supply	5,105,826	$ 465,223		888,603	$ 48,597		1,399,854	$ 54,231	
Sewage	(352,327)	$ (32,103)		(960,679)	$ (52,539)		832,834	$ 32,264	
Other	(602,627)	$ (54,909)		(1,105,165)	$ (60,441)		375,913	$ 14,563	
Total heat-unrelated activities	4,150,872	$ 378,212		(1,177,241)	$ (64,383)		2,608,601	$ 101,058	
Other Operating Income	32,384	$ 2,951		444,420	$ 24,305		608,132	$ 23,559	
Total Operating Income	3,395,817	$ 309,414		4,872,464	$ 266,473		8,506,336	$ 329,537	
Other Income and Deductions									
Income from Financial Activity, net	(1,770,052)	$ (161,280)		(4,302,707)	$ (235,313)		(6,309,297)	$ (244,423)	
Other Income, net	(575,037)	$ (52,395)		460,356	$ 25,177		260,164	$ 10,079	
Total Income, Net	(2,345,089)	$ (213,676)		(3,842,351)	$ (210,137)		(6,049,133)	$ (234,344)	
Income Before Income Tax	1,050,728	$ 95,738		1,030,113	$ 56,337		2,457,203	$ 95,192	
Nondedactable Expenses	554,395	$ 50,514		419,794	$ 22,958		1,105,628	$ 42,832	
Tax Credits	317,404	$ 28,921		767,390	$ 41,968		939,004	$ 36,377	
Total Taxable Income	1,050,728	$ 95,738		1,030,113	$ 56,337		2,457,203	$ 95,192	
Income Tax	489,333	$ 44,586		259,356	$ 14,184		655,957	$ 25,412	
Net Income	561,395	$ 51,152		770,757	$ 42,152		1,801,246	$ 69,781	
Exchange Rate ROL/US$	*10,975*	*at December 31*		*18,285*	*at December 31*		*25,813*	*at December 31*	

Revenues from heat and DHW provide most significant contribution to compare with other activities. Furthermore, from 1998 to 2000 the portion of heat and DHW revenues grew from 59.6% to 71.2% of total operating revenues. At the same time portions of revenues from water supply and sewage decreased from 25.9% to 16.0% and from 9.6% to 8.9%, respectively.

Costs and Expenses

The analysis of the Aqua Color Income Statements indicates the promising trend of the profitability improvement by activities. If in 1998 the water supply was only a profitable activity, in 1999 heat and water supply activities provided profit for overall operating activity, and in 2000 all activities were profitable. Furthermore, although revenues in US Dollar equivalent decreased in 2000, profit from operating activity increased from US$ 266 K to US$ 330 K.

The breakdown of operating expenses shows that a fuel cost is a most considerable part of the Aqua Color expenses, and the portion of these expenses in the total operating expenses increased from 37% in 1998 to 45% in 2000 (figure 3-13). The portion of payroll expenses was substantial and stabile in last three years: 29.2% - 30.7%.

Figure 3-13. Disclosure of Operating Expenses for 1998-2000

	1998			1999			2000		
	('000 ROL)	(US $)	(%)	('000 ROL)	(US $)	(%)	('000 ROL)	(US $)	(%)
Operating expenses									
Fuel									
Oil	5,121,036	$ 466,609	6.3%	7,160,524	$ 391,606	6.1%	8,387,447	$ 324,931	5.9%
Natural gas	24,746,541	$ 2,254,810	30.6%	43,499,091	$ 2,378,949	36.8%	55,584,383	$ 2,153,348	39.0%
Total fuel	29,867,577	$ 2,721,419	37.0%	50,659,615	$ 2,770,556	42.8%	63,971,830	$ 2,478,280	44.9%
Raw materials	1,199,020	$ 109,250	1.5%	1,530,529	$ 83,704	1.3%	1,693,249	$ 65,597	1.2%
Electricity	10,193,865	$ 928,826	12.6%	11,170,228	$ 610,896	9.4%	12,001,064	$ 464,923	8.4%
Materials and suppliers	4,274,697	$ 389,494	5.3%	4,227,827	$ 231,218	3.6%	5,142,486	$ 199,221	3.6%
Outsourced services	5,642,931	$ 514,162	7.0%	4,382,177	$ 239,660	3.7%	6,119,442	$ 237,068	4.3%
Salary	18,000,725	$ 1,640,157	22.3%	25,361,059	$ 1,386,987	21.4%	28,368,988	$ 1,099,019	19.9%
Payroll taxes	6,679,849	$ 608,642	8.3%	10,976,348	$ 600,292	9.3%	13,174,635	$ 510,388	9.3%
Other taxes	249,183	$ 22,705	0.3%	447,343	$ 24,465	0.4%	846,679	$ 32,800	0.6%
Royalties, rents, concessions	6,739	$ 614	0.0%	8,538	$ 467	0.0%	15,698	$ 608	0.0%
Depreciation	3,045,930	$ 277,533	3.8%	7,977,383	$ 436,280	6.7%	10,829,171	$ 419,524	7.6%
Other operating expenses	1,600,190	$ 145,803	2.0%	1,489,986	$ 81,487	1.3%	35,510	$ 1,376	0.0%
Other	11,741	$ 1,070	0.0%	36,069	$ 1,973	0.0%	146,224	$ 5,665	0.1%
Total operating expenses	80,772,447	$ 7,359,676	100.0%	118,267,102	$ 6,467,985	100.0%	142,344,976	$ 5,514,469	100.0%
	10,975	*at December 31*		*18,285*	*at December 31*		*25,813*	*at December 31*	

The breakdown shows the double of the depreciation portion in the total operating expenses in last three years from 3.8% in 1998 to 7.6% 2000. The annual depreciation increased substantially in the U.S. Dollar equivalent also and reached US $420 K.

Tangible Assets

Since the Municipality transferred fixed assets to Aqua Color, the Balance Sheet (Figures 3-15 and 3-16) reflects the residual value of tangible assets operated by the Company. The value of tangible assets consistent with the regulatory process, which permits Aqua Color to recover through depreciation only the historical cost of its assets even though in the economy with high inflation the cost to replace assets upon their retirement will substantially exceed historical cost.

Figure 3-14. Disclosure of Operating Expenses by Activities for 1998-2000

	1998			1999			2000		
	('000 ROL)	(US $)	(%)	('000 ROL)	(US $)	(%)	('000 ROL)	(US $)	(%)
District heating and DHW									
Fuel									
Oil	4,594,802	$ 418,661	9.0%	6,543,387	$ 357,855	8.2%	7,506,708	$ 290,811	7.3%
Natural gas	24,666,349	$ 2,247,503	48.4%	43,380,047	$ 2,372,439	54.5%	55,408,995	$ 2,146,554	54.1%
Total fuel	29,261,151	$ 2,666,164	57.4%	49,923,434	$ 2,730,294	62.8%	62,915,703	$ 2,437,365	61.5%
Electricity	2,220,122	$ 202,289	4.4%	2,419,938	$ 132,346	3.0%	3,310,040	$ 128,232	3.2%
Materials and suppliers	2,055,082	$ 187,251	4.0%	2,266,793	$ 123,970	2.8%	3,469,877	$ 134,424	3.4%
Outsourced services	3,337,403	$ 304,091	6.5%	1,984,405	$ 108,526	2.5%	4,729,791	$ 183,233	4.6%
Salary	9,407,443	$ 857,170	18.5%	13,585,072	$ 742,963	17.1%	14,455,607	$ 560,013	14.1%
Payroll taxes	3,445,813	$ 313,969	6.8%	5,769,643	$ 315,540	7.3%	7,449,503	$ 288,595	7.3%
Other taxes	132,634	$ 12,085	0.3%	83,559	$ 4,570	0.1%	157,034	$ 6,084	0.2%
Royalties, rents, concessions	1,150	$ 105	0.0%	970	$ 53	0.0%	5,809	$ 225	0.0%
Depreciation	1,087,400	$ 99,080	2.1%	3,502,970	$ 191,576	4.4%	5,823,718	$ 225,612	5.7%
Other operating expenses	12,680	$ 1,155	0.0%	15,294	$ 836	0.0%	25,223	$ 977	0.0%
Total district heating and DHW	50,960,878	$ 4,643,360	100.0%	79,552,078	$ 4,350,674	100.0%	102,342,305	$ 3,964,758	100.0%
Water supply									
Fuel	209,046	$ 19,047	1.3%	333,383	$ 18,233	1.6%	397,877	$ 15,414	1.8%
Raw materials	1,159,217	$ 105,623	6.9%	1,477,534	$ 80,806	7.0%	1,626,769	$ 63,021	7.2%
Electricity	6,569,198	$ 598,560	39.4%	7,028,831	$ 384,404	33.3%	6,824,209	$ 264,371	30.0%
Materials and suppliers	962,031	$ 87,657	5.8%	941,350	$ 51,482	4.5%	1,072,740	$ 41,558	4.7%
Outsourced services	1,182,812	$ 107,773	7.1%	791,321	$ 43,277	3.8%	778,785	$ 30,170	3.4%
Salary	4,136,787	$ 376,928	24.8%	5,667,173	$ 309,936	26.9%	6,719,214	$ 260,303	29.6%
Payroll taxes	1,485,874	$ 135,387	8.9%	2,572,144	$ 140,670	12.2%	2,856,907	$ 110,677	12.6%
Other taxes	46,223	$ 4,212	0.3%	142,294	$ 7,782	0.7%	222,446	$ 8,618	1.0%
Royalties, rents, concessions	671	$ 61	0.0%	2,356	$ 129	0.0%	463	$ 18	0.0%
Depreciation	937,089	$ 85,384	5.6%	2,128,164	$ 116,389	10.1%	2,222,755	$ 86,110	9.8%
Other operating expenses	2,937			4,178			5,770		
Total water supply	16,691,885	$ 1,520,901	100.0%	21,088,728	$ 1,153,335	100.0%	22,727,935	$ 880,484	100.0%
Sewage									
Fuel	278,585	$ 25,384	3.3%	238,135	$ 13,024	2.2%	390,931	$ 15,145	3.1%
Raw materials	39,803	$ 3,627	0.5%	51,896	$ 2,838	0.5%	66,126	$ 2,562	0.5%
Thermal energy	-	$ -	0.0%	-	$ -	0.0%	-	$ -	0.0%
Water and sewage	-	$ -	0.0%	-	$ -	0.0%	-	$ -	0.0%
Electricity	1,396,920	$ 127,282	16.6%	1,704,583	$ 93,223	15.7%	1,848,092	$ 71,595	14.7%
Materials and suppliers	549,904	$ 50,105	6.6%	494,986	$ 27,071	4.6%	476,969	$ 18,478	3.8%
Outsourced services	429,428	$ 39,128	5.1%	283,365	$ 15,497	2.6%	334,905	$ 12,974	2.7%
Salary	3,340,647	$ 304,387	39.8%	3,893,261	$ 212,921	35.9%	4,730,871	$ 183,275	37.6%
Payroll taxes	1,346,281	$ 122,668	16.0%	1,905,711	$ 104,223	17.6%	2,107,466	$ 81,644	16.8%
Other taxes	30,011	$ 2,734	0.4%	148,994	$ 8,148	1.4%	290,698	$ 11,262	2.3%
Royalties, rents, concessions	4,918	$ 448	0.0%	5,156	$ 282	0.0%	9,376	$ 363	0.0%
Depreciation	975,134	$ 88,850	11.6%	2,127,358	$ 116,344	19.6%	2,319,794	$ 89,869	18.4%
Other operating expenses	1,163	$ 106	0.0%	2,086	$ 114	0.0%	3,109	$ 120	0.0%
Total sewage	8,392,794	$ 764,719	100.0%	10,855,531	$ 593,685	100.0%	12,578,337	$ 487,287	100.0%
Other activities									
Fuel									
Oil	38,603	$ 3,517	1.2%	45,619	$ 2,495	0.9%	91,931	$ 3,561	2.0%
Natural gas	80,192	$ 7,307	2.6%	119,044	$ 6,510	2.2%	175,388	$ 6,795	3.7%
Total fuel	118,795	$ 10,824	3.8%	164,663	$ 9,005	3.1%	267,319	$ 10,356	5.7%
Raw materials	-	$ -	0.0%	1,099	$ 60	0.0%	354	$ 14	0.0%
Electricity	7,625	$ 695	0.2%	16,876	$ 923	0.3%	18,723	$ 725	0.4%
Materials and suppliers	707,680	$ 64,481	22.5%	524,698	$ 28,696	9.9%	122,900	$ 4,761	2.6%
Outsourced services	693,288	$ 63,170	22.1%	1,323,086	$ 72,359	25.0%	275,961	$ 10,691	5.9%
Salary	1,115,848	$ 101,672	35.5%	2,215,553	$ 121,168	41.8%	2,463,296	$ 95,429	52.5%
Payroll taxes	401,881	$ 36,618	12.8%	728,850	$ 39,861	13.7%	760,759	$ 29,472	16.2%
Other taxes	40,315	$ 3,673	1.3%	72,496	$ 3,965	1.4%	176,501	$ 6,838	3.8%
Royalties, rents, concessions	-	$ -	0.0%	56	$ 3	0.0%	50	$ 2	0.0%
Depreciation	46,307	$ 4,219	1.5%	218,891	$ 11,971	4.1%	462,904	$ 17,933	9.9%
Other operating expenses	-	$ -	0.0%	-	$ -	0.0%	1,408	$ 55	0.0%
Other	11,741	$ 1,070	0.4%	36,069	$ 1,973	0.7%	146,224	$ 5,665	3.1%
Total other activities	3,143,480	$ 286,422	100.0%	5,302,337	$ 289,983	100.0%	4,696,399	$ 181,939	100.0%
	10,975	*at December 31*		*18,285*	*at December 31*		*25,813*	*at December 31*	

Figure 3-15. Balance Sheets in 1998-2000. Assets

	1998		1999		2000	
	('000 ROL)	(US $)	('000 ROL)	(US $)	('000 ROL)	(US $)
ASSETS						
Tangible assets						
Buildings						
Heat and DHW	56,847,268	$ 5,179,706	56,018,018	$ 3,063,605	57,624,808	$ 2,232,395
Water	28,375,470	$ 2,585,464	26,949,765	$ 1,473,873	25,679,594	$ 994,832
Sewage	60,724,719	$ 5,533,004	59,068,025	$ 3,230,409	57,126,143	$ 2,213,076
Other	15,302,620	$ 1,394,316	8,323,698	$ 455,220	11,351,975	$ 439,777
Total buildings	161,250,077	$ 14,692,490	150,359,506	$ 8,223,107	151,782,520	$ 5,880,081
Special buildings						
Heat and DHW	2,297,694	$ 209,357	3,845,175	$ 210,291	7,849,785	$ 304,102
Water	575,160	$ 52,406	1,379,375	$ 75,438	1,810,470	$ 70,138
Sewage	767,544	$ 69,936	667,880	$ 36,526	933,851	$ 36,178
Other	167,689	$ 15,279	50,379	$ 2,755	20,444	$ 792
Total special buildings	3,808,087	$ 346,978	5,942,809	$ 325,010	10,614,550	$ 411,209
Transportation means						
Heat and DHW	7,888	$ 719	43,260	$ 2,366	2,182,531	$ 84,552
Water	2,631	$ 240	141,952	$ 7,763	50,230	$ 1,946
Sewage	39,243	$ 3,576	6,487	$ 355	5,426	$ 210
Other	438,252	$ 39,932	200,247	$ 10,951	122,312	$ 4,738
Total transportation means	488,014	$ 44,466	391,946	$ 21,435	2,360,499	$ 91,446
Other tangible assets						
Heat and DHW	781,062	$ 71,167	1,481,541	$ 81,025	125,640	$ 4,867
Water	118,130	$ 10,764	211,212	$ 11,551	159,484	$ 6,178
Sewage	13,142	$ 1,197	23,319	$ 1,275	15,413	$ 597
Other	267,098	$ 24,337	360,638	$ 19,723	372,164	$ 14,418
Total other tangible assets	1,179,432	$ 107,465	2,076,710	$ 113,575	672,701	$ 26,061
Tangible assets in progress						
Heat and DHW	581,537	$ 52,987	2,208,406	$ 120,777	2,181,935	$ 84,529
Water	821,545	$ 74,856	821,545	$ 44,930	1,044,485	$ 40,464
Sewage	17,412,373	$ 1,586,549	17,529,133	$ 958,662	17,516,788	$ 678,603
Other	11,282,984	$ 1,028,062	12,819,951	$ 701,118	13,949,980	$ 540,425
Total tangible assets in progress	30,098,439	$ 2,742,455	33,379,035	$ 1,825,487	34,693,188	$ 1,344,020
Total Tangible Assets	196,824,049	$ 17,933,854	192,150,006	$ 10,508,614	200,123,458	$ 7,752,817
Total Financial Investments	43,746	$ 3,986	153,317	$ 8,385	168,087	$ 6,512
Current Assets						
Inventories						
Stocks of raw material, consumables, inventors items	1,553,107	$ 141,513	1,756,498	$ 96,062	2,084,004	$ 80,735
Production in progress	4,758	$ 434	3,243	$ 177	2,419	$ 94
Semi-finished, finished products	233	$ 21	21,581	$ 1,180	22,749	$ 881
Goods	223	$ 20	145	$ 8	116	$ 4
Packages	4,008	$ 365	4,365	$ 239	5,776	$ 224
Total inventories	1,562,329	$ 142,353	1,785,832	$ 97,667	2,115,064	$ 81,938
Advance payments to suppliers						
Heat and DHW	-	$ -	-	$ -	-	$ -
Water supply	29,807	$ 2,716	-	$ -	-	$ -
Sewage	-	$ -	-	$ -	-	$ -
Other	98,500	$ 8,975	-	$ -	-	$ -
Total advanced payments to suppliers	128,307	$ 11,691	-	$ -	-	$ -
Receivables						
Accounts receivable						
Heat and DHW	16,541,204	$ 1,507,171	29,045,963	$ 1,588,513	29,827,064	$ 1,155,506
Water supply	8,530,152	$ 777,235	9,813,505	$ 536,697	8,110,796	$ 314,214
Sewage	3,146,678	$ 286,713	4,304,961	$ 235,437	4,507,517	$ 174,622
Other	944,878	$ 86,094	1,729,497	$ 94,586	1,636,699	$ 63,406
Total accounts receivable	29,162,912	$ 2,657,213	44,893,926	$ 2,455,232	44,082,076	$ 1,707,747
Bad debts and disputes	44,971	$ 4,098	172,604	$ 9,440	1,036,865	$ 40,168
Accounts receivable: invoices not issued	338,913	$ 30,880	24,544	$ 1,342	24,550,835	$ 951,104
Total receivables	29,546,796	$ 2,692,191	45,091,074	$ 2,466,014	69,669,776	$ 2,699,019
Less allowances for receivable depreciation	44,971	$ 4,098	146,275	$ 8,000	891,088	$ 34,521
Other receivables	166,197	$ 15,143	336,033	$ 18,378	3,000	$ 116
Credit of VAT	157,149	$ 14,319	4,152,678	$ 227,108	3,240,507	$ 125,538
Subsidies	3,409,209	$ 310,634	4,411,041	$ 241,238	(2,447,762)	$ (94,827)
Debts of other budget entities	20,147	$ 1,836	-	$ -	-	$ -
Intercompany and associations transactions	-	$ -	-	$ -	432,497	$ 16,755
Other debtors	3,621,314	$ 329,960	3,387,410	$ 185,256	3,812,209	$ 147,686
Total other receivables	7,374,016	$ 671,892	12,287,162	$ 671,980	5,040,451	$ 195,268
Cash in bank, ROL account	-	$ -	-	$ -	-	$ -
Cash in bank, foreign currency account	847	$ 77	-	$ -	305	$ 12
Petty cash	67,866	$ 6,184	386,142	$ 21,118	44,249	$ 1,714
Cash in transit	1,480	$ 135	5,581,608	$ 305,256	13,677,471	$ 529,868
Other values	13,475	$ 1,228	15,569	$ 851	29,039	$ 1,125
Total Current Assets	38,650,145	$ 3,521,653	65,001,112	$ 3,554,887	89,685,267	$ 3,474,422
Expenses in advance	43,801	$ 3,991	41,463	$ 2,268	98,878	$ 3,831
Total Assets	**235,561,741**	**$ 21,463,484**	**257,345,898**	**$ 14,074,154**	**290,075,690**	**$ 11,237,581**
Exchange Rate ROL/US$	*10,975*	*at December 31*	*18,285*	*at December 31*	*25,813*	*at December 31*

Figure 3-16. Balance Sheets in 1998-2000. Liabilities

	1998		1999		2000	
	('000 ROL)	(US $)	('000 ROL)	(US $)	('000 ROL)	(US $)
LIABILITIES AND SHAREHOLDER'S EQUITY						
Shareholder's Equity						
Paid-in capital	43,324,950	$ 3,947,604	43,324,950	$ 2,369,426	43,324,950	$ 1,678,416
Reserves	140,701,818	$ 12,820,211	156,433	$ 8,555	279,294	$ 10,820
Profit	561,395	$ 51,152	770,757	$ 42,152	1,801,246	$ 69,781
Profit distribution	561,395	$ 51,152	770,757	$ 42,152	1,801,246	$ 69,781
Other funds	15,824,590	$ 1,441,876	153,027,578	$ 8,369,023	161,008,070	$ 6,237,480
Total Shareholder's Equity	199,851,358	$ 18,209,691	196,508,961	$ 10,747,004	204,612,314	$ 7,926,716
Liabilities						
Long-Term Debt	3,125,815	$ 284,812	9,316,708	$ 509,527	15,064,654	$ 583,607
Current Liabilities						
Short term bank loans	-	$ -	-	$ -	-	$ -
Other loans and similar debts	-	$ -	-	$ -	-	$ -
Interest payable	-	$ -	-	$ -	-	$ -
Accounts payable						
Heat and DHW						
Fuel suppliers	1,773,876	$ 161,629	540,087	$ 29,537	1,763	$ 68
Heat suppliers	11,766,857	$ 1,072,151	28,203,084	$ 1,542,416	30,363,792	$ 1,176,298
Other suppliers	-	$ -	-	$ -	-	$ -
Total heat and DHW	13,540,733	$ 1,233,780	28,743,171	$ 1,571,954	30,365,555	$ 1,176,367
Water supply	428,764	$ 39,067	420,907	$ 23,019	204,170	$ 7,910
Sewage	1,016,185	$ 92,591	461,366	$ 25,232	1,629,860	$ 63,141
Other	1,212,640	$ 110,491	991,155	$ 54,206	1,963,838	$ 76,079
Total account payable	16,198,322	$ 1,475,929	30,616,599	$ 1,674,411	34,163,423	$ 1,323,497
Notes payable						
Heat and DHW	6,400,000	$ 583,144	7,549,103	$ 412,858	15,251,034	$ 590,828
Water supply	-	$ -	595,686	$ 32,578	566,998	$ 21,966
Sewage	-	$ -	-	$ -	191,564	$ 7,421
Other	-	$ -	19,024	$ 1,040	1,015,039	$ 39,323
Total notes payable	6,400,000	$ 583,144	8,163,813	$ 446,476	17,024,635	$ 659,537
Accounts payable for fixed assets						
Heat and DHW	854,683	$ 77,875	1,290,047	$ 70,552	2,669,339	$ 103,411
Water supply	3,178	$ 290	104,250	$ 5,701	247,340	$ 9,582
Sewage	360,493	$ 32,847	378,579	$ 20,704	150,113	$ 5,815
Other	156,826	$ 14,289	192,484	$ 10,527	66,695	$ 2,584
Total accounts payable for fixed assets	1,375,180	$ 125,301	1,965,360	$ 107,485	3,133,487	$ 121,392
Accounts payable - invoices not received	166,374	$ 15,159	47,080	$ 2,575	-	$ -
Advanced payments from clients		$ -		$ -		$ -
Heat and DHW	-	$ -	-	$ -	-	$ -
Water supply	-	$ -	-	$ -	-	$ -
Sewage	-	$ -	-	$ -	-	$ -
Other	34,429	$ 3,137	36,413	$ 1,991	26,455	$ 1,025
Total advance payments	34,429	$ 3,137	36,413	$ 1,991	26,455	$ 1,025
Personnel and similar accounts	1,278,204	$ 116,465	3,679,194	$ 201,214	5,608,113	$ 217,259
Social security fund	1,936,992	$ 176,491	1,616,886	$ 88,427	1,303,826	$ 50,510
Unemployment fund	123,508	$ 11,254	116,243	$ 6,357	133,903	$ 5,187
Income tax	188,421	$ 17,168	259,357	$ 14,184	352,848	$ 13,669
VAT payable	-	$ -	-	$ -	-	$ -
VAT unexpired	147,671	$ 13,455	-	$ -	3,914,862	$ 151,662
Salaries tax	427,767	$ 38,976	292,018	$ 15,970	200,334	$ 7,761
Subsidies	-	$ -	-	$ -	-	$ -
Other taxes and duties	23,119	$ 2,107	936,453	$ 51,214	262,754	$ 10,179
Special fund	22,337	$ 2,035	119,012	$ 6,509	151,043	$ 5,851
Other debts to the state budget	-	$ -	-	$ -	-	$ -
Intercompany and association transactions	-	$ -	-	$ -	-	$ -
Other debts	733,330	$ 66,818	284,528	$ 15,561	307,699	$ 11,920
Total Current Liabilities	29,055,654	$ 2,647,440	48,132,956	$ 2,632,374	66,583,382	$ 2,579,452
Revenues in advance	3,528,914	$ 321,541	3,387,273	$ 185,249	3,815,340	$ 147,807
Total Liabilities	35,710,383	$ 3,253,793	60,836,937	$ 3,327,150	85,463,376	$ 3,310,866
Total Liabilities and Shareholder's Equity	**235,561,741**	**$ 21,463,484**	**257,345,898**	**$ 14,074,154**	**290,075,690**	**$ 11,237,581**
Exchange Rate ROL/US$	*10,975*	*at December 31*	*18,285*	*at December 31*	*25,813*	*at December 31*

Tangible assets involved in heating activity and sewage activities amount 35% and 38% he total residual value or US$2.7 M and US$ 2.9 M as of December 31, 2000, respectively.

Since the proposed project cost is about US$ 3 M, the project implementation will increase substantially company's tangible assets.

Accounts Receivables

Population is a principal debtor. The share of population receivable increased from 75% in 1998 to 78% in 1999 and 83% in 2000. The share of budgetary organizations and other legal entities decreased for the same period of time from 16.2% and 8.5% to 12.4% and 4.0%, respectively.

Although in 2000 total accounts receivable increased slightly in the U.S Dollar equivalent from US$ 2,466 K to 2,699 (Figure 3-17), they still were on the level at the end of 1998. In addition, it is important to note that Aqua Color decreased substantially the portion of receivables exceeded thirty days from 60% in 1998 and 1999 to 43% on December 31, 2000. The Aqua Color management intensifies the bill collection activity and tries to implement different approaches for the work with principal debtors - Residential Associations.

Accounts Payable

Although the fraction of payables for natural gas slightly decreased in 2000 from 92.3% to 89.3%, Distrigas Nord SA-Bacau still was a principal creditor, and the accounts payable amounted US$ 1,181 K as of December 31, 2000. The share of payable to Electrica SA-Piatra Neamt was 4.8%.

However, there are promising trends with accounts payable. First, Aqua Color reduced the percentage of payables exceeded thirty days from 57% to 50% in 2000. Second, accounts payable decreased in the US Dollar equivalent from US$ 1,674 K to US $1,323 K or by 21%.

Long-Term and Short-Term Debts

Aqua Color has bank accounts at Romanian Development Bank, Romanian Commercial Bank and Piatra Neamt Treasury. The company has a good credit history and extensive experience in commercial borrowing in cooperation with two commercial banks: Romanian Development Bank (BRD) and Romanian Commercial Bank (BCR). According the constitutive act of the Company, applying for a loan and issuing guarantees is the attribute of the Board of Administration when the assets that represent collateral do not exceed 50% of the book value of the total Company assets and responsibility of the Shareholders General Assembly when these exceed 50%. Aqua Calor SA has applied for commercial loans for the production activity, to support its own financing for capital investment and for equipment purchase.

In 2000 Romanian Development Bank provided a one-year credit line for investments and a one-year credit line for operating expenses. Romanian Commercial Bank lent for the working capital increase also. As of December 31, 2000 Aqua Color owed ROL 4,0 billion to BRD and ROL 11.0 billion to BCR. In 2001 the Company has a loan agreement with BRD for the investment credit line and the credit line for operating expenses in the amount of ROL 5.0 billion each. In addition the Company has the ROL 14 billion credit line at BCR for the working capital increase. During the entire period considered, the company has returned borrowed amounts on time, respecting the contractual maturity and obligations regarding the interest rates. The loans were guaranteed with:

- DHS assets,
- Assignment of receivables form third parties,
- Guarantees of the Local Council of Piatra Neamt,
- Equipment purchased with loans.

A meeting with the BRD branch management in Piatra Neamt showed that Aqua Color has earned a good reputation at the commercial bank, and the BRD branch manager expressed a strong interest in the continuation of the long-term business cooperation with the Company.

Figure 3-17. Accounts Receivable

		less than 30 days	over 30 days	over 60 days	over 180 days	over 1 year	Total	Share of Total Payables (%)
December 31, 1998								
Population								
Services to residential associations	'000 ROL	8,817,684	6,085,398	5,849,678	1,345,546	16,223	22,114,529	**74.8%**
Services to individual households	'000 ROL	80,366	27,066	28,213	8,713	3,715	148,073	**0.5%**
Rent of appartments	'000 ROL	106	92	197	351	141	887	**0.0%**
Total population	'000 ROL	8,898,156	6,112,556	5,878,088	1,354,610	20,079	22,263,489	**75.3%**
Legal entites								
Budgetary organizations	'000 ROL	1,365,860	841,040	372,158	471,390	-	3,050,448	**10.3%**
Local council Savinesti	'000 ROL	73,237	72,036	224,320	264,608	712,221	1,346,422	**4.6%**
Local council Roznov	'000 ROL	20,623	19,990	83,179	112,153	-	235,945	**0.8%**
Local council Zanesti	'000 ROL	7,347	6,834	51,491	24,301	60,580	150,553	**0.5%**
Other legal entities								
Services to legal entities	'000 ROL	1,279,071	184,168	152,823	253,846	183,780	2,053,688	**7.0%**
Rent of real estate	'000 ROL	123,026	32,041	33,594	21,413	236,177	446,251	**1.5%**
Total other legal entities	'000 ROL	1,402,097	216,209	186,417	275,259	419,957	2,499,939	**8.5%**
Total legal entities	'000 ROL	2,869,164	1,156,109	917,565	1,147,711	1,192,758	7,283,307	**24.7%**
Total	'000 ROL	**11,767,320**	**7,268,665**	**6,795,653**	**2,502,321**	**1,212,837**	**29,546,796**	**100.0%**
		39.8%	**24.6%**	**23.0%**	**8.5%**	**4.1%**	**100.0%**	
	(US$)	**$ 1,072,193**	**$ 662,293**	**$ 619,194**	**$ 228,002**	**$ 110,509**	**$ 2,692,191**	
Exchange Rate ROL/US$					*10,975*			
December 31, 1999								
Population								
Services to residential associations	'000 ROL	14,716,703	9,582,074	6,746,624	3,845,645	292,786	35,183,832	**78.0%**
Services to individual households	'000 ROL	141,841	52,744	23,630	7,572	6,251	232,038	**0.5%**
Rent of appartments	'000 ROL	83,083	67,503	155,625	95,738	755	402,704	**0.9%**
Total population	'000 ROL	14,941,624	9,702,321	6,925,879	3,948,955	299,792	35,818,571	**79.4%**
Legal entites							-	
Budgetary organizations	'000 ROL	1,839,946	1,194,786	391,254	472,638	115,767	4,014,391	**8.9%**
Local council Savinesti	'000 ROL	105,784	107,570	681,665	469,329	1,050,088	2,414,436	**5.4%**
Local council Roznov	'000 ROL	15,641	9,275	70,452	58,689	-	154,057	**0.3%**
Local council Zanesti	'000 ROL	12,264	11,592	36,677	50,728	65,934	177,195	**0.4%**
Other legal entities							-	
Services to legal entities	'000 ROL	1,268,401	276,458	122,736	237,746	264,718	2,170,059	**4.8%**
Rent of real estate	'000 ROL	32,780	15,127	14,264	140,692	139,502	342,365	**0.8%**
Total other legal entities	'000 ROL	1,301,181	291,585	137,000	378,438	404,220	2,512,424	**5.6%**
Total legal entities	'000 ROL	3,274,816	1,614,808	1,317,048	1,429,822	1,636,009	9,272,503	**20.6%**
Total	'000 ROL	**18,216,440**	**11,317,129**	**8,242,927**	**5,378,777**	**1,935,801**	**45,091,074**	**100.0%**
		40.4%	**25.1%**	**18.3%**	**11.9%**	**4.3%**	**100.0%**	
	(US$)	**$ 996,250**	**$ 618,930**	**$ 450,803**	**$ 294,163**	**$ 105,868**	**$ 2,466,014**	
Exchange Rate ROL/US$					*18,285*			
December 31, 2000								
Population								
Services to residential associations	'000 ROL	33,842,954	2,509,073	10,276,141	10,146,926	754,839	57,529,933	**82.6%**
Services to individual households	'000 ROL	251,428	33,741	44,900	58,684	11,025	399,778	**0.6%**
Rent of appartments	'000 ROL	39,699	34,748	83,930	56,710	101,201	316,288	**0.5%**
Total population	'000 ROL	34,134,081	2,577,562	10,404,971	10,262,320	867,065	58,245,999	**83.6%**
Legal entites							-	
Budgetary organizations	'000 ROL	3,394,763	180,915	442,880	1,148,596	21,632	5,188,786	**7.4%**
Local council Savinesti	'000 ROL	69,168	56,435	288,277	393,922	1,962,437	2,770,239	**4.0%**
Local council Roznov	'000 ROL	52,745	30,340	143,801	98,485	-	325,371	**0.5%**
Local council Zanesti	'000 ROL	34,185	20,357	107,985	70,750	88,779	322,056	**0.5%**
Other legal entities							-	
Services to legal entities	'000 ROL	1,773,315	87,728	63,250	293,188	245,972	2,463,453	**3.5%**
Rent of real estate	'000 ROL	52,360	13,249	13,137	22,063	253,063	353,872	**0.5%**
Total other legal entities	'000 ROL	1,825,675	100,977	76,387	315,251	499,035	2,817,325	**4.0%**
Total legal entities	'000 ROL	5,376,536	389,024	1,059,330	2,027,004	2,571,883	11,423,777	**16.4%**
Total	'000 ROL	**39,510,617**	**2,966,586**	**11,464,301**	**12,289,324**	**3,438,948**	**69,669,776**	**100.0%**
		56.7%	**4.3%**	**16.5%**	**17.6%**	**4.9%**	**100.0%**	
	(US$)	**$ 1,530,648**	**$ 114,926**	**$ 444,129**	**$ 476,090**	**$ 133,225**	**$ 2,699,019**	
Exchange Rate ROL/US$					*25,813*			

Figure 3-18. Accounts Payable

		less than 30 days	over 30 days	over 90 days	Total	Share of Total Payables (%)
December 31, 1998						
Distrigas Nord SA-Bacau	'000 ROL	5,900,937	5,897,715	-	11,798,652	**72.8%**
Confmetalon SRL-Onesti	'000 ROL	-	1,229,945	-	1,229,945	**7.6%**
Electrica SA-Piatra Neamt	'000 ROL	1,016,185	-	-	1,016,185	**6.3%**
CN Apele Romane SA-Siret Bacau	'000 ROL	2,778	120,194	285,755	408,728	**2.5%**
Peco SA Petrom-Piatra Neamt	'000 ROL	512,136	-	-	512,136	**3.2%**
Omex SRL-Piatra Neamt	'000 ROL	189,943	-	-	189,943	**1.2%**
Rep Construct SRL-Piatra Neamt	'000 ROL	-	165,237	-	165,237	**1.0%**
Other suppliers	'000 ROL	51,735	667,521	158,242	825,762	**5.1%**
Total	'000 ROL	**7,673,713**	**8,080,612**	**443,997**	**16,198,322**	**100.0%**
		47.4%	**49.9%**	**2.7%**	**100.0%**	
	(US$)	**$ 699,199**	**$ 736,274**	**$ 40,455**	**$ 1,475,929**	
Exchange Rate ROL/US$			*10,975*			
December 31, 1999						
Distrigas Nord SA-Bacau	'000 ROL	11,449,811	6,066,567	10,742,027	28,258,406	**92.3%**
Peco SA Petrom-Piatra Neamt	'000 ROL	543,088	-	-	543,088	**1.8%**
Electrica SA-Piatra Neamt	'000 ROL	461,336	-	-	461,336	**1.5%**
CN Apele Romane SA-Siret Bacau	'000 ROL	179,025	170,417	71,465	420,907	**1.4%**
Petroplast SRL-Piatra Neamt	'000 ROL	127,392	-	-	127,392	**0.4%**
Instelcons SRL -Piatra Neamt	'000 ROL	105,408	-	-	105,408	**0.3%**
Other suppliers	'000 ROL	178,741	124,174	397,147	700,062	
Total	'000 ROL	**13,044,802**	**6,361,158**	**11,210,639**	**30,616,599**	**100.0%**
		42.6%	**20.8%**	**36.6%**	**100.0%**	
	(US$)	**$ 713,415**	**$ 347,889**	**$ 613,106**	**$ 1,674**	
Exchange Rate ROL/US$			*18,285*			
December 31, 2000						
Distrigas Nord SA-Bacau	'000 ROL	14,288,340	10,758,302	5,448,481	30,495,123	**89.3%**
Electrica SA-Piatra Neamt	'000 ROL	1,629,860	-	-	1,629,860	**4.8%**
Peco SA Petrom-Piatra Neamt	'000 ROL	-	-	-	-	**0.0%**
Ruginex SA-Piatra Neamt	'000 ROL	-	313,161	257,673	570,834	**1.7%**
Reper Construct SRL-Piatra Neamt	'000 ROL	349,115	-	31,587	380,702	**1.1%**
CN Apele Romane SA-Siret Bacau	'000 ROL	177,964	43,612	-	221,576	**0.6%**
Peco SA Petrom-Roman	'000 ROL	-	-	-	-	**0.0%**
Other suppliers	'000 ROL	573,510	106,874	184,944	865,328	
Total	'000 ROL	**17,018,790**	**11,221,948**	**5,922,685**	**34,163,423**	**100.0%**
		49.8%	**32.8%**	**17.3%**	**100.0%**	
	(US$)	**$ 659,311**	**$ 434,740**	**$ 229,446**	**$ 1,323**	
Exchange Rate ROL/US$			*25,813*			

Figure 3-19. Aqua Calor Experience with Long- and Short-Term Loans within the Last Years

Purpose	Lender	Amount ('000 ROL)	Date of Origination Term (years); Interest Rate (%)	Security Package	Date when Repaid
Production	Romanian Development Bank	5,000,000	January 1, 1998; 1 year; 59 %	DHC assets guarantee	December 31, 1998
Investment	Romanian Development Bank	700,000	November 24, 1998; 1 year; 62 %	DHC assets guarantee	December 31, 1999
Investment	Romanian Development Bank	220,000	October 10, 1998; 1 year; 62 %	DHC assets guarantee	March 31, 1999
Production	Romanian Commercial Bank	9,900,000	June 12, 1999; 1quarter; 59 %	DHC assets guarantee	December 31, 1999
Production	Romanian Development Bank	2,500,000	January 1, 1999; 1 year; 60 %	DHC assets guarantee	December 31, 1999
Production	Romanian Commercial Bank	9,900,000	January 1, 2000 , 1 year , 59 %	DHC assets guarantee	December 31, 2000
Production	Romanian Development Bank	4,000,000	January 1, 2000, 1 year , 60 %	Boiler houses guarantee	December 31, 2000
Investment	Romanian Development Bank	4,000,000	June 22, 2000, 1 year, 48 %	Equipment to be purchased	March 31, 2001
Production	Romanian Commercial Bank	14,000,000	January 1, 2001, 1 quarter, 48 %	DHC assets guarantee	March 31, 2001
Production	Romanian Development Bank	5,000,000	January 1, 2001, 1 year, 49 %	Boiler houses guarantee	-
Investment	Romanian Development Bank	5,000,000	June 12, 2001, 1 year, 48 %	Boiler houses guarantee	-

The Company management indicated a number of assets available as collateral for securing the loan (Figure 3-20). The total residual value of these assets is considerable, close to US$ 600,000 at the current exchange rate. Nevertheless, the issue of using this collateral in the context of the project requires further analysis since the liquidity of this type of fixed assets (boiler houses) is highly questionable.

Figure 3-20. Assets of Aqua Calor Available as Collateral for Securing a Loan

Description	Inventory Value (ROL)	Residual Value (ROL)
Boiler house # 1	441,547,388	373,782,374
Boiler house # 10	860,694,278	739,256,771
Boiler house # 11	447,882,778	372,439,495
Boiler house # 17	231,621,386	180,118,606
Boiler house # 18	552,222,580	452,627,783
Boiler house # 19	517,500,574	415,047,547
Boiler house # 20	517,500,574	399,736,753
Boiler house # 21	517,500,574	419,646,277
Boiler house # 22	543,226,706	455,279,005
Boiler house # 23	514,563,990	430,085,643
Boiler house cadre	322,380,852	292,226,403
Boiler house # 31	659,139,503	562,696,904
Boiler house # 32	593,293,397	506,548,132
Boiler house # 33	593,293,397	506,414,060
Centrala termica cadre	676,166,029	574,239,539
Boiler house # 36	439,610,867	376,771,014
Boiler house # 37	411,699,066	345,364,308
Boiler house # 38	750,899,927	643,046,374
Boiler house # 40	410,062,889	351,232,339
Boiler house # 41	620,469,472	526,084,647
Boiler house # 42	641,696,059	547,617,276
Boiler house # 44	209,036,568	180,322,197
Boiler house # 45	617,675,318	529,549,823
Boiler house # 46	617,675,318	529,559,385
Boiler house # 48	450,379,750	378,887,495
Boiler house # 49	537,146,735	458,821,657
Boiler house # 50	633,929,931	542,243,537
Boiler house # 52	526,545,843	443,950,010
Boiler house # 53	700,620,795	598,669,968
Boiler house # 54	416,405,563	354,818,962
Boiler house # 61	837,546,885	725,682,334
Boiler house # 62	930,607,650	827,417,573
Centrala termica	840,281,351	760,934,315
Boiler house # 65	837,546,885	725,603,478
Boiler house # 2	930,607,650	827,410,176
Boiler house # 67	665,984,264	505,904,575
TOTAL	**21,014,962,792**	**17,860,036,735**

Shareholder's Equity

Aqua Color is a municipally owned business entity. In 1997 the Municipality transferred ownership of heat, water supply and sewage facilities to the Company. In 1998 Reserves and in 1999-2000 Other Funds represented the Company's ownership in the result of taking a possession of the municipal assets. It is important to note that in 1998 the tangible assets were reevaluated in compliance with the Government Decision 983/98, and Receives of 1998 in the amount of ROL 140.7 M reflected the reevaluation.

4 Technical Background and Description of the Project

4.1 Project Goals

The goal of this project is to improve the overall operational efficiency and the heat supply capacity of the Piatra Neamt district heating system (generation, transmission and distribution network) so that heat comfort levels and sufficient domestic hot water supply are realized in affordable for population manner.

Due to financial limitation only 13 boiler houses with their respective pipe networks and with connections in the buildings are proposed for upgrade within the frame of this pre-feasibility study. Revenues from energy savings will be sufficient to service the debt and finance additional required improvements on a time-phased schedule to upgrade the remaining boiler houses and networks.

4.2 General System Conditions

The city of Piatra Neamt is located in northeastern mountain part of Romania not far from the borders with Ukraine and Republic of Moldavia. The climate for this area is relatively mild, with design outdoor air temperature of -18 degrees centigrade (°C). The monthly average temperature in the city for the past three years is given below.

Figure 4-1. Monthly Average Temperature for Piatra Neamt

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1997	-3.4	0.7	3	5	15.7	18.1	19	18.1	12.4	7.1	-3.4	0.7
1998	-0.2	2.9	2	11.5	13.5	18.8	20.2	19	13.4	9.1	-0.2	2.9
1999	-0.1	-0.2	4.3	9.8	13	19.8	21.2	19.2	15.4	9.3	-0.1	-0.2
2000	-3	1.9	3.6	12.2	15.8	18.2	19.7	20.3	13	9.2	6.5	2.5

The municipal district heating system in Piatra Neamt consists of 66 local networks originating from 66 boiler houses (BHs), and serves population and public buildings primary. No heat is purchased from outside sources. SC AQUA CALOR SA Piatra Neamt, the local heat production and distribution company, owns and operates this system. This is a private company 100%-owned by city council.

Municipal district heating system serves the majority of city population; namely up to 116,000 residents out of 131, 000 of the total. The total amount of buildings connected to DH system is 819, including: 718 apartment buildings, 44 public ones, 18 commercial and 35 others; and also 5 small industrial enterprises. The total floor area of heated buildings is around 1.91 million m^2.

Generation Side Conditions

The total number of boilers located at 66 boiler houses is 404, with the total installed capacity of 333.57 Gcal/hr. Most of these BHs are fueled by natural gas, and only few of them utilize liquid fuel. All boiler houses are equipped with gas meters and heat meters. The boilers' park consists of old-fashioned and inefficient local-made boilers (model Metalica), with the exception of few recently installed ones. DH

Company is doing all the best to keep these old boilers in proper shape, but it became more expensive every year as more and more investments are needed for maintenance and repair. Comparison of reading of gas and heat meters confirms decent performance of Aqua Calor staff in boilers and BHs maintenance; in general boilers' operational performance is not far from manufacturers' data. Nevertheless in spite of all efforts of Aqua Calor, poor boilers' design and obsolete technical arrangements at BHs doesn't allow coming closer to operational efficiency matching rising energy cost.

The lack of control in combustion processes, heat supply, etc. becomes an essential impediment for efficient operation of BHs. This lack of control at BH accompanied with the absence of any control at the Demand Side (DS) doesn't allow for balancing of heat supply to customers. As a result, some buildings often are overheated, with the others under heated.

The next deficiency of existing systems is the absence any chemical water treatment, i.e. raw untreated water is used as a heating medium circulating inside boiler tubes, networks, and internal heating system of the buildings. Therefore, all boilers tube systems require complete replacement once every several years, despite very beneficial chemical content of raw water.

The main environmental problem comes from the use of very basic gas burners installed at Metalica boilers. These burners don't provide proper mixing of natural gas with air, causing reduction in combustion efficiency and excessive generation of carbon monoxide and nitrogen oxides.

Almost all boiler houses are significantly oversized in term of the installed capacity against the demands from connected buildings. At the stage of city's development these BHs were intended for serving more buildings than eventually had been built.

Transmission and Distribution Conditions

The transmission and distribution network from each boiler house consists of three pipelines in underground, non-accessible, concrete channels. Two pipes carry hot water for space heating (supply and return), and one pipe carries hot water for domestic use; there is no re-circulation of domestic hot water. The lack of a return for domestic hot water reduces overall system efficiency. All local network pipes are oversized (up to 250 mm in diameter for space heating and up to 100 mm for domestic hot water).

Despite of the absence of chemical water treatment, steel pipes of underground networks are still not in a bad shape; corrosion and water losses are less than can be expected for aged pipes. As it was already mentioned, the beneficial fact is that untreated water, used as a heating medium, is not aggressive. Thus internal corrosion of pipes is developing slowly. Fortunately underground water is not aggressive as well, and located deeply from earth surface in most areas of the city. Therefore, corrosion of pipes from outside is not at alarming level either.

The picture with heat losses is quite different, i.e. these losses are very high. It is caused primarily by missing thermal insulation; visual observation through manholes confirmed that fact. The second cause for increased heat losses is related to certain operational procedures. DH Company management claimed that during last several years they experienced limitations in natural gas supply. In order to save natural gas and to spread limited supply between operating boilers, they made decision to reduce the temperatures in heating networks against the required according to technical codes under certain outdoor temperatures. Some improvement of fuel utilization in boilers had been achieved, but low water temperature entering into the buildings turned to undesirable effect of the failure of heat extraction in radiators. Eventually for many networks unavoidable temperature drops within networks (i.e. heat losses) became almost equal to reduced useful extraction in the buildings.

The low temperatures and small temperature differential between supply and return water causes an over-consumption of power for water pumping.

End-Use Conditions

Reported demand of all connected to BHs buildings at the buildings' level is 202.128 Gcal/hr. This value reflects design characteristics of connected buildings only, but doesn't mean maximum heating demand actually met. Because of high heat losses in transmission and distribution, the real maximum hourly supply was significantly less. There are indications that radiators in buildings never had been flushed, and are clogged with scale and sediment. Nevertheless, Aqua Calor claimed that during last heating seasons many buildings had been overheated, with the exception of short periods of very cold temperatures when BH could not provide the supply adequate to comfort level. During the most of heating season time residents reduced this overheating in very traditional way, i.e. by windows' opening. By conservative assessment introduction of control at the buildings' level would allow to achieve at least 3% savings in heat supplied due elimination of heat waste.

It seems as a contradiction that heat supply to users, which is reduced against needed according to the design, creates buildings' overheating. The explanation might be the following:

- Design demand was overestimated; thermal characteristics of well-built buildings allow to have less heat supplied for maintaining of indoor comfort level,
- Last several winters were warmer against average outdoor temperatures observed for many years and accepted by construction codes for buildings' heat demand calculations,
- Provided by Aqua Calor information shows that radiators in many buildings are oversized, which to some extend diminishes detrimental effect of reduced water temperature.

By the own reasons and independently to this project, the City Council launched the program for installation of heat meters for every building in the city. The target is to establish procedures, when the customers (users associations) pay for heat actually consumed, instead of calculated on theoretical basis one. Introduction of mentioned measure would provide the answer on the amount of heat needed for each specific building.

Conclusions on Existing System Conditions

The overall conclusions about the condition of equipment, the DH Company performance, and the end-user situation for the Piatra Neamt space heating and hot water systems are:

- All elements of the district heating system (boiler houses, piping networks, and end-user internal building systems) are poorly designed and deteriorated, and in need of upgrade or replacement.
- The main equipment and pipe networks are oversized for current and future demand.
- Reported data on heat consumption are not reliable.
- Upgrade of the system to meet western standards for living conditions requires an investment that is not affordable for municipal budgets.

Aqua Calor ordered in the past and already has the proposals on upgrade of entire municipal heating system, developed by the group of specialists from Technical Institute in the city of Iasi. These proposals include the measures targeted at improvement of energy efficiency for all components of heating systems (boiler houses, transmission and distribution, and demand side). Disregard of technical merits of mentioned project, it is obvious that with the total cost of around $US 67 millions such proposals are non-acceptable for commercial loan. Such investments exceed more than ten times annual budget of Aqua Calor and the municipality as well. Furthermore, proposed huge investments in no way could provide reasonable payback. Reported data on present conditions for 13 local systems/networks eventually selected for upgrade are presented below at Figure 4.2.

Figure 4-2. Reported Data on 13 Networks Performance

Network	Heating Load, Gcal/h				Boiler Houses 2000				Network Losses January and February 1999					2000		
	Maximum Heat	Load at the Buildings level	Boiler Houses Gates	Boilers	Gas Consuption, 000 m3/y	Heat Supply from BH, Gcal/y	Specific Gas Consumption, m3/Gcal	Boiler House Efficiency, %	Temperature of Supply Water at BH, deg. C	Temperature of Return Water at BH, deg. C	Temperature of Supply Water at Endusers, deg. C	Temperature of Return Water at Endusers, deg. C	Network Efficiency, %	Heat Delivery Efficiency Overall, %	Annual Heat Delivery to Endusers, Gcal	Number of Connected Buildings
1	3211061	3.21	3.42	3.52	834,160	5,678	146.90	84.6%	48.0	46.0	42.0	41.0	57.1%	48.3%	3,245	26
2	2230132	2.23	2.37	2.45	736,506	4,346	169.46	73.3%	48.0	46.0	42.0	41.0	57.1%	41.9%	2,484	6
3	2449189	2.45	2.61	2.69	699,518	3,567	196.10	63.3%	48.0	46.0	42.0	41.0	57.1%	36.2%	2,038	5
4	2653737	2.65	2.82	2.91	809,908	4,949	163.64	75.9%	50.0	48.0	42.0	41.0	66.7%	50.6%	3,300	6
5	3341604	3.34	3.55	3.66	946,367	6,111	154.87	80.2%	48.0	46.0	42.0	41.0	57.1%	45.8%	3,492	13
6	3369192	3.37	3.58	3.70	884,058	5,603	157.78	78.7%	48.0	46.0	42.0	41.0	57.1%	45.0%	3,202	10
14	5290609	5.29	5.63	5.80	1,592,761	10,268	155.12	80.1%	50.0	47.0	43.0	42.0	50.0%	40.0%	5,134	22
22	6106878	6.11	6.50	6.70	1,698,728	9,756	174.13	71.3%	49.0	47.0	42.0	41.0	62.5%	44.6%	6,097	16
23	3991214	3.99	4.25	4.38	1,114,758	7,010	159.02	78.1%	48.0	46.0	42.0	41.0	57.1%	44.6%	4,006	12
27	5661874	5.66	6.02	6.21	1,394,601	9,612	145.10	85.6%	49.0	46.0	42.0	40.0	44.4%	38.1%	4,272	24
28	4259334	4.26	4.53	4.67	1,005,243	6,287	159.89	77.7%	49.0	46.0	42.0	40.0	44.4%	34.5%	2,794	22
41	4798123	4.80	5.10	5.26	1,221,505	7,867	155.28	80.0%	50.0	47.0	42.0	41.0	55.6%	44.4%	4,370	21
51	4972258	4.97	5.29	5.45	1,193,550	7,606	156.92	79.2%	49.0	47.0	42.0	41.0	62.5%	49.5%	4,754	17
54	4607411	4.61	4.90	5.05	1,313,291	8,363	157.04	79.1%	50.0	47.0	42.0	40.0	50.0%	39.6%	4,181	22

4.3 Project Approach

During several meetings between Electrotek team and Aqua Calor management it had been established the following approach for development of pre-feasibility on upgrade of heating network:

1. Aqua Calor consider as long-term target to have all 66 system upgraded, in order to provide all consumers with sufficient and affordable heat in most efficient manner. But:
2. The total investments into upgrade, affordable for company's budget are in a range of $US 3.5 millions; the last is accepted as a milestone for current pre-feasibility study,
3. Such investments would allow upgrade of 13 local systems, out of total 66. For each system an upgrade should include energy efficient measures for all systems' components (BH, transmission and distribution, and demand side).
4. Criteria for selection of the systems subject to upgrade are the following:
    - Each upgraded system can be considered as a small separate project, with the targeted payback of around 4 years,
    - There is no urgent need for replacement of any specific local system; all systems are almost equally worn-out. Thus it was agreed that economic criteria, i.e. anticipated payback on investment for any specific network should be a base for loan packaging, i.e. they should be included in the order of diminishing payback,
5. The residents currently paying their bills should be benefited by better service in the first turn, i.e. the districts with better average payments would have the privilege.
6. Estimated savings from the upgrade of selected systems are sufficient to service the loan and provide additional funds for re-investment to upgrade the remaining networks on a scheduled basis.

4.4 Proposed Technical Measures and Assumptions

Technical Measures

Within the frame of proposed pre-feasibility study Aqua Calor budget supports the upgrade of limited number of boiler houses and isolated networks. At the completion of measures included in pre-feasibility study these isolated networks have been upgraded as follows:

- New efficient boiler(s) are installed with capacities matching calculated base load; two natural gas-fired efficient boilers in each boiler house. For the base load it is assumed the space-heating load responding to average temperature of heating season plus entire DHW load. Thus new boilers would cover around 60% of total heating load. In addition to new boiler(s), one or two of better-maintained existing boilers in each BH are upgraded with new burners and up-to-date control. The capacity of upgraded boilers would make the remaining 40% of total required boiler house capacity. It is understood that the efficiency of upgraded boilers would be 5 – 6 % less than new ones, but the cost of upgrade is only a fraction of new installation. Taking into account that upgraded boilers are designated for peak heating load only, their shares in total heat generation would be less than 10%. Thus their lesser efficiency can't significantly reduce overall efficiency of annual heat supply.
- Worn-out 3-pipe transmission/distribution systems are rehabilitated into 2-pipes systems. The pipes designated for space are to be re-insulated, and some worn-out sections replaced. It would be no more DHW pipe, but preparation of DHW is to be moved into served buildings.
- Chemical water treatment unit is installed inside each boiler house.
- Plate heat exchangers for space heating are installed at boiler houses, and the ones for preparation of domestic hot water within individual buildings.
- Metering and control systems for the distribution of heat, incorporated into individual heating substations (IHSS) are installed at all buildings. This measure allows consumers to regulate heat flow to meet their individual desired indoor comfort level or to stay within their budget.
- Consumer billing should be changed to a consumption-based tariff.

Specific energy efficient measures for each section of heating system are:

Generation side (in each boiler house):

- Replacement of the least efficient boiler(s) with one or two high efficiency gas-fired boilers;
- Upgrade of the most efficient boiler(s) with environmentally friendly burners, combustion control and other control;
- Installation of chemical water treatment in each boiler house;
- Installation of a plate heat exchanger, separating the primary loop in the boiler house with the space-heating distribution loop.

The decision on a future destiny of remaining old non-upgraded boilers in boiler houses is up to Aqua Calor management. In Electrotek opinion it is advisable to keep one maintained unit as a cold backup, but decommission the others to avoid future maintenance cost.

Distribution network:

- Rehabilitation of 3-pipe networks into two-pipe systems, with re-insulation of entire pipes and partial replacement of worn-out sections;
- Removal of the domestic hot water pipes.

Demand side:

- Flushing of each buildings' heat extraction systems (the municipal government suggested that the DH Company would complete this upgrade under a contract with individual building owners associations);
- Installation of individual heating substation (IHSS) in each building. Such IHSS would consist of: control valve and a pump for space heating, and plate heat exchanger, circulation pump and control for DHW.

  As a fund-saving measure single IHSS might be used for serving of several small buildings, providing that these small buildings are located in proximity.
- Each building would have the own heat meters, but as it was already mentioned it would be financed from other sources than considered loan.

It is assumed that project implementation for all 13 systems would be completed in two non-heating seasons. The rationale for a 2-year implementation schedule is:

- More affordable for the municipal budget due distribution of investments between two years,
- More feasible for implementation due distribution of construction work between two years.

Specifically for any system the upgrade of all components is to be implemented in time between the beginnings of April and the end of October. Such schedule would allow having the system completely upgraded from the start of the next heating season, and achieve utmost energy savings and fast return on investments.

Assumptions

These assumptions are based on an analysis of information provided by the DH Company, observations made during site visits, and on some measurements made in boiler houses and selected distribution networks.

- *Reported data for the year 2000 are assumed as the baseline for heat delivery to customers and fuel consumption by boiler houses.*

  All existing boiler houses currently are equipped with gas meters and heat meters. Reported by DH Company gas consumption based on the reading of gas meters are accepted as baseline gas consumption. Reported by DH Company heat supply to customers, which also based on heat meters reading minus theoretical heat losses in the networks can't be accepted for the purposes of this pre-feasibility study. Heat supplies to customers adjusted by real measured losses in the networks are assumed as baseline heat delivery.

- *The heat delivery efficiency of the networks varies between 44.4% and 66.7%.*

  According to the measurements of water temperatures at selected distribution networks, the average temperature drop within networks is close to the temperature drop inside the buildings (useful extraction). The future heat delivery for upgraded networks is assumed as 94%, which would be achieved by implementation of the following:

  - Improvement of heat extraction inside the buildings via flushing of internal systems, and elevating of water temperature entering into the buildings up to 80°C,
  - Re-insulation of the networks and replacements of damaged sections

- *Water from boiler houses for space heating is currently supplied according to approved temperatures graph: 60°C - at coldest outdoor temperatures, and 39°C at the warmest.*

  After the upgrade all networks would be converted to variable flow with constant temperatures of 80°C/60°C during entire heating season. Taking into the account that existing buildings' radiators

are oversized, there is no need to switch to the level of 90°C/70°C, in spite of the fact that last is more common for DH systems.

- *Installed capacities of boilers at all boiler houses exceed the demand, for some networks more than twice. Due to the application of small boilers, with prevailing size of 0.875 Gcal/h, the number of boilers in some boiler houses reaches 11.*

At each rehabilitated boiler house, two new boilers are to be installed, and one or two existing boilers upgraded. Their capacities would match real demands, properly adjusted with achievable energy savings in transmission/distribution and with the demand side measures. Capacities of new boilers at each upgraded boiler house are selected for base-heating load, i.e. not less than 60% of total maximum space heating and full DHW load. The rest of 40% is to be meet by upgraded boilers. The total number of new and upgraded boilers for each boiler house would not exceed 4.

Next chapter provides detail description of energy conservation measures (ECO) for the network served by BH-2. The measures proposed for remaining 12 networks are similar ones, differ only by the number of recommended for installation boilers, capacities, etc. Thus, for other networks only key parameters of networks before and after upgrade are presented in the tables.

4.5 Energy Conservation Measures

Upgrade of Local Network # 2

Baseline Energy Use Conditions

Aqua Calor SC (the DH Company in the city) provided information on the current performance of Network #2. The rationale to propose this network for upgrade is:

- All the local networks are in poor condition with low operating efficiency. Network #2 is one of the less efficient and significantly oversized. It was selected for upgrade because the potential for energy saving is larger than for other networks.
- Non-payment for utility services by consumers in this network is lower than in others.

Aqua Calor SC provided the data in the following Figures regarding BH-2.

Figure 4-3. Boiler House # 2 - Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat 2000 (Gcal/yr)	Supplied Heat 1999 (Gcal/y)
1	PA 25	31	Natural gas	0.875	71.50%	1,007.00	748.00
2	PA 25	2	Natural gas	0.875	80.50%	1,007.00	748.00
3	PA 25	31	Natural gas	0.875	71.50%	1,007.00	748.00
4	PA 25	31	Natural gas	0.875	71.50%	662.50	567.00
5	PA 25	31	Natural gas	0.875	71.50%	662.50	567.00
6	PA 25	31	Natural gas	0.875	71.50%		567.00
7	PA 25	31	Natural gas	0.875	71.50%		748.00
	Total			**6.125**	**72.79%**	**4346**	**4693**

Figure 4-4. Boiler House # 2 - Distribution Network

Network # 2 (Reported Data)					
Size DN	**Average Age (Years)**	**Length Supply (m)**	**Length Return (m)**	**Total Length (m)**	**Conditions of Insulation**
40	37	3	3	6.00	OK
50	37	298	298	596.00	OK
65	37	5	5	10.00	OK
80	37	8	8	16.00	OK
100	37	20	20	40.00	OK
125	37	115	115	230.00	OK
150	37	122	122	244.00	OK
200	37	121	121	242.00	OK
Total		**692**	**692**	**1,384.00**	

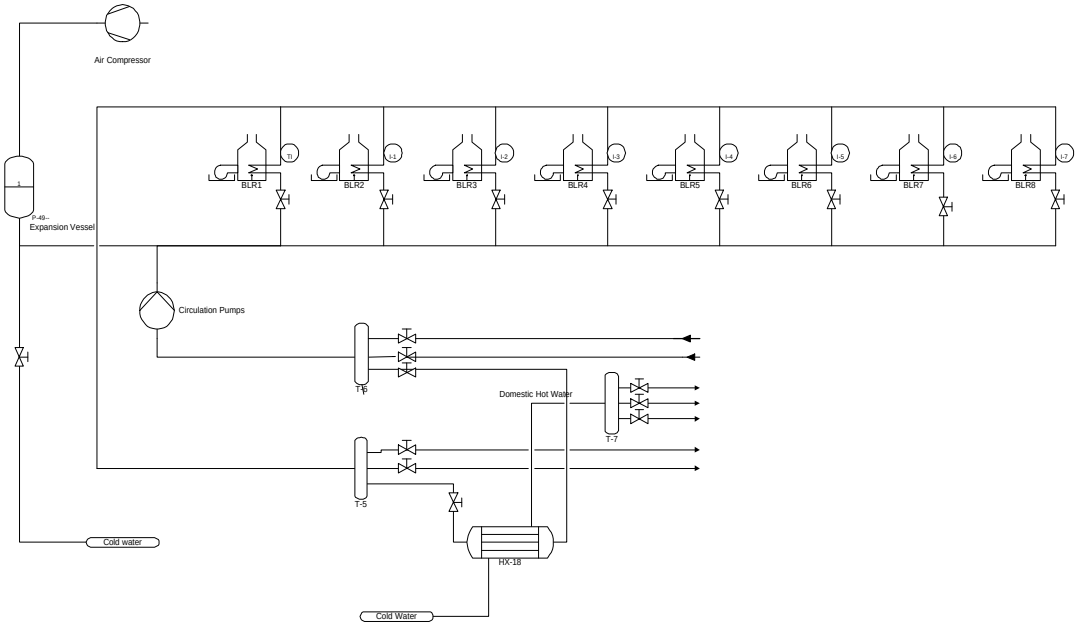
The data above was reviewed by the Electrotek team.

- The total boiler nameplate capacity of BH-2 is 6.13 Gcal/hr, but calculated consumer demand is only 2.23 Gcal/hr,
- Due deterioration of thermal insulation and other factors heat losses within the network are reaching 43%. The distribution network is significantly oversized. The network uses 150 mm and 200 mm diameter pipes. A pipe diameter of 125 mm is sufficient to meet the calculated demand for heat.

Re-insulation of the pipes and some small repair are included in this project only, since there is no urgent need to replace oversized network as the last is not heavily corroded. Nevertheless such replacement with diameters reductions should be considered for a future.

A flow chart of the existing distribution network for BH-1 is shown below.

Figure 4-5. Schematic of Local Network # 2



Evaluation of Specific Measures

The following upgrade and modernization is proposed for Local Network #2:

Generation side for BH # 2

- Replace the two most worn-out boilers with two gas fired efficient boilers of 0.8 Gcal/h each. These two new boilers will carry base load for entire heating season.
- Upgrade one of better-maintained existing boilers with new burners and up-to-date control. This boiler will serve peak load during periods of coldest winter temperatures. It is advisable to keep one more existing boiler as a cold backup, but without any upgrade. The remaining 3 boilers should be removed.
- Install plate heat exchanger (PHE) to separate the primary heat distribution loop of the new natural gas-fired boilers from the secondary space-heating loop. This secondary loop includes the entire secondary distribution network and the piping inside the buildings.
- Install a chemical water treatment unit inside BH-2. This will ensure needed water quality for the primary heating loop.
- Introduce modern control for new equipment.

Transmission and distribution for Local Network # 2:

- Re-insulate and provide minor repair for two-pipe space heating system.
- No domestic hot water (DHW) pipe would be upgraded, since future DHW will be prepared in individual buildings (or at the annexes adjacent to these buildings).

End-Users on Local Network #2:

Establish individual heating substation (IHSS) in each building. Such IHSS would consist of control valve and a pump for space heating plate heat exchanger, circulation pump and control for DHW. DHW is prepared on the individual building level.

Other

There is one measure that must be done to maximize the benefits for the population from the improved heat distribution network. Residential buildings are owned by property owner's associations, and therefore the municipal government cannot take a loan to fund demand side measures to reduce and improve energy consumption within the buildings. The current piping systems in these buildings are clogged with sediments. The Municipal Government told Electrotek that the flushing and cleaning of the building's internal piping systems would be completed by the DH Company staff under direct agreements with the property owner's associations.

Figure 4-6 present the heat generation and distribution system, and Figure 4-7 demand side arrangement for Local Network #2. New equipment is shown shadowed. Figure 4-8 shows the main parameters of the Local Network #2 before and after the upgrade. Figure 4.9 shows list of equipment and measures, with their approximate costs.

Figure 4-6. Flow Chart of Upgraded Local Network # 2

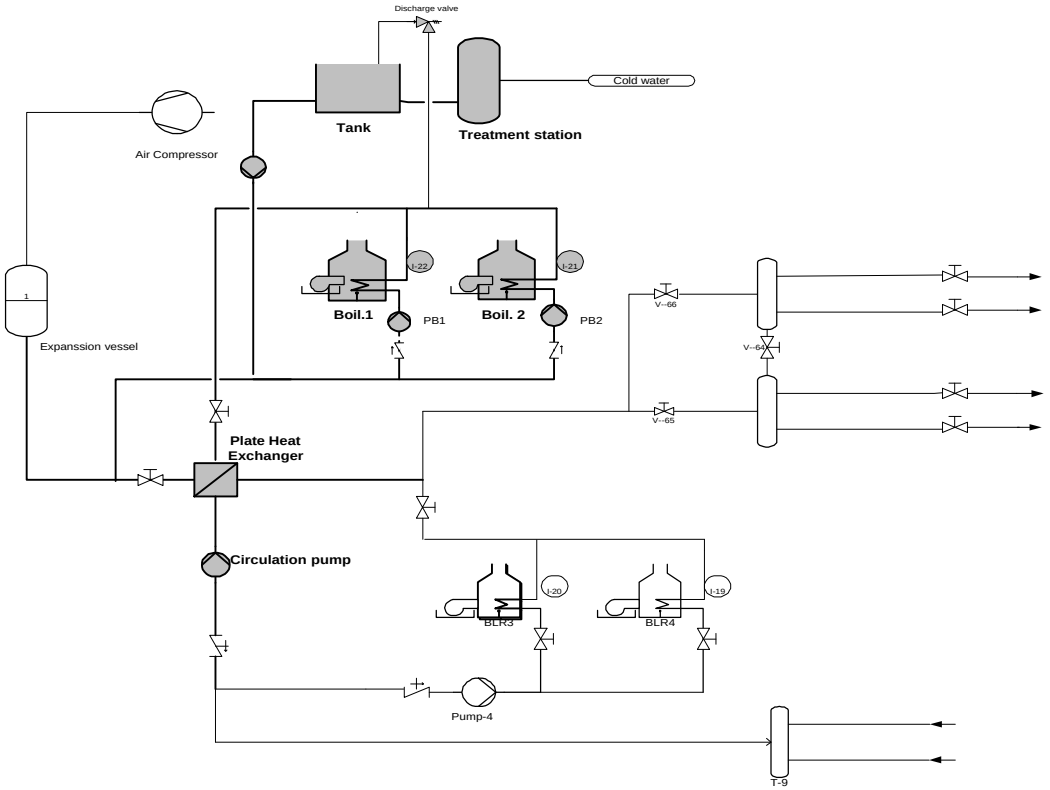


Figure 4-7. Flow Chart of Individual Heating Substation Installation

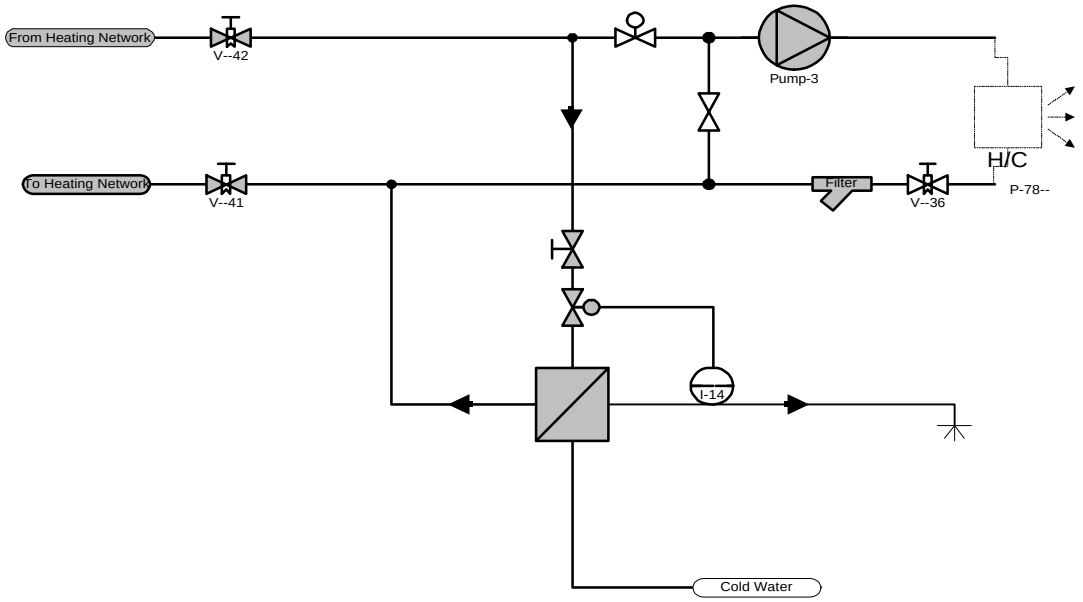


Figure 4-8. Equipment and Measures for Local Network # 2

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			2,69
New Boilers	2	1	2
Upgraded Boilers	1	0,875	0,875
Total Installed Capacity			2,875

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$33,00	$14,85
2 Upgraded Boilers (Burners and control)	$6,50	$2,93
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$21,50	$9,60
4 Chemical Water Treatment	$10,00	$2,50
5 Control and Power Supply	$5,00	$2,00
Network		
1 Piping replacement	$2,00	$1,00
2 Piping re-insulation	$1,03	$2,05
DSM		
1 Construction		$7,50
2 IHSS	$27,50	$5,50
Equipment, total	$106,53	
Construction & Installation, total		$47,93
Total		**$154,45**

Figure 4-9. Key Parameters of Local Network # 2 – Before and After Upgrade

Circuit Design for Network # 2

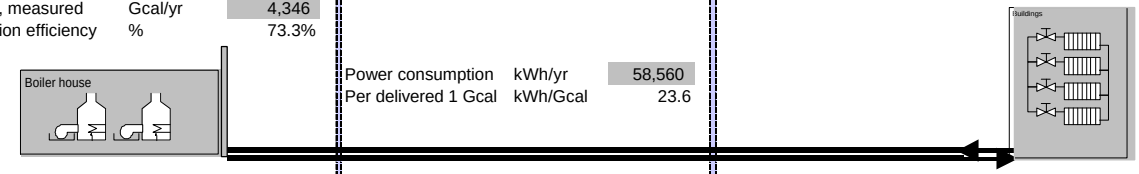
The city: **Piatra Neamt**

Before implementation, (year 2000 - base line)

Boiler house	# 2	
Boilers		7
Installed boilers' capacity	Gcal/h	6.125
Gas consumption, measured	000 m^3	736.506
@ heat content of:	Gcal/000 m^3	8.05
BH heat supply, measured	Gcal/yr	4,346
Overall generation efficiency	%	73.3%

Transmission and distribution		
Length of network	m	692
Transmission Efficiency, %		57.1%
Current losses	Gcal/yr	1,863
Power consumption	kWh/yr	58,560
Per delivered 1 Gcal	kWh/Gcal	23.6

Buildings		
Number of served buildings		5
Floor area	m^2	22,940
Actual heat supply	Gcal/yr	2,484



After implementation

Comp. 1, HOB improvements		
Boilers in operation, new		2
upgraded		1
Installed boilers' capacity	Gcal/h	2.475
Required capacity of boilers,	Gcal/h	2.446
Required capacity of BH		2.372
New boilers' efficiency	%	93.0%
Upgraded boilers' efficient	%	88.0%
Average BH efficiency	%	89.5%
Losses within BH	%	3.0%
BH heat supply, new	Gcal/yr	2,510.0
Natural gas consumption	in Gcal/yr	2,804.5
	000 m3/yr	**348.4**

Comp. 2, Distribution Improvements		
Length of new network, m		692
Re-insulation and repair, m		692
Assumed losses	%	6.0%
within upgraded network		
Future network	Gcal/yr	150.6
losses		
Savings in network,	Gcal/year	1,712
Power consumption	kWh/yr	28,313
Per delivered 1 Gcal	kWh/Gcal	12
Power savings	**kWh/yr**	**30,247**

Comp. 3, DSM (IHSS Introduction)		
Calculated demand	Gcal/h	2.230
Overheating elimination	%	3%
DHW waste reduction	%	2%
Adjusted heat supply		
to buildings	Gcal/yr	2,359

Total Fuel Savings	**000 m3/yr**	**388.1**
For Local Network	**%**	**52.7%**

Upgrade of Local Network # 3

Baseline Energy Use Conditions

Figure 4-10. Boiler House # 3 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	31	Natural gas	0.875	63.35%	793	495
2	PA 25	31	Natural gas	0.875	63.35%		495
3	PA 25	31	Natural gas	0.875	63.35%	793	495
4	PA 25	31	Natural gas	0.875	63.35%	793	496
5	PA 25	31	Natural gas	0.875	63.35%		521
6	PA 25	31	Natural gas	0.875	63.35%	593	521
7	PA 25	31	Natural gas	0.875	63.35%	593	521
	Total			**6.125**	**63.35%**	**3565**	**3544**

Figure 4-11. Boiler House # 3 - Distribution Network

Network # 3 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
40	27	27	27	54.00	OK
50	27	38	38	76.00	OK
65	27	47	47	94.00	OK
80	27	71	71	142.00	OK
100	27	75	75	150.00	OK
125	27	98	98	196.00	OK
150	27	118	118	236.00	OK
Total		**474**	**474**	**948.00**	

Figure 4-12. Equipment and Measures for Local Network # 3

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			2.69
New Boilers	2	1	2
Upgraded Boilers	1	0.875	0.875
Total Installed Capacity			2.875

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$33.00	$14.85
2 Upgraded Boilers (Burners and control)	$6.50	$2.93
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$21.50	$9.60
4 Chemical Water Treatment	$10.00	$2.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
DSM		
1 Construction		$7.50
2 IHSS	$27.50	$5.50
Equipment, total	$106.01	
Construction & Installation, total		$46.39
Total		**$152.40**

Upgrade of Local Network # 4

Baseline Energy Use Conditions

Figure 4-13. Boiler House # 4 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	31	Natural gas	0.875	75.91%	1,184	747
2	PA 25	31	Natural gas	0.875	75.91%	1,184	747
3	PA 25	31	Natural gas	0.875	75.91%	1,184	747
4	PA 25	31	Natural gas	0.875	75.91%	698	747
5	PA 25	31	Natural gas	0.875	75.91%	698	618
6	PA 25	31	Natural gas	0.875	75.91%		618
7	PA 25	31	Natural gas	0.875	75.91%		618
	Total			**6.125**		**4948**	**4842**

Figure 4-14. Boiler House # 4 - Distribution Network

Network # 4 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
50	36	9	9	18.00	OK
65				-	
80	36	9	9	18.00	OK
100	36	132	132	264.00	OK
125				-	
150	36	236	236	472.00	OK
200	36	174	174	348.00	OK
Total		**560**	**560**	**1,120.00**	

Figure 4-15. Equipment and Measures for Local Network # 4

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			2.91
New Boilers	2	1	2
Upgraded Boilers	1	0.875	0.875
Total Installed Capacity			2.875

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$33.00	$14.85
2 Upgraded Boilers (Burners and control)	$6.50	$2.93
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$21.50	$9.60
4 Chemical Water Treatment	$10.00	$2.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$9.00
2 IHSS	$33.00	$6.60
Equipment, total	$111.51	
Construction & Installation, total		$48.99
Total		**$160.50**

Upgrade of Local Network # 5

Baseline Energy Use Conditions

Figure 4-16. Boiler House # 5 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	31	Natural gas	0.875	80.21%	1,083	1,070
2	PA 25	2	Natural gas	0.875	80.21%	1,083	1,070
3	PA 25	31	Natural gas	0.875	80.21%	1,083	1,070
4	PA 25	31	Natural gas	0.875	80.21%	1,083	1,070
5	PA 25	31	Natural gas	0.875	80.21%	592	753
6	PA 25	31	Natural gas	0.875	80.21%	592	753
7	PA 25	31	Natural gas	0.875	80.21%	592	753
	Total			**6.125**		**6108**	**6539**

Figure 4-17. Boiler House # 5 - Distribution Network

Network # 5 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
32	30	20	20	40.00	OK
40	30	49	49	98.00	OK
50	30	76	76	152.00	OK
65	30	170	170	340.00	OK
80	30	141	141	282.00	OK
100	30	14	14	28.00	OK
125	30	105	105	210.00	OK
150	30	156	156	312.00	OK
200	30	137	137	274.00	OK
250	30	216	216	432.00	OK
Total		**1084**	**1084**	**2,168.00**	

Figure 4-18. Equipment and Measures for Local Network # 5

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			3.66
New Boilers	2	1.5	3
Upgraded Boilers	1	0.875	0.875
Total Installed Capacity			3.875

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$43.00	$19.35
2 Upgraded Boilers (Burners and control)	$6.50	$2.93
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$25.80	$11.52
4 Chemical Water Treatment	$14.00	$3.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$19.50
2 IHSS	$58.50	$11.70
Equipment, total	$155.31	
Construction & Installation, total		$72.01
Total		**$227.32**

Upgrade of Local Network # 6

Baseline Energy Use Conditions

Figure 4-19. Boiler House # 6 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	31	Natural gas	0.875	78.73%	1,020	931
2	PA 25	31	Natural gas	0.875	78.73%	1,020	931
3	PA 25	31	Natural gas	0.875	78.73%	1,020	931
4	PA 25	31	Natural gas	0.875	78.73%	1,020	931
5	PA 25	31	Natural gas	0.875	78.73%	761	985
6	PA 25	31	Natural gas	0.875	78.73%		
7	PA 25	31	Natural gas	0.875	78.73%	761	985
	Total			**6.125**		**5602**	**5694**

Figure 4-20. Boiler House # 6 - Distribution Network

Network # 6 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
32	27	75.50	75.50	151.00	OK
40				-	
50	27	100.00	100.00	200.00	OK
65	27	68.00	68.00	136.00	OK
80	27	130.00	130.00	260.00	OK
100	27	32.00	32.00	64.00	OK
125	27	170.00	170.00	340.00	OK
150	27	236.00	236.00	472.00	OK
200	27	279.00	279.00	558.00	OK
Total		**1090.5**	**1090.5**	**2,181.00**	

Figure 4-21. Equipment and measures for Local Network # 6

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			3.70
New Boilers	2	1.5	3
Upgraded Boilers	1	0.875	0.875
Total Installed Capacity			3.875

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$43.00	$19.35
2 Upgraded Boilers (Burners and control)	$6.50	$2.93
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$25.80	$11.52
4 Chemical Water Treatment	$14.00	$3.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$15.00
2 IHSS	$55.00	$11.00
Equipment, total	$151.81	
Construction & Installation, total		$66.81
Total		**$218.62**

Upgrade of Local Network # 14

Baseline Energy Use Conditions

Figure 4-22. Boiler House # 14 – Boilers

Main Equipment (Reported Data)								
No	Type of Boiler	Age (Years)	Fuel	Back Up Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	24	Natural gas		0.875	80.08%	1,489	1,072
2	PA 25	24	Natural gas		0.875	80.08%	1,489	1,072
3	PA 25	24	Natural gas		0.875	80.08%	1,489	1,072
4	PA 25	24	Natural gas		0.875	80.08%	1,489	1,072
5	PA 25	1	Natural gas		0.875	80.08%	1,489	1,072
6	PA 25	1	Natural gas		0.875	80.08%	941	1,032
7	PA 25	2	Natural gas		0.875	80.08%	941	1,032
8	PA 25	24	Natural gas		0.875	80.08%	941	1,032
	Total				**7**		**10,268.00**	**8,456.00**

Figure 4-23. Boiler House # 14 - Distribution Network

Network # 14 (Reported Data)						
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Laid Channels (%)	Conditions of Insulation
100	18	437.00	437.00	874.00		Bad
125	18	508.00	508.00	1,016.00		Bad
150	18	104.00	104.00	208.00		Bad
200	18	460.00	460.00	920.00		Bad
Total		**1509**	**1509**	**3,018.00**	10%	

Figure 4-24. Equipment and Measures for Local Network # 14

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			5.80
New Boilers	2	2	4
Upgraded Boilers	2	0.875	1.75
Total Installed Capacity			5.75

US Dollars in Thousands	Equipment,	Construction &
Boiler House		
1 New Boilers	$53.00	$23.85
2 Upgraded Boilers (Burners and control)	$13.00	$5.85
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$32.25	$14.40
4 Chemical Water Treatment	$14.00	$3.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$1.03	$2.05
DSM		
1 Construction		$33.00
2 IHSS	$99.00	$19.80
Equipment, total	$219.28	
Construction & Installation, total		$105.45
Total		**$324.73**

Upgrade of Local Network # 22

Baseline Energy Use Conditions

Figure 4-25. Boiler House # 22 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	25	Natural gas	0.875	71.34%	1388	1699
2	PA 25	25	Natural gas	0.875	71.34%	1388	1699
3	PA 25	25	Natural gas	0.875	71.34%	1388	1699
4	PA 25	25	Natural gas	0.875	71.34%	1388	1699
5	PA 25	25	Natural gas	0.875	71.34%	1388	1699
6	PA 25	25	Natural gas	0.875	71.34%	937	1339
7	PA 25	25	Natural gas	0.875	71.34%	937	1339
8	PA 25	25	Natural gas	0.875	71.34%	937	1339
	Total			**7.000**		**9,751**	**12,512**

Figure 4-26. Boiler House # 22 - Distribution Network

Network # 22 (Reported Data)						
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Laid Channels (%)	Conditions of Insulation
32	28	458.00	458.00	916.00		Bad
40	28	27.00	27.00	54.00		Bad
50	28	861.00	861.00	1,722.00		Bad
65	28	242.00	242.00	484.00		Bad
80	28	404.00	404.00	808.00		Bad
100	28	188.00	188.00	376.00		Bad
125	28	162.00	162.00	324.00		Bad
150	28	350.00	350.00	700.00		Bad
Total		**2692**	**2692**	**5,384.00**	8%	

Figure 4-27. Equipment and Measures for Local Network # 22

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			6.70
New Boilers	2	2	4
Upgraded Boilers	2	0.875	1.75
Total Installed Capacity			5.75

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$53.00	$23.85
2 Upgraded Boilers (Burners and control)	$13.00	$5.85
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$32.25	$14.40
4 Chemical Water Treatment	$14.00	$3.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$33.00
2 IHSS	$99.00	$19.80
Equipment, total	$218.76	
Construction & Installation, total		$103.91
Total		**$322.68**

Upgrade of Local Network # 23

Baseline Energy Use Conditions

Figure 4-28. Boiler House # 23 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	26	Natural gas	0.875	78.12%	1277	1197
2	PA 25	26	Natural gas	0.875	78.12%	1277	1197
3	PA 25	26	Natural gas	0.875	78.12%	1277	1197
4	PA 25	26	Natural gas	0.875	78.12%	1277	1197
5	PA 25	26	Natural gas	0.875	78.12%		
6	PA 25	26	Natural gas	0.875	78.12%		888
7	PA 25	26	Natural gas	0.875	78.12%	951	888
8	PA 25	26	Natural gas	0.875	78.12%	951	888
	Total			**7.000**		**7010**	**7452**

Figure 4-29. Boiler House # 23 - Distribution Network

Network # 23 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
40	19	5.00	5.00	10.00	OK
50	19	260.00	260.00	520.00	OK
65				-	
80	19	115.00	115.00	230.00	OK
100	19	511.00	511.00	1,022.00	OK
125	19	45.00	45.00	90.00	OK
150	19	446.00	446.00	892.00	OK
200	19	1.00	1.00	2.00	OK
Total		**1383**	**1383**	**2,766.00**	

Figure 4-30. Equipment and Measures for Local Network # 23

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			4.38
New Boilers	2	2.5	5
Upgraded Boilers	2	0.875	1.75
Total Installed Capacity			6.75

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$63.00	$28.35
2 Upgraded Boilers (Burners and control)	$13.00	$5.85
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$32.25	$14.40
4 Chemical Water Treatment	$20.00	$5.00
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$19.20	$9.60
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$24.00
2 IHSS	$88.00	$17.60
Equipment, total	$240.96	
Construction & Installation, total		$107.31
Total		**$348.28**

Upgrade of Local Network # 27

Baseline Energy Use Conditions

Figure 4-31. Boiler House # 27 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	2	Natural gas	0.875	79.89%	1242	1196
2	PA 25	24	Natural gas	0.875	79.89%	1242	1196
3	PA 25	24	Natural gas	0.875	79.89%	1242	1196
4	PA 25	24	Natural gas	0.875	79.89%	1242	1196
5	PA 25	24	Natural gas	0.875	79.89%	1242	1196
6	PA 25	24	Natural gas	0.875	79.89%	1133	1103
7	PA 25	24	Natural gas	0.875	79.89%	1133	1103
8	PA 25	24	Natural gas	0.875	79.89%	1133	1103
9	PA 25	24	Natural gas	0.875	79.9%		1103
	Total			**7.875**		**9609**	**10392**

Figure 4-32. Boiler House # 27 - Distribution Network

Network # 27 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
50	19	568.00		568.00	OK
65	19	64.00		64.00	Bad
80	19	957.00		957.00	OK
100	19	172.00		172.00	Bad
125	19	98.00		98.00	OK
150	19	94.00		94.00	OK
200				-	
250	19	65.00		65.00	OK
Total		**2018**	**0**	**2,018.00**	

Figure 4-33. Equipment and Measures for Local Network # 27

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			6.21
New Boilers	2	1.4	2.8
Upgraded Boilers	2	0.875	1.75
Total Installed Capacity			4.55

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$41.00	$18.45
2 Upgraded Boilers (Burners and control)	$13.00	$5.85
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$25.80	$11.52
4 Chemical Water Treatment	$14.00	$3.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$18.00
2 IHSS	$66.00	$13.20
Equipment, total	$167.31	
Construction & Installation, total		$74.03
Total		**$241.35**

Upgrade of Local Network # 28

Baseline Energy Use Conditions

Figure 4-34. Boiler House # 28 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	2	Natural gas	0.875	77.69%	1097	1140
2	PA 25	24	Natural gas	0.875	77.69%	1097	1140
3	PA 25	24	Natural gas	0.875	77.69%	1097	1140
4	PA 25	24	Natural gas	0.875	77.69%	1097	1140
5	PA 25	24	Natural gas	0.875	77.69%		
6	PA 25	24	Natural gas	0.875	77.69%	948	802
7	PA 25	24	Natural gas	0.875	77.69%	948	802
8	PA 25	24	Natural gas	0.875	77.69%		802
	Total			**7.000**		**6284**	**6966**

Figure 4-35. Boiler House # 28 - Distribution Network

Network # 28 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
32	30	34.00	34.00	68.00	OK
40				-	
50	30	397.00	397.00	794.00	OK
65	30	29.00	29.00	58.00	OK
80	30	515.00	515.00	1,030.00	OK
100	30	130.00	130.00	260.00	OK
125	30	51.00	51.00	102.00	OK
150	30	32.00	32.00	64.00	OK
200	30	88.00	88.00	176.00	OK
250	30	89.00	89.00	178.00	OK
Total		**1365**	**1365**	**2,730.00**	

Figure 4-36. Equipment and Measures for Local Network # 28

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			4.67
New Boilers	2	1.5	3
Upgraded Boilers	2	0.875	1.75
Total Installed Capacity			4.75

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$43.00	$19.35
2 Upgraded Boilers (Burners and control)	$13.00	$5.85
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$25.80	$11.52
4 Chemical Water Treatment	$14.00	$3.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$33.00
2 IHSS	$99.00	$19.80
Equipment, total	$202.31	
Construction & Installation, total		$96.53
Total		**$298.85**

Upgrade of Local Network # 41

Baseline Energy Use Conditions

Figure 4-37. Boiler Houses # 41 and # 9 – Boilers

Boiler House # 41							
Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	19	Natural gas	0.875	80.00%	1,041	1,113
2	PA 25	19	Natural gas	0.875	80.00%	1,041	1,113
3	PA 25	19	Natural gas	0.875	80.00%	1,041	1,113
4	PA 25	19	Natural gas	0.875	80.00%	1,041	1,113
5	PA 25	19	Natural gas	0.875	80.00%	1,041	989
6	PA 25	1	Natural gas	0.875	80.00%	1,330	989
7	PA 25	19	Natural gas	0.875	80.00%	1,330	989
	Total			**6.125**		**7865**	**7419**
Boiler House # 9							
1	PA 25	30	Natural gas	0.875	84.00%	839	700
2	PA 25	30	Natural gas	0.875	84.00%	397	915
3	PA 25	30	Natural gas	0.875			501
	Total			**2.625**		**1,236**	**2,116**

Figure 4-38. Boiler House # 41 - Distribution Network

Network # 41 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
65	19	196.00	196.00	392.00	Bad
80	19	100.00	100.00	200.00	Bad
100	19	369.00	369.00	738.00	OK
125	19	111.00	111.00	222.00	OK
150	19	248.00	248.00	496.00	OK
200				-	
250	19	459.00	459.00	918.00	OK
Total		**1483**	**1483**	**2,966.00**	

Figure 4-39. Equipment and Measures for Local Network # 41

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			5.26
New Boilers	2	1.8	3.6
Upgraded Boilers	2	0.875	1.75
Total Installed Capacity			5.35

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$49.00	$22.05
2 Upgraded Boilers (Burners and control)	$13.00	$5.85
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$25.80	$14.40
4 Chemical Water Treatment	$14.00	$3.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$31.50
2 IHSS	$94.50	$18.90
Equipment, total	$203.81	
Construction & Installation, total		$99.71
Total		**$303.53**

Upgrade of Local Network # 51

Baseline Energy Use Conditions

Figure 4-40. Boiler House #51 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	1	Natural gas	0.875	79.16%	1077	1290
2	PA 25	19	Natural gas	0.875	79.16%	1077	1290
3	PA 25	19	Natural gas	0.875	79.16%	1077	1290
4	PA 25	19	Natural gas	0.875	79.16%	1077	1290
5	PA 25	19	Natural gas	0.875	79.16%	1077	1290
6	PA 25	19	Natural gas	0.875	79.16%	1108	985
7	PA 25	19	Natural gas	0.875	79.16%	1108	985
8	PA 25	19	Natural gas	0.875	79.16%		985
	Total			**7.000**		**7601**	**9405**

Figure 4-41. Boiler House #51 - Distribution Network

Network # 51 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
65	19	37.00	37.00	74.00	OK
80	19	179.00	179.00	358.00	OK
100	19	410.00	410.00	820.00	OK
125				-	
150				-	
200	19	311.00	311.00	622.00	OK
Total		**937**	**937**	**1,874.00**	

Figure 4-42. Equipment and Measures for Local Network # 51

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			5.45
New Boilers	2	1.8	3.6
Upgraded Boilers	2	0.875	1.75
Total Installed Capacity			5.35

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$49.00	$22.05
2 Upgraded Boilers (Burners and control)	$13.00	$5.85
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$25.80	$14.40
4 Chemical Water Treatment	$14.00	$3.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$25.50
2 IHSS	$93.50	$18.70
Equipment, total	$202.81	
Construction & Installation, total		$93.51
Total		**$296.33**

Upgrade of Local Network # 54

Baseline Energy Use Conditions

Figure 4-43. Boiler House # 54 – Boilers

Main Equipment (Reported Data)							
No	Type of Boiler	Age (Years)	Fuel	Maximum (Rated) Capacity (Gcal/h)	Annual Average Efficiency (%)	Supplied Heat in 2000 (Gcal/yr)	Supplied Heat in 1999 (Gcal/y)
1	PA 25	19	Natural gas	0.875	79.10%	1,116	1,471
2	PA 25	19	Natural gas	0.875	79.10%	1,116	1,471
3	PA 25	1	Natural gas	0.875	79.10%	1,116	1,471
4	PA 25	19	Natural gas	0.875	79.10%	1,116	1,471
5	PA 25	19	Natural gas	0.875	79.10%	1,116	1,308
6	PA 25	19	Natural gas	0.875	79.10%	1,390	1,308
7	PA 25	19	Natural gas	0.875	79.10%	1,390	1,308
	Total			**6.125**		**8360**	**9808**

Figure 4-44. Boiler House # 54 - Distribution Network

Network # 54 (Reported Data)					
Size DN	Average Age (Years)	Length Supply (m)	Length Return (m)	Total Length (m)	Conditions of Insulation
50	25	67.00	67.00	134.00	OK
65	25	44.00	44.00	88.00	OK
80				-	
100	25	134.00	134.00	268.00	OK
125				-	
150	25	33.00	33.00	66.00	OK
Total		**278**	**278**	**556.00**	

Figure 4-45. Equipment and Measures for Local Network # 54

	Numbers of Unitis	Gcal/h per Unit	Gcal/h
Calculated Boilers' Load			5.05
New Boilers	2	1.6	3.2
Upgraded Boilers	2	0.875	1.75
Total Installed Capacity			4.95

US Dollars in Thousands	Equipment, without VAT	Construction & Installation, without VAT
Boiler House		
1 New Boilers	$45.00	$20.25
2 Upgraded Boilers (Burners and control)	$13.00	$5.85
3 Auxiliary equipment (DH heat exchangers, primary and secondary loops' pumps, piping)	$25.80	$11.52
4 Chemical Water Treatment	$14.00	$3.50
5 Control and Power Supply	$5.00	$2.00
Network		
1 Piping replacement	$2.00	$1.00
2 Piping re-insulation	$0.51	$0.51
Boiler House		
1 Construction		$33.00
2 IHSS	$99.00	$19.80
Equipment, total	$204.31	
Construction & Installation, total		$97.43
Total		**$301.75**

4.6 Project Capital Cost

The breakdown of the project cost without VAT including costs of construction and installation, as well as technical and price contingencies presented in Figure 4-46.

For each network, the cost of boiler house upgrade is around 70% from the entire cost. A little less than 30% is the cost of demand side measures (DSM). For piping networks between boiler houses and buildings the cost of re-insulation and minor pipes rehabilitation is included only. Aqua Calor is not complaining in regard of damaged sections and water leakage, and they are not considering the replacement of oversized pipes as an urgent issue. Electrotek agreed such procedure could be implemented later under separate project, after complete upgrade of entire heating system of 66 local networks.

Proposed design of boiler houses and DS measures, i.e. introduction of individual heating substations are based on well-known traditional technical solutions. The costs of equipment, pipes, and construction works are consistent with similar projects in Romania and other Eastern European countries. Therefore, the probability of significant cost overrun during implementation is low, and the technical and price contingency margins are selected at the level of 3% and 8% respectively.

The following schedule is recommended for the project construction:

1. Initiation of upgrade program is planned starting after the end of heating season 2001/2002 in April and for six networks simultaneously. These six networks selected are # 2, # 3, # 14, # 22, # 23, and # 54, and they are selected on the base of better economic indices achieved with the upgrade, i.e. as the ones presenting shorter payback period than 7 remaining networks . Implementation of most profitable measures during the first year of construction would allow for achievement of utmost savings from the very beginning and reduce working capital for construction period.
2. The remaining seven networks, namely # 4, # 5, # 6, # 27, # 28, # 41, and # 51 are planned for upgrade in the year 2003, in the same manner but during next non-heating season.
3. Taking into the account vital necessity for the population to have DH systems' uninterruptible operation in wintertime all construction and installation work shall be carried-out during non-heating season(s) up to the end of September. Under such time limitation it is become clear the necessity of breaking project implementation schedule into two years or in other words in two non-heating seasons. Furthermore, such schedule is more beneficial for project sponsor providing an opportunity to split the own investments between two years.
4. In order to stay in this construction schedule, lesser amount of investments and works is suggested for the first year of construction. Having experience from the first year of construction more work could be done in the second year. It is very important for the future contractor to make the preparation work, such as equipment and material procurement, mostly before construction initiating.
5. The measures proposed for generation side or boiler houses include the following:
   - Installation of two efficient boilers in each BH, at the space used to be a space of two existing boilers subject to demolishing. Capacities of the new boilers will match base-heating load, i.e. not less than 60% of total maximum space heating and full DHW load.
   - Upgrade of one or two better-maintained existing boilers with environmentally friendly burners and control. The task of these boilers is to match the rest 40% of the load, namely peak load.
   - Establishing of chemical water treatment for each network;
   - Installation of plate heat exchanger (PHE) separating primary loop inside BH with the secondary space-heating loop; pumps for primary and secondary heating loops, and other auxiliary equipment;
   - Control and Power supply;
   - Internal BH pipes.
6. Proposed measures for networks are limited with re-insulation, and replacement of small section of damaged space-heating network on the needed base found during re-insulation. DHW pipes are to be removed or abandoned, as DHW preparation is to be moved into buildings.
6. At demand side, in each building individual heating substations (IHSS) will be introduced. Such IHSS would consist of: control valve and a pump for space heating, and plate heat exchanger, circulation pump and control for DHW.

Figure 4-46. Project Cost

US Dollars in Thousands	Equipment			Construction and Installation			Total		
	Year 1	Year 2	Total	Year 1	Year 2	Total	Year 1	Year 2	Total
Network # 2	104		104	48		48	153		153
Network # 3	107		107	48		48	154		154
Network #4		112	112		51	51		163	163
Network # 5		156	156		74	74		229	229
Network # 6		152	152		68	68		221	221
Network # 14	219		219	105		105	325		325
Network # 22	241		241	109		109	350		350
Network # 23	168		168	76		76	243		243
Network # 27		239	239		114	114		353	353
Network # 28		203	203		98	98		301	301
Network # 41		204	204		101	101		306	306
Network # 51		203	203		95	95		298	298
Network # 54	205		205	99		99	304		304
Total, with contingencies and without VAT	**1,044**	**1,270**	**2,314**	**485**	**601**	**1,086**	**1,529**	**1,871**	**3,400**
VAT	198	241	440	92	114	206	291	355	646
Total, with VAT	**1,243**	**1,511**	**2,754**	**577**	**715**	**1,292**	**1,820**	**2,226**	**4,046**
Total, without VAT and price contigenc	**967**	**1,176**	**2,143**	**449**	**556**	**1,005**	**1,416**	**1,732**	**3,148**
Total, without VAT,price and technical contingencies	**939**	**1,142**	**2,080**	**436**	**540**	**976**	**1,375**	**1,682**	**3,056**

4.7 Project Savings and Simple Payback Period

The summary of estimated savings with implementation of the energy efficiency measures outlined in Section 4.5 for 13 Local Networks are presented in Figure 4-47. The breakdown of these savings by constituents is the following:

- Energy efficiency improvements in heat generation, transmission/distribution and DSM provide annual savings of natural gas in the amount of US$ 644,282 or 90.7% of the total savings.
- The next essential input provides the savings in labor and maintenance (US$ 55,407 or 7.8% of the total)
- Savings in electricity consumption are only of US$ 10,760, or 1.5% of the total savings. This might seems as a small ratio, since presently at least two times more power is used for water pumping due low temperature difference between supply and return water in heating pipes. From the other hand presently all BHs are built according to poor design, and operates without auxiliary equipment (fans, exhaust fans, control, chemical treatment). Such kind of equipment would be installed with the purpose of efficiency improvement, which leads to increase of power consumption. Ultimately, this will result in a higher efficiency of the system as a whole, but most of the gain will appear as fuel rather than electricity savings.
- Similar situation takes place with water savings. It is well known that presently water waste in the buildings is significant, but water supply system operates I in essence without metering. Furthermore very cheap raw water is currently used for loss replenishments, but in a future it would be chemically treated water. It is assumed that cost of preparation of small amounts of chemical treated water would be in the same range as present cost of large amount of untreated water.

To summarize all mentioned above it should be stated that energy efficiency measures targeted at upgrade of selected 13 isolated heating networks provide simple payback period of 4.3 years. Such value indicates quite good economic performance of proposed project, which is significantly above average for energy efficient projects in DH.

Figure 4-47. Savings and Investments

	Savings						Investments with Contingencies and without VAT (US$)	Simple Payback Period (Years)
	Natural gas (000 m^3)	(US$)	Electricity (MWh)	(US$)	Labor and Maintenance in 1999 (US$)	Total (US$)		
Network 2	388.126	$32,991	30.247	$1,361	$3,960	$38,312	$137,166	3.6
Network 3	413.592	$35.155	18.896	$850	$5.600	$41.605	$138.846	3.3
Network 4	347.060	$29,500	19.022	$856	$2,989	$33,345	$146,127	4.4
Network 5	456.547	$38,806	-9.787	-$440	$8,179	$46,545	$206,195	4.4
Network 6	434.925	$36,969	22.329	$1,005	$4,743	$42,716	$198,375	4.6
Network 14	872.618	$74,173	21.525	$969	$6,340	$81,481	$291,916	3.6
Network 22	843.436	$71,692	52.711	$2,372	$2,804	$76,868	$314,929	4.1
Network 23	552.861	$46,993	23.200	$1,044	$2,836	$50,874	$218,803	4.3
Network 27	795.377	$67,607	-4.844	-$218	$2,999	$70,388	$317,581	4.5
Network 28	613.287	$52,129	19.464	$876	$1,088	$54,093	$270,493	5.0
Network 41	608.462	$51,719	34.597	$1,557	$5,709	$58,985	$274,701	4.7
Network 51	526.734	$44,772	1.458	$66	$6,566	$51,404	$268,228	5.2
Network 54	726.758	$61,774	10.298	$463	$1,594	$63,832	$273,100	4.3
Total	**6,778.06**	**$644,282**	**189.972**	**$10,760**	**$55,407**	**$710,448**	**$3,056,459**	**4.3**

Natural gas ($US/000 m^3) 85
Electricity ($US/MWh) 45

Average exchange rate in the year 1999 *14.630 000 ROL/$US*

5 Financing Plan

5.1 Type and Amount of Financing Required

Under the base case, the total project cost is US$ 3,090 K without value added taxes (VAT). Expected total financial resources include debt financing in the amount of US$ 2,140 K from lending institutions and US$ 951 K from the project sponsors, including US$ 33,682 for interest payments during the construction period. The estimated debt-to-equity ratio is 69:31 (Figure 1-2).

Figure 5-1. Project Cost and Proposed Financial Scheme

Project Cost		
Base project cost	$ 3,056,459	
Capitalized interest during construction	$ -	
Interest exceeding savings during construction	$ 33,682	
Principal paid during construction	$ -	
Additional working capital during construction	$ -	
Total Project Cost	**$ 3,090,141**	
Base Capital Structure		
Debt	$ 2,139,521	70.0%
Equity	$ 916,938	30.0%
Total Investments	**$ 3,056,459**	100.0%
Financial Scheme		
Total loan requested	**$ 2,139,521**	69.2%
Project sponsor's contribution		
Investments	$ 916,938	
Interest during construction	$ 33,682	
Total project sponsor's contribution	**$ 950,619**	30.8%
Other contributions	$ -	0.0%
Total Investments	**$ 3,090,141**	100.0%

5.2 Proposed Financial Schemes

Financing Sources and Risk Sharing

Obstacles for structuring long-term project financing under the current economic, financial institutional and legal environment in Romania are the following:

- It is difficult to secure commercial bank loans with 3 to 5 year maturity without external credit risk mitigation and loan security.

- The IFC, which focuses mainly on private sector project financing, is not very interested in the improvement of municipally owned facilities.
- Financial schemes with foreign vendor's credits or Eximbank participation are realistic, but they often require 100%-banking guarantee or some minimal level of project sponsors credit rating confirmed by international rating agencies.

Although there is a possibility to utilize a newly created World Bank/GEF energy efficiency fund, this fund is not specifically focused on municipal projects and, additionally, its planned financing transactions might be too small for the current project. Nevertheless, participation of the fund, at least as a co-financier, would be desirable for risk mitigation.

Initial discussions with a number of commercial banks indicate that:

- Some Romanian and international commercial banks are interested in long-term project financing under the condition of credit risk sharing.
- Detailed project financial and risk analysis and disclosure of the financial indicators of the project sponsors increase probability of the deal success.
- External mitigation of the credit risk should significantly facilitate financial deal structuring by municipalities and municipally owned companies.

Considering all of the above, the following financial schemes with five-year maturity should be viable:

Scheme 1. Favorable Development

Sources of debt financing

- Principal Financing – US$ 1,926 K (90% of the total debt) from commercial lenders with DCA Guarantees covering up to 50% of the funding or up to US$ 963 K
- Co-financing – US$ 214 K (10% of the debt) from the World Bank/GEF Fund

Risk sharing

- U.S. Government - 45%
- Commercial lenders – 45%
- World Bank/GEF Fund – 10%

Maturity

- Five years.

Scheme 2. Intermediate Development

Sources of debt financing

- Principal Financing – US$ 2,139 K (100% of the total debt) from commercial lenders with DCA Guarantees covering up to 50% of the funding or up to US$ 1,070 K.

Risk sharing

- U.S. Government - 50%
- Commercial lenders – 50%

Maturity

- Five years.

Scheme 3. Pragmatic Development

Sources of debt financing

- Principal Financing – US$ 2,139 K (100% of the total debt) from commercial lenders.

Risk sharing

- Commercial lenders – 100%

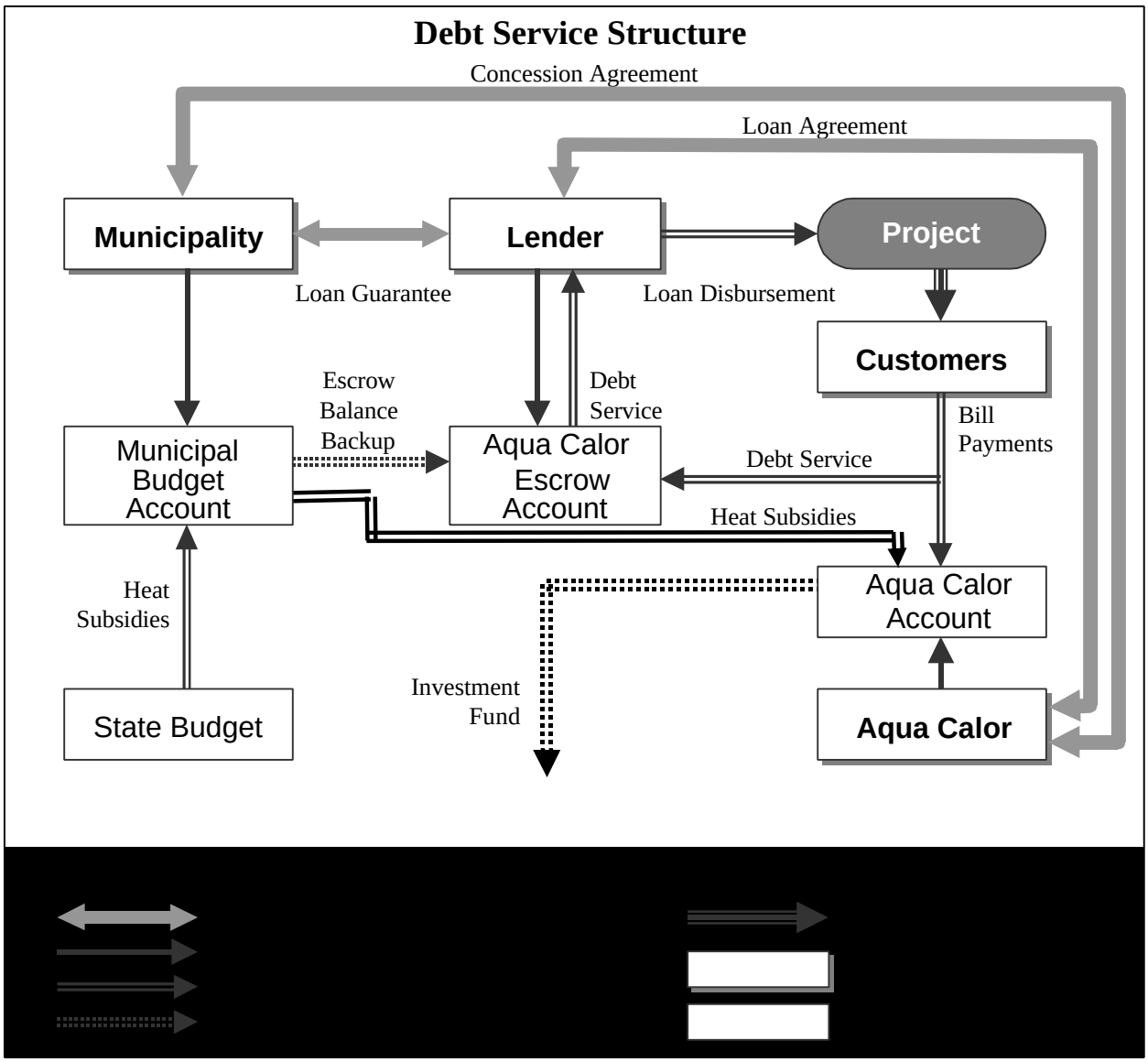
Maturity

- Five years.

Project Sponsor

Electrotek evaluated different approaches to the implementation of any of the three financial schemes above and proposes Aqua Calor to be the main Project Sponsor using an escrow account to secure the loan repayment. The escrow account is a cash or cash equivalent account administered by the lender on behalf of the borrower (the public service utility). The escrow account ultimately benefits the lender.

Figure 5–2. Debt Service Structure: Aqua Calor as the Project Sponsor



6 Project Cash Flow Analysis

6.1 Base Case Assumptions

The base case assumes that the debt financing will be in US dollars with a fixed interest rate. The applied current interest on outstanding loan principal is 12%, which is 8% above the current very low six-month LIBOR. The interest rate is paid monthly without a grace period, and the loan principal is paid off in equal parts. The loan originates on April 1, 2002. The loan principal repayment term is five years including the twelve-month grace period (Figure 6-1). It is important to note the requested grace period during which the project is partially completed and does not provide the full savings. The construction ends September 30, 2003, and thus, the loan repayment period continues only three years and six months after the project construction is finished.

Figure 6-1. Project Evaluation Period and Loan Conditions

Evaluation Period		
Current year		2001
Construction begins	(da/mo/year)	1-Apr-02
Construction ends	(da/mo/year)	30-Sep-03
Operation begins	(da/mo/year)	1-Oct-02
Operation ends	(da/mo/year)	30-Oct-17
Loan conditions		
Total disbursement	(US$)	$2,139,521
Disbursement begins	(da/mo/year)	1-Apr-02
Interest payment begins	(da/mo/year)	30-Apr-02
Payment on principal		
Begins	(da/mo/year)	30-Oct-03
Maturity	(da/mo/year)	31-Mar-07
Number of payments		27
Payment amount	(US$)	$79,242
Interest Rate	(%)	12.00%

Loan disbursement and amortization schedules as well as debt service schedule are shown in Figure 6-2. The loan will be returned in five years form the beginning of the disbursement. The last tranche is due in September 2003, and therefore the loan repayment period continues only three years and six months after the loan disbursement is finished. Interest will be paid on monthly without capitalization during the construction.

Figure 6-2. Loan Disbursement and Amortization Schedule

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
2002													
Loan Disbursement	0	0	0	160,389	160,389	160,389	160,389	160,389	160,389	0	0	0	**962,331**
Payment of interest	0	0	0	1,604	3,208	4,812	6,416	8,019	9,623	9,623	9,623	9,623	**62,552**
Repayment of principal	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Project Sponsor's Contribution	0	0	0	81,477	81,477	81,477	81,477	81,477	81,477	0	0	0	**488,864**
Principal Outstanding													
Beginning of Month	0	0	0	160,389	320,777	481,166	641,554	801,943	962,331	962,331	962,331	962,331	
End of Month	0	0	0	160,389	320,777	481,166	641,554	801,943	962,331	962,331	962,331	962,331	
2003													
Loan Disbursement	0	0	0	196,198	196,198	196,198	196,198	196,198	196,198	0	0	0	**1,177,190**
Payment of interest	9,623	9,623	9,623	11,585	13,547	15,509	17,471	19,433	21,395	21,395	20,603	19,810	**189,620**
Repayment of principal	0	0	0	0	0	0	0	0	0	79,242	79,242	79,242	**237,725**
Project Sponsor's Contribution													**0**
Principal Outstanding													
Beginning of Month	962,331	962,331	962,331	1,158,530	1,354,728	1,550,926	1,747,125	1,943,323	2,139,521	2,139,521	2,060,280	1,981,038	
End of Month	962,331	962,331	962,331	1,158,530	1,354,728	1,550,926	1,747,125	1,943,323	2,139,521	2,060,280	1,981,038	1,901,797	
2004													
Loan Disbursement	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Payment of interest	19,018	18,226	17,433	16,641	15,848	15,848	15,848	15,848	15,848	15,848	15,056	14,263	**195,727**
Repayment of principal	79,242	79,242	79,242	79,242	0	0	0	0	0	79,242	79,242	79,242	**554,691**
Project Sponsor's Contribution													**0**
Principal Outstanding													
Beginning of Month	1,901,797	1,822,555	1,743,314	1,664,072	1,584,831	1,584,831	1,584,831	1,584,831	1,584,831	1,584,831	1,505,589	1,426,348	
End of Month	1,822,555	1,743,314	1,664,072	1,584,831	1,584,831	1,584,831	1,584,831	1,584,831	1,584,831	1,505,589	1,426,348	1,347,106	
2005													
Loan Disbursement	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Payment of interest	13,471	12,679	11,886	11,094	10,301	10,301	10,301	10,301	10,301	10,301	9,509	8,717	**129,164**
Repayment of principal	79,242	79,242	79,242	79,242	0	0	0	0	0	79,242	79,242	79,242	**554,691**
Project Sponsor's Contribution													
Principal Outstanding													
Beginning of Month	1,347,106	1,267,864	1,188,623	1,109,381	1,030,140	1,030,140	1,030,140	1,030,140	1,030,140	1,030,140	950,898	871,657	
End of Month	1,267,864	1,188,623	1,109,381	1,030,140	1,030,140	1,030,140	1,030,140	1,030,140	1,030,140	950,898	871,657	792,415	
2006													
Loan Disbursement	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Payment of interest	7,924	7,132	6,339	5,547	4,754	4,754	4,754	4,754	4,754	4,754	3,962	3,170	**62,601**
Repayment of principal	79,242	79,242	79,242	79,242	0	0	0	0	0	79,242	79,242	79,242	**554,691**
Project Sponsor's Contribution													
Principal Outstanding													
Beginning of Month	792,415	713,174	633,932	554,691	475,449	475,449	475,449	475,449	475,449	475,449	396,208	316,966	
End of Month	713,174	633,932	554,691	475,449	475,449	475,449	475,449	475,449	475,449	396,208	316,966	237,725	
2007													
Loan Disbursement	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Payment of interest	2,377	1,585	792	0	0	0	0	0	0	0	0	0	**4,754**
Repayment of principal	79,242	79,242	79,242	0	0	0	0	0	0	0	0	0	**237,725**
Project Sponsor's Contribution													
Principal Outstanding													
Beginning of Month	237,725	158,483	79,242	0	0	0	0	0	0	0	0	0	**475,449**
End of Month	158,483	79,242	0	0	0	0	0	0	0	0	0	0	**237,725**

6.2 Project Financial Analysis

Capital Investment Decision Indicators

The Capital Investment Decision Indicators (financial internal rate of return (IRR), net present value (NPV), and the payback period) were calculated for project cash flows before financing (net free cash flow). Net free cash flows were discounted at the fixed rate of 15%. During the first heating season (2002/2003) only part of technical measures will be implemented, therefore, the energy and cost savings are less than in subsequent years.

Figure 6-3 summarizes results of the computation of IRR, NPV, and Payback Period for the project.

Figure 6-3. Project Financial Results

Investments (US$)	Savings 2002 (US$)	2003 (US$)	2004 (US$)	2005 (US$)	2006 (US$)	IRR (%)	NPV (US$)	Payback Period (Years)
3,056,459	**141,188**	**495,962**	**710,448**	**710,448**	**710,448**	**25%**	**1,241,267**	**4.65**

The cash flow analysis indicates the payback period for the whole project is 4.65 years, the IRR for the total capital investment is 25%. Assuming a fixed discount rate of 15%, the NPV is US$ 1,241 K or 40% of the total project cost.

Projects for networks # 2, 3 and 14 have simple payback periods less than 3.6 years (figure 6-4), payback period of other eight projects do not exceed 4.6 years, and the longest simple payback of the investment package is 5.2. These results indicate that proposed measures are feasible for district heating rehabilitation projects.

Figure 6-4. Simple Payback Period of the Investment Package Components

Networks	Savings (US$)	Investments (without VAT) (US$)	Simple Payback Period (Years)
Network 2	$ 38,342	$ 137,166	3.6
Network 3	$ 41,624	$ 138,846	3.3
Network 4	$ 33,364	$ 146,127	4.4
Network 5	$ 46,535	$ 206,195	4.4
Network 6	$ 42,739	$ 198,375	4.6
Network 14	$ 81,502	$ 291,916	3.6
Network 22	$ 76,920	$ 314,929	4.1
Network 23	$ 50,897	$ 218,803	4.3
Network 27	$ 70,383	$ 317,581	4.5
Network 28	$ 54,113	$ 270,493	5.0
Network 41	$ 59,020	$ 274,701	4.7
Network 51	$ 51,406	$ 268,228	5.2
Network 54	$ 63,842	$ 273,100	4.3
Total	**$ 710,687**	**$ 3,056,459**	4.3

Therefore, the project has a promising financial viability and should be recommended for the implementation.

Cash Flow Analysis

The Project Annual Cash Flow Statement (Figure 6-5) illustrates project ability to ensure successful debt financing. Even during the construction period, when only part of technical measures will be implemented, cash amounts to US$ 112 K and UD$ 180 K at the end of 2002 and 2003, respectively. The Project Monthly Cash Flow Statement (Figure 6-6) shows that in 2002 the project sponsor needs only US$ 34 K of the working capital for six months from April to September 2002 to pay interests before

getting first savings in October 2002. Starting October 2002 the part of implemented technical measures provides cash to pay interest during the construction period, which ends in September 2003. Since October 2003 the project generates cash to pay interest and principal

Therefore, the project provides substantial cash to serve debt before maturity including the period of the construction.

When the loan is paid off starting 2008 the project generates annual net cash in the amount of US$ 710 K.

Figure 6-5. Project Annual Cash Flow Statement for 2002-2008

Cash Flow from Savings and Investments

(US Dollars)	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2016
Cash Flow from Savings								
Electricty	$ 2,824	$ 8,540	$ 10,760	$ 10,760	$ 10,760	$ 10,760	$ 10,760	$ 10,760
Gas	$ 129,111	$ 451,380	$ 644,282	$ 644,282	$ 644,282	$ 644,282	$ 644,282	$ 644,282
O&M	$ 9,253	$ 36,043	$ 55,407	$ 55,407	$ 55,407	$ 55,407	$ 55,407	$ 55,407
Net Cash Flow Provided by Savings	$ 141,188	$ 495,962	$ 710,448	$ 710,448	$ 710,448	$ 710,448	$ 710,448	$ 710,448
Cash Flow Before Financing								
Interest	$ (62,552)	$ (189,620)	$ (195,727)	$ (129,164)	$ (62,601)	$ (4,754)	$ 0	$ -
Net Cash Flow Before Financing	$ (62,552)	$ (189,620)	$ (195,727)	$ (129,164)	$ (62,601)	$ (4,754)	$ 0	$ -
Net Cash Flow from Investments	$ (1,374,759)	$ (1,681,700)	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Financing								$ -
Loan Disbursement	$ 962,331	$ 1,177,190	$ -	$ -	$ -	$ -	$ -	$ -
Project Sponsor's Contribution	$ 412,428	$ 504,510	$ -	$ -	$ -	$ -	$ -	$ -
Principal	$ -	$ (237,725)	$ (554,691)	$ (554,691)	$ (554,691)	$ (237,725)	$ -	$ -
Net Cash Flow from Financing	$ 1,374,759	$ 1,443,975	$ (554,691)	$ (554,691)	$ (554,691)	$ (237,725)	$ -	$ -
Increase (Decrease) in Cash	$ 78,637	$ 68,618	$ (39,969)	$ 26,594	$ 93,157	$ 467,969	$ 710,448	$ 710,448
Cash, Beginning of Year	$ 33,682	$ 112,319	$ 180,936	$ 140,967	$ 167,561	$ 260,718	$ 728,687	$ 6,412,273
Cash, End of Year	$ 112,319	$ 180,936	$ 140,967	$ 167,561	$ 260,718	$ 728,687	$ 1,439,135	$ 7,122,722

Cash Flow Analysis

(US Dollars)	Year 2002	Year 2003	Year 2004	Year 2005	Year 2006	Year 2007	Year 2008	Year 2016
Net Free Cash Flow	$ (1,233,571)	$ (1,185,738)	$ 710,448	$ 710,448	$ 710,448	$ 710,448	$ 710,448	$ 710,448
Discounted Net Free Cash Flow	$ (1,233,571)	$ (1,031,076)	$ 537,201	$ 467,131	$ 406,201	$ 353,218	$ 307,146	$ 100,407
Cumulative Cash Flow	$ (1,233,571)	$ (2,419,309)	$ (1,708,860)	$ (998,412)	$ (287,964)	$ 422,485	$ 1,132,933	$ 6,816,519
						4.41		

IRR	**25%**
NPV	**$ 1,241,267**
Payback Period (Years)	**4.65**

Figure 6-6. Project Monthly Annual Cash Flow Statement for 2002-2004

Monthly Project Cash Flow

(US Dollars)	2002 31-Jan	2002 28-Feb	2002 31-Mar	2002 30-Apr	2002 31-May	2002 30-Jun	2002 31-Jul	2002 31-Aug	2002 30-Sep	2002 31-Oct	2002 30-Nov	2002 31-Dec
Cash Flow from Savings	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,649	$ 52,946	$ 70,594
Cash Flow Before Financing												
Interest	$ -	$ -	$ -	$ (1,604)	$ (3,208)	$ (4,812)	$ (6,416)	$ (8,019)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)
Including Exceeding of Savings During Construction	*$ -*	*$ -*	*$ -*	*$ (1,604)*	*$ (3,208)*	*$ (4,812)*	*$ (6,416)*	*$ (8,019)*	*$ (9,623)*	*$ -*	*$ -*	*$ -*
Net Cash Flow Before Financing	$ -	$ -	$ -	$ (1,604)	$ (3,208)	$ (4,812)	$ (6,416)	$ (8,019)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)
Net Cash Flow from Investments	$ -	$ -	$ -	$ (229,127)	$ (229,127)	$ (229,127)	$ (229,127)	$ (229,127)	$ (229,127)	$ -	$ -	$ -
Cash Flow From Financing												
Loan Disbursement	$ -	$ -	$ -	$ 160,389	$ 160,389	$ 160,389	$ 160,389	$ 160,389	$ 160,389	$ -	$ -	$ -
Project Sponsor's Contribution	$ -	$ -	$ -	$ 70,342	$ 71,946	$ 73,550	$ 75,154	$ 76,757	$ 78,361	$ -	$ -	$ -
Including Contribution in Construction	*$ -*	*$ -*	*$ -*	*$ 68,738*	*$ 68,738*	*$ 68,738*	*$ 68,738*	*$ 68,738*	*$ 68,738*	*$ -*	*$ -*	*$ -*
Principal	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Repayment of other long-term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Cash Flow from Financing	$ -	$ -	$ -	$ 230,730	$ 232,334	$ 233,938	$ 235,542	$ 237,146	$ 238,750	$ -	$ -	$ -
Increase (Decrease) in Cash	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,025	$ 43,322	$ 60,971
Cash, Beginning of Month	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,025	$ 51,348
Cash, End of Month	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,025	$ 51,348	$ 112,319

Monthly Project Cash Flow

(US Dollars)	2003 31-Jan	2003 28-Feb	2003 31-Mar	2003 30-Apr	2003 31-May	2003 30-Jun	2003 31-Jul	2003 31-Aug	2003 30-Sep	2003 31-Oct	2003 30-Nov	2003 31-Dec
Cash Flow from Savings	$ 123,991	$ 99,192	$ 49,596	$ 24,798	$ -	$ -	$ -	$ -	$ -	$ 24,798	$ 74,394	$ 99,192
Cash Flow Before Financing												
Interest	$ (9,623)	$ (9,623)	$ (9,623)	$ (11,585)	$ (13,547)	$ (15,509)	$ (17,471)	$ (19,433)	$ (21,395)	$ (21,395)	$ (20,603)	$ (19,810)
Including Exceeding of Savings During Construction	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Net Cash Flow Before Financing	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)	$ (9,623)
Net Cash Flow from Investments	$ -	$ -	$ -	$ (280,283)	$ (280,283)	$ (280,283)	$ (280,283)	$ (280,283)	$ (280,283)	$ -	$ -	$ -
Cash Flow From Financing												
Loan Disbursement	$ -	$ -	$ -	$ 196,198	$ 196,198	$ 196,198	$ 196,198	$ 196,198	$ 196,198	$ -	$ -	$ -
Project Sponsor's Contribution	$ -	$ -	$ -	$ 84,085	$ 84,085	$ 84,085	$ 84,085	$ 84,085	$ 84,085	$ -	$ -	$ -
Including Contribution in Construction	*$ -*	*$ -*	*$ -*	*$ 84,085*	*$ 84,085*	*$ 84,085*	*$ 84,085*	*$ 84,085*	*$ 84,085*	*$ -*	*$ -*	*$ -*
Principal	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (79,242)	$ (79,242)	$ (79,242)
Repayment of other long-term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Cash Flow from Financing	$ -	$ -	$ -	$ 280,283	$ 280,283	$ 280,283	$ 280,283	$ 280,283	$ 280,283	$ (79,242)	$ (79,242)	$ (79,242)
Increase (Decrease) in Cash	$ 114,367	$ 89,569	$ 39,973	$ 13,213	$ (13,547)	$ (15,509)	$ (17,471)	$ (19,433)	$ (21,395)	$ (75,839)	$ (25,450)	$ 140
Cash, Beginning of Month	$ 112,319	$ 226,686	$ 316,255	$ 356,228	$ 369,440	$ 355,893	$ 340,384	$ 322,913	$ 303,479	$ 282,084	$ 206,246	$ 180,796
Cash, End of Month	$ 226,686	$ 316,255	$ 356,228	$ 369,440	$ 355,893	$ 340,384	$ 322,913	$ 303,479	$ 282,084	$ 206,246	$ 180,796	$ 180,936

Monthly Project Cash Flow

(US Dollars)	2004 31-Jan	2004 28-Feb	2004 31-Mar	2004 30-Apr	2004 31-May	2004 30-Jun	2004 31-Jul	2004 31-Aug	2004 30-Sep	2004 31-Oct	2004 30-Nov	2004 31-Dec
Cash Flow from Savings	$ 177,612	$ 142,090	$ 71,045	$ 35,522	$ -	$ -	$ -	$ -	$ -	$ 35,522	$ 106,567	$ 142,090
Cash Flow Before Financing												
Interest	$ (19,018)	$ (18,226)	$ (17,433)	$ (16,641)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,056)	$ (14,263)
Including Exceeding of Savings During Construction	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Net Cash Flow Before Financing	$ (19,018)	$ (18,226)	$ (17,433)	$ (16,641)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,056)	$ (14,263)
Net Cash Flow from Investments	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cash Flow From Financing												
Loan Disbursement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Project Sponsor's Contribution	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Including Contribution in Construction	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Principal	$ (79,242)	$ (79,242)	$ (79,242)	$ (79,242)	$ -	$ -	$ -	$ -	$ -	$ (79,242)	$ (79,242)	$ (79,242)
Repayment of other long-term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Net Cash Flow from Financing	$ (79,242)	$ (79,242)	$ (79,242)	$ (79,242)	$ -	$ -	$ -	$ -	$ -	$ (79,242)	$ (79,242)	$ (79,242)
Increase (Decrease) in Cash	$ 79,353	$ 44,623	$ (25,630)	$ (60,360)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,848)	$ (15,848)	$ (59,567)	$ 12,270	$ 48,585
Cash, Beginning of Month	$ 180,936	$ 260,289	$ 304,911	$ 279,281	$ 218,922	$ 203,073	$ 187,225	$ 171,377	$ 155,528	$ 139,680	$ 80,113	$ 92,382
Cash, End of Month	$ 260,289	$ 304,911	$ 279,281	$ 218,922	$ 203,073	$ 187,225	$ 171,377	$ 155,528	$ 139,680	$ 80,113	$ 92,382	$ 140,967

7 Risks Analysis

It is important to note that in the base case, the cash flow analysis does not assume any increase in the tariffs for electricity, heat and gas prices in US Dollar equivalent during the evaluation period. In addition the project base line was estimated for the year 2000, which was warmer than the average in terms of degree-days. Thus, the selected approach to assessment of project economics is rather conservative.

7.1 Sponsor's Risk

The project sponsor's risk is extremely important for the decision on financing the project. Usually the sponsor's risk is considered in the strong correlation with sponsor creditworthiness, which makes sense.

The comprehensive analysis of the risks related to different revenue sources and expense items of the Piatra Neamt budget and financial position and performance of Aqua Color is beyond the scope of this work. Nevertheless, the sections 2 and 3 provide the disclosure of the municipality and Aqua Color financial statements for last three years, which demonstrate reasonable assets to secure the debt financing.

Speaking of the municipal budget, one may assume that the risks of adverse changes to the corporate and personal property taxes should be relatively low, and risks related to the timely transfers of heat subsidies are moderate. There is some uncertainty with the risks related to the municipal share of the individual income tax primarily due to the introduction of the Global Income Tax system. However, positive signs of the stabilization of the economic activities in the city mentioned in 2.1 together with encouraging trend and forecasts of unemployment level in the region make these risks less alarming. The main conclusion is that with the implementation of the project and realized savings in heat subsidies, the Piatra Neamt budget will have a significant amount of funds freed up, enough to back up any debt guarantee or ensure the debt service (if the council decides to take the loan).

The most important risks from Aqua Color are related to the issue of customer retention described above and mainly caused by increasing cost of fuel. Realization of the project and installation of the new equipment gives the company an opportunity to resolve major operational problems by increasing efficiency and simultaneously providing better level of comfort for residents, which should address the retention issue. As a regulated public service utility, Aqua Color can stabilize sales and show sustainable financial position at the end of the construction period, if the company demonstrates through the project implementation that it will achieve the following goals:

- Increase of the quality of services provided to customers;
- Reduction of the operating costs;
- Improvement in cost and managerial accounting and financial planning.

In a sense, the very goal of the proposed project is to increase efficiency of district heating system in Piatra Neamt and therefore to address the risks related to Aqua Color performance.

Finally, two additional important considerations, which substantially ameliorate the sponsor risk, should be noted. First, the financial schemes presented in the section 5 provide the security of the loan through the recourse on the project cash flow. Second, the detailed project cash flow analysis on monthly basis before maturity demonstrates the very strong financial viability of the project, and the information presented below just confirm extremely high robustness of the project under different circumstances relating to the project implementation. Furthermore, the project robustness and ability not only the service debt but also to generate additional cash for other district heating needs, give a reasonable assurance to consider the project sponsor's risk as irrelevant.

7.2 Heat Tariff Policy Changes

The section 3 includes the description of the cost and expenses included in heat tariff and the tariff setting procedure in Romania. It is obvious that the energy efficiency project does not have any chance if authorities cannot guarantee the level of tariffs for the savings utilization.

Thus, the risk of tariff policy changes will be eliminated before the beginning of the project implementation.

7.3 Completion Risk

The completion risk includes

- Cost-overrun risk;
- Start up delay (time-delay) risk;
- Approval and regulatory risk.

Cost-overrun risk includes any project risk running over budget. It is important to note that proposed technical solutions and technologies are well known worldwide, and the proposed equipment is available in Romania.

However, consequences of the cost-overrun were estimated through including in the computation technical and price contingencies. The technical contingency in the amount of 3% of the base project cost covers the cost of additional equipment or other costs that would result from a more design of a definitive project at an actual site. The proposed price contingency in the amount of 8% covers the cost of the well-know equipment that would effect from changes on the Romanian market, which is not stable because of the economy in the transition.

Results of the this scenario presented in Figure 7-1 show that including 3% of the technical contingency and 8% of the price contingency does not deteriorate substantially financial indicators of the project. The IRR is 22%, the NPV is US$ 923 K and the payback period is 5.1 years.

Figure 7-1. Cost-overrun Sensitivity Analysis

	IRR (%)	Change (%)	NPV (US$)	Change (US$)	Payback Period (Years)	Change (Years)
Total Project	**21.6%**	**3.2%**	**922,376**	**318,891**	**5.14**	**0.48**

Start up delay risk is very important for all projects and very important for the proposed measures, which must be finished before the beginning of the heating season. Otherwise the potential savings will be lost.

This risk has been mitigated by the proposed use of well-known technologies and the proposed month-by-month schedule for the equipment installation over two years. The risk is also mitigated by the proposed turnkey contract and including in the contract adequate incentives for the contractor to complete the work on time.

However, in order to assess the impact of the start up delay on the project financial indicators, this scenario assumes that the project will not be finished in September 2002 before the heating season 2002/2003, and the operation of new facilities will be started on January 1, 2003 after three-month delay. The cash flow analysis showed that it would require additional working capital in the amount of US$ 29 K to pay interest in November-December 2002. However, savings in January 2003 provide interest payment, but also return the working capital and give a surplus in the amount of US$ 85 K.

Figure 7-2. Start Up Delay Sensitivity Analysis

	IRR (%)	Change (%)	NPV (US$)	Change (US$)	Payback Period (Years)	Change (Years)
Total Project	**23.2%**	**1.6%**	**1,100,079**	**141,188**	**4.60**	**-0.05**

In addition, cash flow analysis shows (Figure 7-2) that capital budgeting indicators still look promising. The IRR is 23%, the NPV 1,100 K, and the payback period is 4.6 years. Therefore, under the start up delay scenario the project is financially still viable.

Approval and regulatory risk. Most approval and permits have to be provided by the local authorities, who are interested in the fast project development (see section 9). Therefore, the approval procedures are not expected to be troublesome or represent a major risk.

7.4 Operating Risk

The operating risk is the possibility that the savings are lower than expected due to operational failure or project mismanagement. The risk could be significant if measures are not taken to ensure that the project is properly implemented and operated. Although Aqua Color has a considerable experience in operating the district heating system and is interested in the new equipment and proper operation of it, the proposed training of technical personal is very important for this risk mitigation.

The other concern is related to the timely preparation of internal heating systems within apartment buildings for heat extraction from upgraded networks, primarily by cleaning and flushing of radiators. These internal systems are under the authority of owner associations, and Aqua Color is not in charge for their maintenance. Once internal surfaces of radiators became covered by sediments or even clogged, it reduces amount of heat sale by Aqua Color. This risk can and should be reduced by reaching and formalizing preliminary agreements with the Residential Associations that are connected to the networks being upgraded. The preparation work should be incorporated into the project implementation schedule.

The scenario tests the project results if savings of all proposed measures are lower than assumed in the base scenario by 5% over the evaluation period. The assumption of this scenario does not deteriorate substantially capital budgeting indicators: the IRR is 23%, the NPV is US$ 1,037 K, and the payback period is 4.9 years (Figure 7-3).

Figure 7-3. Results of Reduced Savings Sensitivity Analysis

	IRR (%)	Change (%)	NPV (US$)	Change (US$)	Payback Period (Years)	Change (Years)
Total Project	**23.2%**	**1.6%**	**1,037,349**	**203,919**	**4.88**	**0.23**

The monthly cash flow analysis shows that additional decrease in savings over 5% requires additional working capital during the construction period. However, it was noted above that the project base line was estimated during the heating season of the year 2000, which was warmer than the average heating season. Therefore, the assumption of the decrease of estimated saving by 5% is conservative, and the scenario demonstrates the project feasibility.

7.5 Electricity and Fuel Price Change Risk

In the base scenario, prices for electricity and gas in US$ are stable over the project evaluation period. However, the development of the power sector in Romania can affect the electricity prices, and

fluctuations on the international market can change prices for gas in the country. Although changes of the electricity prices are not material for the project since they do not significantly affect its savings, this scenario follows the conservative approach and assumes the decrease of the electricity prices by 10% over the evaluation period. The trend of fuel prices is very important for the result, especially the reduction of gas prices, which can lead to the decrease of project savings. The scenario is conservative and assumes the decrease of gas prices by 6%.

Results of the cash flow analysis shows that the project does not need an additional working capital even during the period of the construction, when just a part of technical measures are implemented. Additionally, the IRR of 23%, the NPV in the amount of US$ 1,013 K of and the payback period of 4.9 years demonstrate that the project is sustainable under the electricity and gas adverse change scenario (Figure 7-4).

Figure 7-4. Electricity and Fuel Prices Sensitivity Analysis

	IRR (%)	Change (%)	NPV (US$)	Change (US$)	Payback Period (Years)	Change (Years)
Total Project	**23.0%**	**1.8%**	**1,013,448**	**227,820**	**4.91**	**0.25**

7.6 The Worst Case Development

This worst case scenario tests the consequences of cost-overrun, start up delay and low savings due to both operational failure and decrease of fuel prices. The scenario assumes technical and price contingency of 1.5% and 4%, respectively, and the start- up delay of one month, which means that the project will start providing savings from November 1, 2002.

Additionally, the scenario includes decrease of energy savings by 2.5% due to operational failure or project mismanagement over the project evaluation period. Moreover, the scenario assumes the decrease of electricity prices by 5% and liquid fuel prices by 2.5%.

However, the results of the worst-case scenario presented in Figure 7-5 demonstrate the project robustness even under these circumstances. The cash flow analysis shows an IRR of 21%, a NPV of US$ 782 K and a payback period of 5.2 years.

Figure 7-5. The Worst Case Sensitivity Analysis

	IRR (%)	Change (%) 0	NPV (US$)	Change (US$)	Payback Period (Years)	Change (Years)
Total Project	**20.9%**	**3.9%**	**781,649**	**459,618**	**5.18**	**0.52**

Therefore, the results of this worst case as well as other scenarios lead to the conclusions that the project is financially viable, sustainable to the development and attractive for investments.

8 Expected Project Benefits

Rehabilitation of the 13 local heating systems could provide various benefits for city economy and population. Due to drastic efficiency improvements in operation of these systems simple payback for the proposed measures is 4.3 years (all 13 systems combined). Therefore, besides reaching the direct target of the project (improving operating efficiency and quality of service for the 13 upgraded systems), the completion of the proposed measures should leave Aqua Calor with freed-up funds that can be used in a number of different ways. Indeed, as was noted before, this project can become the first stage of a comprehensive program of municipal infrastructure rehabilitation. Detailed analysis and development of such program require additional local input in terms of social and political decision making and, in any case, are beyond the scope of the project. Nevertheless, this section of pre-feasibility study briefly addresses some additional benefits to be derived from the project.

8.1 Environmental Improvements

The relevant environmental issues for such type of projects are:

Local: Air quality, smog formation and occupational health. Emissions from boiler stacks, which might contain NO_x, CO, and even some particulate matters, disperse in the atmosphere and increase the concentration of these substances in the air at ground level, which affects the health of population at nearby areas. In the summer some substances contribute to the formation of low-level ozone; the last is irritating and harmful being in high concentrations.

Regional: Acid rains caused by the emission of NO_x,

Global:

- Emission of greenhouse gases, mainly CO_2 from the boiler stacks,
- Use for production of insulation foam (PUR with CFC or HCFC) of some substances causing ozone depletion.

Environmental Impact from Construction

This pre-feasibility study presumes that no ozone depleting substances would be used in new construction materials. The following issues require special attention during the project implementation:

In the phase of construction scrap and waste will be generated. This scrap and waste must be disposed of in a safe and environmentally responsible way, including recycling to the maximum possible degree. Environmental management plan for the implementation of the project should be developed.

Environmental aspects should be taken into account in procurement of new equipment and construction materials, primary related to the insulation. Application of asbestos insulation or PUR-insulation that have to be blown with CFC or HCFC is not acceptable.

Fuel, Water, and Electricity Consumption Decrease and Emission Reductions

The Figure 8-1 shows the current level of emissions from the thirteen selected systems and environmental impact of proposed measures.

Figure 8-1. Summary of the Project Environmental Impact and Air Emission Reductions

BH	Before Implementation			After Implementation			Saving	
	Heat Generation (GJ/yr)	CO_2 (kg/yr)	NO_X (kg/yr)	Heat Generation (GJ/yr)	CO_2 (kg/yr)	NO_X (kg/yr)	CO_2 (kg/yr)	NO_X (kg/yr)
2	1416.02	7080.10	184.08	669.80	3349.00	43.54	3731.09	140.55
3	1344.91	6724.53	174.84	549.73	2748.63	35.73	3975.89	139.11
4	1557.14	7785.72	202.43	889.88	4449.40	57.84	3336.32	144.59
5	1819.50	9097.51	236.54	941.74	4708.69	61.21	4388.82	175.32
6	1699.71	8498.53	220.96	863.51	4317.55	56.13	4180.97	164.83
14	3062.27	15311.35	398.10	1384.56	6922.80	90.00	8388.55	308.10
22	3266.00	16330.02	424.58	1644.40	8222.00	106.89	8108.02	317.69
23	2143.25	10716.27	278.62	1080.31	5401.57	70.22	5314.70	208.40
27	2681.28	13406.42	348.57	1152.08	5760.39	74.89	7646.03	273.68
28	1932.70	9663.49	251.25	753.58	3767.91	48.98	5895.58	202.27
41	2348.49	11742.44	305.30	1178.65	5893.23	76.61	5849.20	228.69
51	2294.74	11473.70	298.32	1282.03	6410.16	83.33	5063.54	214.98
54	2524.96	12624.78	328.24	1127.68	5638.40	73.30	6986.39	254.95
Total	**28090.97**	**140454.85**	**3651.83**	**13517.95**	**67589.73**	**878.67**	**72865.12**	**2773.16**
							51.9%	**75.9%**

Implementation of the proposed project should yield considerable environmental benefits due to reduction of atmospheric emissions. The consumption of natural gas by heat-only-boilers for the same customer service level will be significantly reduced, since the project will lead to reduction of losses in heat generation, transmission and distribution. The proposed project creates absolute reduction in fuel consumption and alleviation of water losses in the district heating system.

8.2 Technology Transfer

With the implementation of the project, not only Aqua Calor but also the Municipality will benefit from the introduction of advance technologies in Piatra Neamt district heating systems. The newest technologies will have a demonstration effect and should positively affect the level, quality and technological culture of operation and maintenance performed by the local personnel, improve its morale and attitude toward the service, increase technical performance by Aqua Calor and municipality service departments.

Furthermore, technical, economic, and financial approaches applied at this project development present high potential for replication at other municipal heating systems in Romania. Local heating systems in Piatra Neamt are built utilizing local-made inefficient equipment and poor traditional design; both of these conditions are widespread at other Romanian cities. Analysis of reported data and visual observations confirm that Aqua Calor management made a lot of efforts for keeping the systems in best operational shape. Nevertheless, within the frame of current project decent payback of 4.3 years is achieved. It became possible due to proper selection of specific systems for upgrade, as well by application of some fund-saving measures such as upgrade of existing boilers for peak load matching. Electrotek team visited 17 Romanian cities; in general their similar heating systems are in worse shape than in Piatra Neamt with higher potential for energy savings. Thus, the payback for the similar measures applied at these sites would be definitely shorter.

9 Necessary Approvals and Permits

Information on the appropriate procedures to obtain permits, approvals and other necessary for the project implementation, which is presented below, is wholly and entirely based on the statements made during interviews with the representatives of Piatra Neamt municipality and Aqua Calor. The limited scope of the work on the pre-feasibility study prevented Electrotek team from conducting independent verification of this information, let alone general legal analysis of the regulations and legislation involved. This task may and should be performed during the preparation of the full business plan for the project.

9.1 State and County Level Approvals

Figure 9-1. State and County Permits and Approval Necessary for the Project Implementation

Permit or Approval	Who Should Apply	Who Has Authority to Issue	Steps to Take and Conditions to Meet	Relevant Legal Acts and Normative Documents
Financial and economic permits				
Endorsement for municipal guarantee of the loan by the national government	The mayor	Ministry of Finance	Develop feasibility study	Budget law for the year
Technical and economic approval for the investment project	City and County Councils	Local governments cannot initiate any investment of more than 100 million Lei without the technical approval of the Ministry of Finance (even if the city intends to fully fund the investment). If the investment exceeds some higher level, it must also be examined by the Interagency Committee for Public Works, chaired by the representative of the Ministry of Public Works, and then approved by the Government.	1. Before presentation of a project to the Ministry of Finance and, if needed, Ministry of Public Works, the City or County Council, along with the public service utility must have already prepared the project concept, the pre-feasibility study and the feasibility study. 2. A series of approvals and permissions is required, which may include: urban planning, territorial planning, Ministry of Agriculture, Forestry Department, power supply availability and power utility route approval, transport utilities, gas and oil utilities route approval, Historical Sites and Natural Monuments, Department of Water Management and Ministry of Environment.	Law # 76/2000 Law # 10/1991, as amended by the Law # 72/1996 The elements to be included in the feasibility documentation are defined in the joint order of the Ministry of Finance and the Ministry of Public Works # 1743/69/N1996, published in the Official Gazette #232bis of September 26, 1996
Environmental permits				
County environmental permit	Aqua Calor	Neamt County Inspectorat for Environment Protection (county level)	1. Fill the application form 2. Provide document regarding the land ownership 3. Sign and provide a water supply contract 4. Sign and provide a waste storage and neutralization contract 5. Obtain sanitary authorization 6. Present a list of properly trained personnel	Law #137/1995

9.2 Municipal Level Approvals

Figure 9-2. Local Permits and Approval Necessary for the Project Implementation

Permit or Approval	Who Should Apply	Who Has Authority to Issue	Steps to Take and Conditions to Meet	Relevant Legal Acts and Normative Documents
Financial permits				
Approval for the municipal loan guarantee	The mayor	City Council	1. Offer legislative initiative of the mayor 2. Obtain endorsement by the Ministry of Finance 3. Pass the City Council decision	Law # 69/1991 plus budget law for the year
Construction permits				
Different construction permits	Aqua Calor	Piatra Neamt City Hall	1. Get *Urbanism certificate* 2. Receive approvals in principle 3. Sign necessary agreements	Proof of the legal status of the land Technical project Permissions from Conel, Romtelecom, and other affected companies or organizations.
Zoning permits				
Not needed				
Environmental permits				
Not needed				

10 Conclusions

10.1 General Findings

The project is feasible and has promising capital budgeting indicators for district heating rehabilitation projects including a payback period of 4.6 years. The project is appropriate for commercial financing. Expected project benefits are significant and will lead to a more cost-effective heat supply, greater comfort in residential buildings, and more modern municipal infrastructure.

10.2 Recommended Next Steps

Step 1: Approve Project Technical, Organizational and Financial Schemes

- First, the municipality will need to make a decision on the proposed technical measures.
- Next, the municipality and Aqua Calor will need to make a decision on the project sponsor.
- The municipality and Aqua Calor must then evaluate the various financing options that are available and select the source that best meets the needs of the project.
- The Aqua Calor must get ANRE approval on the level of tariffs for the investment return and the tariff adjustment procedure for the exchange rate changes.
- The project sponsor will need to select a scheme for project financing.

Step 2: Market Project to Lenders

- The project sponsors should market the project to lenders utilizing results of the pre-feasibility study and the step 1.
- The project sponsor should negotiate terms and conditions of financing including the loan security package.
- The project sponsor should select the lender for the project financing.
- The project sponsors should and clarify requirements to loan documentation including a business plan.

Step 3: Prepare Security Package for Project Financing

- The municipality should be ready to provide guarantees of the loan repayment, which can include pledged collateral and an escrow account as required by the selected lender.
- The municipality should take into account that increased municipal contributions to the project financing will make loan approval much easier.

Step 4: Develop Detailed Business Plan and Other Loan Documentation

- The project sponsor should finalize the project technical design and the final detailed schedule for the project implementation.
- The project sponsor will need to prepare loan documents including detailed business plan utilizing the pre-feasibility study and results of negotiations with lenders.

Step 5: Establish Project Implementation Team and Provide Staff Training

In this step, the various parties involved with the project are assigned responsibilities for carrying out the different tasks involved.

- First, a Project Implementation Team, comprised of key staff of the institutions involved in the project, is formed. These institutions include the municipality and Aqua Calor (technical and financial staff). Preferably, this team is kept to a small number of members, to facilitate efficient decision-making, project management and delegation of implementation-related tasks. The municipality may also wish to appoint a Technical Advisor, who is highly knowledgeable of the technical aspects of the project, to this committee.
- Equally important is the identification of lower-level staff within each of these organizations that can carry out day-to-day tasks related to project implementation. Technical and financial staff from the municipality and Aqua Calor will be key to successful project implementation.
- Specific tasks or functions required to implement the project are identified and delegated to the designated lower-level staff as appropriate. This staff keeps the Project Implementation Team apprised of their progress and also relies on the team for support when problems arise.
- The project successful implementation requires training to financial and technical staff of Aqua Calor:
  - Financial staff – in cost analysis, capital budgeting, risk assessment and mitigation, long-term financial decision process, and proposal development;
  - Technical staff - in proper operation and maintenance of installed equipment.

Step 6. Specify, Procure and Install Equipment

In this stage of the project, the specific goals are to: (1) minimize the cost; (2) minimize the disruption to end-users; (3) minimize the interruption of service; and (4) maximize the quality of the installation. The following process is typically used:

- First, detailed specifications are drawn up that describe the specific equipment needs and technical modifications associated with the project. Most likely, the targeted buildings and facilities will need to be audited in order to obtain the detail necessary for the specification.
- Based on these specifications, specific vendors are identified that can meet the needs of the project in terms of both the quality and cost of their product. At a minimum, at least two vendors per type of equipment are desired. Also, local vendors are strongly preferred, so that they can continue to maintain and repair the equipment as needed.
- Next, a competitive bid (tendering) process is used to identify the lowest-cost bidder whose product quality is still acceptable.
- Following this, a schedule is drawn up for installing the equipment. It is recommended that a phased approach be used. Equipment and measures should be installed in a limited number of buildings and facilities first, in order to identify and adjust for any modifications that are needed. After this is done, the balance of the installations should be scheduled so that the equipment is in place and working properly by the start of the heating season.
- Next, the equipment is installed, commissioned and tested. Typically, local or regional vendors are used in this step to guarantee high-quality results and provide some warranty for the work in the event problems arise.

Some vendors provide up to a 12-month warranty on their work. As part of this warranty, they continuously monitor and verify energy savings, which provides valuable input into Step 7 (Monitor and

Verify Energy Cost Savings). In addition, in order to ensure efficient work of the new equipment, some improvements have to be made at the end-user level even before the installation:

- Municipal government should reach agreement with owner associations on flushing and cleaning internal heating networks inside the buildings connected to networks proposed for upgrade. Presently these buildings are not ready to accept space heating, as pipes and radiators are clogged with sediments. Even highest energy efficiency achieved within DH networks wouldn't make any difference for inhabitants, if internal systems were not properly maintained.
- The second agreement, which should be reached between municipal government and owner associations, is related to location of plate heat exchangers for DHW preparation for connected buildings. Secured spaces should be allocated inside the buildings (in basements or under stairwells) for these plate heat exchangers, which in a future would become sections of individual heating substations. Dedicated DH personal should have around-the-clock access to this equipment. Only with such arrangement the maximum energy efficiency at the demand side can be achieved.

Step 7: Monitor and Verify Energy Cost Savings

Monitoring and verification (M&V) of energy cost savings is needed to document the project cash flow and to identify the amount (in ROL and hard currency equivalent) that should be allocated to the special escrow account for the project and two other accounts for the investment fund and the purchase and additional fuel. It also helps to ensure the persistence of savings under the project.

- First, an M&V plan is drawn up, which outlines the specific methods that will be used for each measure to monitor and verify energy and cost savings. This plan also identifies monitoring equipment (such as data loggers) that is needed, and assigns M&V tasks to specific members of the Project Management and project implementation team.
- Next, specific M&V activities are assigned and carried out on a regular basis. Savings for specific measures should be verified on a monthly basis during the first year of the project and less often (every 3 months) afterwards. Energy savings information and data should be forwarded to designated financial staff, so they can calculate energy cost savings due to the project.
- To ensure persistence of energy savings, appropriate training and education are provided to technical staff of Aqua Calor. A main focus of this training should be on appropriate operation and maintenance of the technical measures that are installed.

Step 8: Provide Debt Service and Utilize Extra Savings

This step - to pay off the loan is the most important, since its result will determine the ability of the municipality and Aqua Calor to complete DHS rehabilitation and to originate other projects in the future. Extra savings after debt service might be used for

- Investments in other district heating facilities;
- Increase in heating and hot water supply for all consumers;
- Providing a comfort level approaching Western standards.

Step 9: Ensure Further Rehabilitation of the District Heating System

Future rehabilitation of other DHS facilities requires the following actions:

- Taking into account that even under optimistic scenario upgrade of entire heating system in the city can be made in several years, during this time some existing boilers should stay in operation. Brief energy audit indicated that combustion efficiency of the existing boilers even built under

the same design varies in wide range. All old boilers at remaining 53 BHs should be tested, and less efficient boilers should be shutdown forever. Presently available capacity of all BHs exceeds the load.

- Presently all networks are operating under the low temperature of supply water. It causes failure of heat extraction within buildings radiators, and inevitable losses in networks came close to useful extraction in the buildings. The temperature of supply water for entire heating system should be increased up to the level of 80°C for the coldest design outdoor temperature of -18°C and for other wintertime should be increased accordingly.
- Old boilers, which should be in operation, have to go through basic maintenance. Even from visual observation one can see some of opening into furnaces; selected energy audit indicated huge amounts of air in flue gases. Significant excess of the air is introduced with old-fashioned burners, as well as sucked from the holes. Being heated this extra air is discharged uselessly with flue gases. Also from visual observation one can see non-insulated external boilers' surfaces and pipes. The holes in the boiler should be closed, and thermal insulation should be applied where it needed.
- Replacement of oversized piping network is not considered as urgent and economically viable measures under current energy prices. The limited funds available from the loan and other sources should be rather used for gradual upgrade all 66 systems similarly to these 13. Nevertheless conditions of the pipes should be examined, and time-phased program for their replacement, and an optimization in the term of sizes and users' connection should be developed.

11 Informational Attachments

Figure A. Members of the Piatra Neamt City Council

#	Name	Occupation	Organization	Position	Political affiliation
1	Daniel Apetrei	Engineer	Romanian Road Authority Neamt Agency	Inspector	Independent
2	Vasile Babata	Economist	Urbanex SA	Economic Director	NPCDP
3	Andrei Baciu	Engineer	SC Apex SRL	Manager	NLP
4	Vasile Balan	Economist		Retired	PRM
5	Iosif Balint	Engineer			PRM
6	Elena Boengiu	Engineer	SC FIBREX NYLON SA	Director	AfR
7	Constantin Chirita	Engineer	SC General Construct	Cheef Engineer	Independent
8	Gheorghe Deaconu	Artillery Officer		Retired	DP
9	Constantin Gaube	Physician	County Direction for Public Health	Director	SDP
10	Eugen Paul Grigoras	Engineer	SC Drupo SA	Engineer	PRM
11	Irina Mihaela Hirte	Teacher	"Petru Rares" National College	Teacher	NPCDP
12	Mircea Al. Mandrila	Engineer	Parliamentarian Office	Parliamentarian Councilor	SDP
13	Gheorghe Ostahie	Engineer	SC Altex SRL	Technical Director	DP
14	Vasile Ouatu	Economist	County Direction for Youth and Sport	Director	SDP
15	Ioan Pacala	Engineer	Aqua Calor SA	Technical Director	SDP
16	Corneliu Ptasnec	Engineer	SC Stefident SRL	Manager	Independent
17	Petre Ralea	Economist	Ralea C&A Company SA	Manager	DP
18	Radu Pavel Staicu	Engineer	County Office of Legal Metrology	Director	Independent
19	Victor Stanescu	Metal manufacturer	SC Polo SRL	Manager	SDP
20	Gheorghe Stanoaia	Chemist	SC Mastonia Matasaru	Manager	SDP
21	Gheorghe Stefan	Engineer	SC Termoutilaj	Manager	NLP
22	Cornelia Al. Tudorancea	Engineer	Moldocor SA	Technical Production Director	AfR
23	Georgeta Vintea	Physician	County Hospital	Physician	Independent

Abbreviations: DP - Democratic Party; NPCDP - National Peasant Christian Democratic Party; SDP - Social-Democratic Party; PRM - Great Romania Party; AfR - Alliance for Romania; NLP - National Liberal Party.

Figure B. Full Budget Table (Revenues)

##	*Romanian Lei in Thousands*	1998 Initial Projections	1998 Actual	1999 Initial Projections	1999 Actual	2000 Initial Projections	2000 Actual
1	**REVENUES - TOTAL (rows 02+69+76+85+89)**	50,718,422	48,534,668	106,915,000	101,948,922	237,522,600	157,194,335
2	**OWN REVENUES - TOTAL (rows 03+50+55)**	17,005,704	12,889,434	61,367,000	49,452,493	84,905,000	66,347,524
3	**I. CURRENT REVENUES (rows 4+32)**	14,556,272	11,168,936	37,560,000	34,777,698	47,605,000	51,700,706
4	**A. TAX REVENUES (row 5+25)**	9,754,807	8,406,596	31,160,000	30,725,363	42,565,000	47,036,047
5	**A1. DIRECT TAX (row 06+07+17+18+21)**	9,358,859	8,084,657	29,810,000	30,222,884	39,950,000	44,173,015
6	**INCOME TAX** (from autonomous regies subordinated to the local authority						
7	**TAX REVENUES FROM POPULATION (r 8 to 16)**	5,300,102	4,650,535	24,660,000	23,511,295	28,800,000	28,005,376
8	Income tax from freelancers, artizans and other individuals, family associati	1,800,000	1,087,492	2,000,000	1,326,127	1,000,000	802,807
9	Individual property tax (tax on buildings)	800,000	466,449	14,000,000	13,859,687	20,500,000	20,755,267
10	Individual car tax (tax on cars for individuals)	800,000	467,805	1,600,000	1,299,616	2,700,000	2,472,647
11	Income tax from rents, sub-renting	260,000	273,378	300,000	800,459	150,000	203,186
12	Income tax on intellectual property (copy right, etc.)	5,000	217	10,000	5,702		
13	Income tax related to awards and earnings in kind or money	5,000	166	400,000			
	Income tax from interests	800,000	806,234				
14	Income tax for people not on salaries	700,000	1,423,080	3,000,000	3,770,528	900,000	723,459
15	Individual land property tax (tax on land)			450,000	1,086,204	2,900,000	2,539,505
16	Other taxes from population	130,102	125,715	2,900,000	1,362,974	650,000	508,504
17	**TAX FOR STATE-OWNED LAND USE**	86,000	105,480	150,000	132,672	200,000	384,334
18	**CORPORATE PROPERTY TAX (BUILDINGS AND LAND) r19+20**	2,536,585	1,927,411	2,000,000	3,748,098	7,300,000	11,016,838
19	Corporate building tax	2,536,585	1,927,411	1,500,000	2,990,421	6,000,000	9,020,520
20	Corporate land tax			500,000	757,677	1,300,000	1,996,318
21	**OTHER DIRECT TAXES (r 22 to 24)**	1,436,172	1,401,230	3,000,000	2,830,818	3,650,000	4,766,467
22	Car tax for corporate	786,000	961,830	2,300,000	1,769,123	2,850,000	3,623,853
23	Agriculture income tax						
24	Other revenues from direct taxes	650,172	439,400	700,000	1,061,695	800,000	1,142,614
25	**A2. INDIRECT TAXES (r. 26+27)**	395,948	321,939	1,350,000	502,479	2,615,000	2,863,032
26	**SHOW BIZ TAX**	40,000	49,827	100,000	27,666	60,000	40,258
27	**OTHER INDIRECT TAXES (r. 28 to 31)**	355,948	272,112	1,250,000	474,813	2,555,000	2,822,775
28	Taxes and tariffs for license issuing and operating authorization			400,000		1,200,000	1,499,734
29	Stamp taxes related to complaints						
30	Extrajuridical stamp taxes	355,948	272,112	800,000	474,813	1,350,000	1,319,577
31	Other revenues from indirect taxes			50,000		5,000	3,464
32	**B. NON-TAX REVENUES (row 33+34+42)**	4,801,465	2,762,340	6,400,000	4,052,336	5,040,000	4,664,659
33	**NET PROFIT CASH-IN FROM REGIES AUTONOMOUS**						
34	**CASH-IN FROM PUBLIC INSTITUTIONS (r 35 to 41)**	1,520,346	1,323,110	2,900,000	2,204,315	2,020,000	1,581,249
35	Other revenues related to transport on public roads	560,000	425,961	1,412,000	1,372,774	1,500,000	1,188,210
36	Revenues from public services for plants profilaxy			202,000			
37	Revenues from centers for artificial seeding			38,000			
38	Revenues from sanitary-veterinary ambulatories			248,000	11,568		
39	Cash-in from public institutions and self-financing activities			200,000			
40	Contributions owed by persons recipients of social meals				5,674	20,000	16,601
41	Other revenues from public institutions	960,346	897,149	800,000	814,299	500,000	376,438
42	**MISCELLANEOUS REVENUES (r 43 to 49)**	3,281,119	1,439,230	3,500,000	1,848,021	3,020,000	3,083,410
43	Revenues from recovery of expenses related to legal charges, imputations a	300,000	207,309	700,000	151,630	10,000	4,136
44	Revenues from fines, penalties according to the law	150,000	91,579	400,000	206,856	200,000	355,763
45	Recovery of funds from previous years' local budget financing	500,000	463,404	1,000,000	364,860	300,000	335,830
46	Revenues form concession and renting activities	2,000,000	673,338	1,100,000	1,107,472	2,500,000	2,382,762
47	Cash-in from confiscated goods sale						
48	Revenues from managing the assets of the former agriculture production co						
49	Cash-in form other sources	331,119	3,600	300,000	17,203	10,000	4,920

##	*Romanian Lei in Thousands*	1998 Initial Projections	1998 Actual	1999 Initial Projections	1999 Actual	2000 Initial Projections	2000 Actual
50	**II. REVENUES FROM EQUITY (r. 51)**	2,449,432	1,720,498	1,400,000	859,410	5,250,000	2,957,214
51	**REVENUES FROM STATE GOODS' SALE (r 52 to 54)**	2,449,432	1,720,498	1,400,000	859,410	5,250,000	2,957,214
52	Revenues from sale of public institutions' goods	1,500,000	894,077	1,000,000	499,305	2,000,000	1,626,744
53	Revenues from sale of dwellings built by the state	600,000	629,526	100,000	96,468	2,250,000	803,787
54	Revenues from privatization	349,432	196,895	300,000	263,638	1,000,000	526,683
55	**III. REVENUES WITH SPECIAL DESTINATION (r. 56)**			22,407,000	13,815,385	32,050,000	11,689,604
56	**REVENUES WITH SPECIAL DESTINATION (r.57 to 68)**			22,407,000	13,815,385	32,050,000	11,689,604
57	Special taxes			1,477,000	852,985	1,000,000	1,035,665
58	Revenues from private goods sale						
59	Revenues from funds for public roads			4,300,000	1,300,000	12,150,000	3,000,000
60	Revenues from the intervention fund						
61	Revenues from the dwellings fund			10,600,000	11,617,115	18,800,000	7,630,659
62	Revenues from fixed assets amortization						
63	Revenues from the civil aircraft fund						
64	Donations and sponsorships			30,000	45,285	100,000	23,280
65	Contributions of legal persons and individuals to take part in funding of pub			6,000,000			
66	Revenues for financing the program devoted to paving communal roads and Revenues for financing the actions related to mitigation of earthquake risk						
67	of existent buildings, which are used as dwellings						
68	Revenues from renting, selling and concession of the goods administrated b						
69	**IV. REVENUES FROM STATE BUDGET (r.70+71)**	16,200,000	16,400,000	45,548,000	37,007,791	148,337,600	82,188,353
70	**REVENUES QUOTA FROM WAGE TAX**	16,200,000	16,400,000	43,947,000	31,686,791	3,500,000	3,572,107
71	**REVENUES QUOTA FROM INCOME TAX (r 72 to 75)**			1,601,000	5,321,000	144,837,600	78,616,246
72	Breakdown quotas from income tax					130,183,600	50,872,246
73	Breakdown amounts from income tax for local budget balancing			1,601,000	2,226,000		2,200,000
74	Breakdown amounts from income tax for heat subsidizing				3,095,000	12,654,000	21,344,000
75	Amounts allocated by the county council for local budget balancing					2,000,000	4,200,000
76	**V. SUBSIDIES (r. 77 + 81)**	17,512,718	19,245,234		11,289,757	4,280,000	4,358,457
77	**SUBSIDIES FROM STATE BUDGET (r. 78 to 80)**	17,512,718	19,245,234		11,289,757		
78	Subsidies for local budget for investments partially financed by external loa	9,712,718	11,445,234				
	Subsidies for social protection of population for heating and public transpor				11,289,757		
	Subsidies for investments partially financed by external loans	7,800,000	7,800,000				
79	Subsidies for local budget for supporting child protection system						
80	Subsidies for local budget for financing the development and/or update the						
81	**SUBSIDIES RECEIVED FROM OTHER BUDGETS (r. 82 through 84)**					4,280,000	4,358,457
82	Subsidies from the special fund for social solidarity for handicapped people					3,023,000	3,084,456
83	Subsidies from the special fund for social solidarity for handicapped people					1,257,000	1,274,001
84	Subsidies received from other local budgets to support the protection systen						
85	**VI. CASH-IN FROM GRANTED LOANS (r.86)**						
86	**CASH-IN FROM GRANTED LOANS (r. 87)**						
87	Cash-in from payback of temporary loans for the establishment of public services and institutions or activities entirely financed from extrabudgetary funds						
88	**VII. LOANS (r. 89 + 92+94)**				4,198,881		4,300,000
89	**INVESTMENT LOANS (r. 90+91)**				4,000,000		4,300,000
90	Internal loans for investments				4,000,000		4,300,000
91	External loans for investments						
92	**TEMPORARY LOANS (r. 93)**						
93	Temporary loans from State Treasury						
94	**LOANS FROM THE OPERATING REVOLVING FUND**				198,881		

Figure C. Full Budget Table (Expenses)

##	*Romanian Lei in Thousands*	1998 Initial Projections	1998 Actual	1999 Initial Projections	1999 Actual	2000 Initial Projections	2000 Actual
95	**EXPENSES - TOTAL (r. 144+153+240+268+318+335+342+351+358+386+398+404)**	52,016,722	51,120,335	106,915,000	99,971,450	237,522,600	158,870,183
144	**I. GENERAL PUBLIC SERVICES – TOTAL (rd152)**	8,040,000	6,765,937	14,321,000	11,444,026	21,101,100	21,572,992
152	Executive authorities	8,040,000	6,765,937	14,321,000	11,444,026	21,101,100	21,572,992
153	**III SOCIAL-CULTURAL EXPENDITURES – TOTAL (r. 170+185+190+214)**	11,596,300	11,473,921	20,090,000	17,611,635	42,944,800	24,746,159
170	**EDUCATION (r. 179 through 184)**	7,000,000	6,266,583	11,000,000	11,423,447	18,180,000	9,460,420
179	Pre-school education	1,241,000	992,500	2,600,000	1,809,376	1,770,000	1,284,034
180	Primary and secondary education	2,010,600	1,721,340	3,950,000	2,966,694	7,432,500	2,519,694
181	High-school education	3,044,600	2,687,640	4,040,000	5,420,887	7,492,500	4,919,735
182	Professional education	406,800	368,599	180,000	924,380	1,335,000	644,223
183	Post- high school education	0	199,504	230,000	302,110	150,000	92,734
184	Boarding, hostels and canteens for student	297,000	297,000				
185	**HEALTH (r. 188 + 189)**	1,110,000	2,254,330	1,940,000	1,940,000	2,900,000	1,607,204
188	Nurseries	539,000	496,378	1,000,000	1,000,000	1,600,000	872,751
188a	Health. diagnostic and treatement centers	571.000	1.757.952				
189	Other institutions and health care actions			940,000	940,000	1,300,000	734,454
190	**CULTURE, RELIGION AND ACTIONS RELATED TO SPORT AND YOUTH (r. 203 through 21**	380,000	291,071	2,200,000	1,001,491	7,700,000	3,046,274
203	Communal, city, municipal, county public libraries						
204	Musems						
205	Theatres and professional institutions for performances and concerts						
206	Mass art schools						
207	Culture houses						
208	Culture houses in rural areas						
209	Centres for the preservation and promotion of the folk tradition and art						
210	Religion cults						
211	Sports activity						
212	Youth activity						
213	Other institutions and actions related to culture, religion and sports and youth oriented activity	380,000	291,071	2,200,000	1,001,491	7,700,000	3,046,274
214	**SOCIAL CARE, ALLOWANCES, PENSIONS, ALLOWANCES AND DAILY ALLOWANCES (r**	3,106,300	2,661,937	4,950,000	3,246,697	14,164,800	10,632,260
227	Old persons hostels	2,000,000	1,654,344	2,000,000	1,654,344		
228	Pilot centres for the recovery and reintegration of the minors with handicap						
229	Centres for the recovery and reintegration of the minors with handicap						
230	Centres for integration through occupational therapy						
231	Centres for recovery and neorophsyhiatric rehabilitation						
232	Social care canteens	797,400	705,671	2,500,000	1,267,839	3,520,800	2,114,051
233	Social care	209,000	208,684	300,000	207,268	512,000	549,647
234	Support of the child's rights protection system						
235	Birth allowances	99,000	93,238	150,000	117,247	112,000	116,227
236	Specialised public service for child's protection						
237	Pensioners hostels					2,920,000	2,350,054
238	Payment due to the personal assistant for children and adults with severe handicap					4,730,000	4,416,096
239	Other actions related to social care, allowances, support and daily allowances	900				2,370,000	1,086,185
240	**IV. SERVICES AND PUBLIC DEVELOPMENT, DWELLINGS, ENVIRONMENT AND WATER**	29,542,437	30,211,107	48,195,000	55,067,450	127,575,700	89,323,148
241	**SERVICES AND PUBLIC DEVELOPMENT AND DWELLINGS (r. 256 through 267)**	29,542,437	30,211,107	48,195,000	55,067,450	127,575,700	89,323,148
256	Street maintenance and repair	4,300,000	4,179,250	6,300,000	9,677,744	25,000,000	24,052,174
257	Lighting	1,300,000	1,819,510	2,000,000	1,379,729	4,000,000	3,094,841
258	Cleaning	2,200,000	2,231,097	3,000,000	3,326,762	7,000,000	3,330,565
259	Parks, public gardens and leisure areas maintenance	2,000,000	2,127,194	2,500,000	3,398,805	6,000,000	5,114,815
260	Heating for population	7,862,437	9,392,794				
261	Dwellings				36,310	19,600,000	10,099,344
262	Water supply, tratment stations, pumping stations	1,802,000	1,802,000		30,000	700,000	337,052
263	Networks, boiler houses, substations			7,000,000	18,050,257	12,654,000	21,544,000
264	Sewage	200,000	175,227	500,000	214,959	500,000	8,898
265	Local interest hydraulic works, inside the municipality						
266	Introduction of natural gas in municipalities						
267	Rural electrifications						
	Other actions for public and dwellings development	9,878,000	8,484,036	26,895,000	18,952,884	52,121,700	21,741,460

##	*Romanian Lei in Thousands*	1998 Initial Projections	1998 Actual	1999 Initial Projections	1999 Actual	2000 Initial Projections	2000 Actual
268	**V. ECONOMIC ACTIONS (r. 282 + 292 + 310)**	1,890,281	2,083,840	1,548,000	1,680,042	5,725,000	2,905,000
282	**AGRICULTURE AND FORESTS (r. 289 through 291)**			488,000	285,636		
289	Fight against plants deseases - Local centres for plants protection			202,000	128,960		
290	Centers for artificial seeding			38,000			
291	Sanitary-veterinary ambulatories			248,000	156,676		
292	**TRANSPORT AND COMMUNICATIONS (r. 306 through 309)**	1,890,281	2,083,840	1,060,000	1,394,405	5,725,000	2,905,000
306	Civil aviation						
307	Roads and bridges	15,000	15,000	30,000		245,000	
308	Public transportation	1,875,281	2,068,840	1,030,000	1,394,405	5,480,000	2,905,000
309	Other expenses in the field of transport and communications						
310	**OTHER ECONOMIC ACTIONS (r. 316 + 317)**						
316	Prevent and elimination of floods and frost						
317	Other expenditures for economic actions						
318	**VI. OTHER ACTIONS (r. 319)**	6,000	3,827	254,000	93,453	1,786,000	1,510,530
319	**OTHER ACTIONS (r. 330 through 334)**	6,000	3,827	254,000	93,453	1,786,000	1,510,530
330	Military commandments						
331	Civil protection	6,000	3,827	254,000	93,453	486,000	32,015
332	Romanian Social Development Fund						
333	Regional Development Fund					200,000	
334	Other expenditures					1,100,000	1,478,515
335	**VII. GUARANTEE FUNDS AND REDISTRIBUTION (r. 339)**						
339	**REPAYMENT OF FOREIGN LOANS, INTEREST RATES AND FEES RELATED TO GUARAN**						
340	Repayment of foreign loans						
341	Payment of interest rates and fees						
342	**VIII. TRANSFERS (r. 343)**					2,000,000	200,000
343	**TRANSFERS FROM LOCAL BUDGETS (r. 349+350)**					2,000,000	200,000
349	Transfers form local budgets to the health fund budget						
350	supporting the child's protection system					2,000,000	200,000
351	**IX. LOANS GRANTED (r.352)**						
356	Temporary loans for the set-up of public institutions and services of local interest or of activities fully supported from extrabudgetary revenues						
358	**X. PAYMENTS OF INTEREST RATES AND OTHER EXPENDITURES (r. 368 + 380)**	10,000			649,715	900,000	1,492,756
368	**INTEREST RATES RELATED TO LOCAL PUBLIC DEBT AND OTHER EXPENDITURES (r.**				649,715	900,000	1,492,756
376	Interest rates corresponding to the internal local public debt				649,715	900,000	1,492,756
377	Interest rates corresponding to the foreign local public debt						
378	Expenditures occassioned by the issue and sale of value titles, in compliance with the law						
379	Exchange rate difference corresponding to the foreign local public debt						
380	**PAYMENT OF INTEREST RATES (r. 385)**	10,000					
385	Interest rates corresponding to the loans from the treasury fund	10,000					
386	**XI. REPAYMENT OF LOANS (r. 387)**	581,704	581,703		560,000	3,440,000	4,494,500
387	**REPAYMENT OF GRANTED LOANS (r. 394 through 397)**	581,704	581,703		560,000	3,440,000	4,494,500
394	Repayment of loans granted form the treasury fund	581,704	581,703				
395	Repayment of loans granted form the state treasury fund						
396	Repayment of internal investment loans				560,000	3,440,000	4,494,500
397	Repayment of foreign invsetment loans						
398	**XII. RESERVE FUNDS (r. 403)**	350,000		100,000			
403	Budgetary reserve fund available for local and county councils	350,000		100,000			
404	**XIII. EXPENDITURES WITH SPECIAL DESTINATION (r. 405)**			22,407,000	12,865,130	32,050,000	12,625,098
405	**SPECIAL DESTINATION EXPENDITURES (r. 419 through 431)**			22,407,000	12,865,130	32,050,000	12,625,098
419	Public services financed from special taxes			1,477,000	492,534	1,000,000	1,385,637
420	Expenditures from the public roads fund			4,300,000	1,300,000	12,150,000	3,000,000
421	Expenditures form the intervention fund						
422	Expenditures from the dwellings fund			10,600,000	11,029,495	18,800,000	8,214,059
423	Expenditures from the fixed assets depreciation						
424	Expenditures from the civil aviation fund						
425	Expenditures from donations and sponsorship			30,000	43,100	100,000	25,402
426	Expenditures from amounts paid by legal persons and individuals to participate in public interest actions			6,000,000			
427	Expenditures for financing the program of paving communal roads and villages water supply						
428	Expenditures for financing the activities to reduce seismic risk for existing buildings and other special n						
429	Expenditures for purchase of medical equipment for public hospitals						
430	Investment expenditures from the revenues obtained from selling private property assets						
431	**XIV. SURPLUS / DEFICIT**	-1,298,300	-2,585,668	0	1,977,472	0	-1,675,849