

**Preliminary Business Plan**

**District Heating Company  
for the City of Handlova, Slovakia**

**Prepared by  
Pacific Northwest National Laboratory  
Tecogen  
EGU**

**Prepared: April 1994  
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Advanced International Studies

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Pacific Northwest National Laboratory  
Washington, DC 20024

### **Disclaimer**

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This information has been compiled with all due care, based in large part on information provided by staff from the City of Handlova; from Slovensky Energeticky Podnik (SEP), who currently manages the heating plant; and from the Ministry of Finance of the Slovakian National Government. All estimates and projections used in this Business Plan contain substantial elements of subjective judgment and analysis. No liability is assumed for the correctness or completeness of the information. Pacific Northwest National Laboratory and its subcontractors disclaim all liability for the possible errors or omissions in this Business Plan or in other written or oral statements communicated or made available to any prospective lender or investor.

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## Summary

The City of Handlova, Slovakia, needs to replace its district heating system, which is old, unreliable, and expensive to maintain. The current plant is owned by a state-run utility, the Slovensky Energeticky Podnik (SEP). The plan is to privatize the heating plant, acquire capital to rehabilitate the central plant (converting it to a cogeneration facility), install a new hot-water distribution system, and implement an extensive energy efficiency effort in the residential buildings on the system. System capacity is 100 MWt, with annual heat sales estimated to be 450,000 gigajoules per year (GJ/yr). The capital necessary for system improvements is estimated to be 465 million Slovakian Krowns (SK) ( in 1997 price levels). The total market value of existing fixed assets that will survive the rehabilitation effort as part of the new system is estimated at 342 million SK.

There has been substantial analysis and preparation for this activity, which is documented in demand-side and supply-side technical and economic analyses, an integrated demand/supply report, and this preliminary business plan. The preparation includes investigation of ownership, management, and technology alternatives; estimation of the market value of existing assets and investment requirements; and forecasting of future cash flows. In this last activity, cash flows required to operate the system and pay interest and principal on borrowed money were used as the basis for estimating the price that would have to be charged before the proposed heating plant company would be a viable operation. Given uncertainties in the future inflation rate for this emerging economy, all analyses were done on a real basis with estimated escalation rates for fuel, labor, and other factors of production.

The effort also attempted to document historical costs as a basis for examining whether future cost projections are realistic. This exercise was difficult for several reasons. First, the company has been run under the state government and was never operated as a profit-making enterprise. Second, the Handlova heating plant has been only a small element within the much larger SEP, and it was difficult to identify and segregate the costs and cash flows that are attributable to the Handlova system.

These preliminary projections indicate that the cost of heating from the new system will be reasonable from both a cost per unit of energy basis (SK/GJ) and, from the perspective of an apartment dweller in Handlova, on a total cost per year basis. Delivering heat at the projected cost will, however, require a substantial change in the way that the heating plant is run, with proportionally very large reductions in labor, operations and maintenance (O&M), and overhead charges. In addition, there will need to be significant revenues from the sale of electricity to the national grid. Some operating savings will naturally occur because of added reliability and efficiency of the new equipment, but beyond this, there will need to be staff reductions and a western-style profit-making orientation. Discussions with system managers indicate that they are prepared to effect this paradigm shift.

This work has been funded through the U.S. Agency for International Development (USAID) through the U.S. Department of Energy (DOE). The effort has been managed by Pacific Northwest National Laboratory (a DOE national laboratory) with significant support from Tecogen (a U.S.-based manufacturer of thermal equipment), and from EGU, the Slovakian National Energy Laboratory. Much

individual effort and support was required from the officials and citizens of Handlova. Revitalization of the city heating system is a very high priority for Handlova, and the Mayor and his staff have given this effort responsive and effective support.

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## 1.0 Introduction

As part of the privatization process in Slovakia, the Central Heating System Handlova is being transferred from state to private ownership as a joint stock company. A new private corporation, "Teplaren Handlova A.S." (Heating Plant Handlova), is being established for the purpose of operating the heating system. The new heating company will be managed by professional managers under the direction of new owners as described below:

- 60% ownership by Slovensky Energeticky Podnik (SEP), the National Electric Transmission Company. SEP currently manages operation of the existing heating plant as a government agency. SEP is soon to be privatized and will be the private majority owner of the new joint stock company.
- 35% ownership by the City of Handlova. The city currently owns approximately 60% of the residential buildings the heating plant serves, as well as a significant amount of land through which the distribution system runs.
- 5% ownership by Sub, Bana Handlova, the Handlova Coal Mine company, which currently provides the fuel for the heating plant.

Recognizing the importance of the district heating system to his citizens, the Mayor of Handlova has taken the lead in restructuring the company, and he will provide continued oversight to ensure that the company is structured as a viable entity that can meet the long-term heating needs of the people.

The existing heating system serves 4,009 of the city's 5,193 dwelling units, providing 72% of the total residential heat and hot water, 84% of the thermal energy consumed by the non-residential (commercial) sector, and 100% of the thermal energy used by the industrial sector. Total end-use consumption is about 450 TJ/year, with a peak demand of about 54 MW<sub>e</sub>, providing an average load factor of 26%.

The existing heating plant is fueled entirely by industrial-grade brown coal dust provided by the Sub Bana Handlova, a coal mine adjacent to the power plant. The proximity of the mine to the plant ensures that an adequate supply of coal will always be available and eliminates the cost of fuel transportation.

The plant is equipped with three boilers that provide a total capacity of 100 tons/hour of steam (60MW<sub>t</sub>). The balance of plant includes a closed-loop condenser cooling system, a closed-loop coal preparation and delivery system, and mechanical ash collectors. The plant was constructed from 1937 to 1940 as a power plant for the coal mine. In 1965, construction was begun to convert the system to a district heating system, with service beginning in 1968. The heat is distributed as steam at 250°C and 3.0/0.9 MPa, through a network consisting of 8,035 meters of pipe (5,300 meters buried and 2,735 meters above ground), and 31 heat exchanger stations. The distribution system, including most rights-of-way and most heat exchanger stations, is owned by the City of Handlova.

A large portion of the existing heating plant equipment and the distribution system is at the end of its useful life and will soon have to be replaced, requiring substantial capital investment. Additional investments need to be made to ensure that emissions from the plant meet Slovakian environmental standards. Under the USAID Support for Eastern European Democracy (SEED) Program, heat supply alternatives and the demand-side energy efficiency potential were investigated by a U.S./Slovak team.

Results are documented in supply-side, demand-side, and integrated energy resource reports, which are summarized here and are available to the prospective investor. Also available are detailed estimates of the market value of all system assets, and the financial statements of the existing heating company.

On the supply side, three major configurations were investigated as replacement systems: a centralized dual-fuel (coal and gas) cogeneration system; a centralized coal-fired cogeneration system; and a decentralized gas-fired, heat-only system. The demand-side report evaluated the costeffectiveness of numerous energy efficiency options for residential and non-residential buildings, including such measures as insulation, window replacements, hot water flow restrictors, radiator reflectors, improved heating controls, and weather stripping. The integrated report defines the least-cost package of supply-side and demand-side alternatives for upgrading the system.

The combination of a centralized coal-and-gas cogeneration system coupled to an aggressive efficiency program was considered most desirable by the city and has been selected for implementation. This decision was based upon economics, fuel availability, risk reduction, and social and environmental impact upon the community.

To implement required rehabilitation of the central heating system, including the main heating plant, distribution system and the heat exchanger stations, the company seeks capital investment (debt and/or equity) for its working capital and fixed asset needs. This document is intended to provide potential lenders or investors with essential information adequate for them to make a judgment as to their potential interest in further exploring this opportunity.

## 2.0 Survey of the Existing System

Figure 2.1 depicts the layout of the Handlova Central Heating System. In general, the central heating system, including the heat generating plant, distribution system, and the heat exchanging stations, is old and inefficient and needs to be replaced.

### 2.1 The Generation and Delivery System

The central heating system covers 80% of the current energy demand for space heating and water heating in the city of Handlova. The heating plant was built from 1937 to 1940 and was originally designed as a power plant with a condensing steam turbine, which supplied the electricity for the coal mine Handlova. The last major capacity addition to the plant was in 1954, when the boiler K6 (45 tons/hour, 432°C, 3.8 MPa) was built. The power plant was converted to a heating plant in 1965-68 and upgraded with addition of a closed-loop condenser cooling system, natural circulation boilers, a closed-loop coal preparation and delivery system, and mechanical ash collectors.

The steam distribution system was built in 1965 and heat distribution began in 1968. In 1982, because of equipment age and economically ineffective production of electricity, the cogeneration plant was converted to heat production only. Boiler K1 was retrofitted in 1982, and boiler K5 was retrofitted for dual-fuel (coal and natural gas) operation and a pre-combustion reactor in 1990. Boiler K6, which was installed in 1954, was upgraded in 1989 and was converted to dual-fuel operation. Currently the distribution network consists of 31 heat exchanger stations, 5,300 meters of pipes installed in non-accessible channels, and 2,735 meters of pipes on the surface. Steam is supplied through the non-regulated heat transfer station TG2 at 3.0/0.9 MPa and 250°C. Maximum pipe dimension is DN 400 for the steam distribution lines and DN 150 for the condensate return lines.

The heat generating plant uses industrial grade coal (brown powdered coal) with a heating value of 10.5-11.0 MJ/kg and natural gas with a heating value of 33.4 MJ/m<sup>3</sup>. Boilers with natural circulation are equipped with closed-loop coal feed and electrostatic filters. Boiler K1 is equipped with a pre-combustion reactor; boilers K5 and K6 are equipped with gas burners with capacity equal to 50% of the boiler total output. Total output of all boilers is 100 ton/hr (60tMW). The plant employs 120 workers and 24 administrative staff members.

The new 115-meter concrete stack was built in 1983; in 1984 and 1985, the flue exhaust system was equipped with electrostatic filters. The old generators have been removed from the building. Ash produced by the heating plant is deposited in a refuse depository outside of the city.

#### 2.1.1 System Thermal Balance

The Handlova heating system thermal balance is provided in Table 2.1, with separate breakout for total Handlova heating consumption and that provided by the Handlova district heating system. About 30.7% of the energy supplied by the district heating system is for space and water heating in the residential sector, with 11% to 13% each in the non-residential and industrial sectors. System losses account for almost 45% of the coal energy provided to the plant.

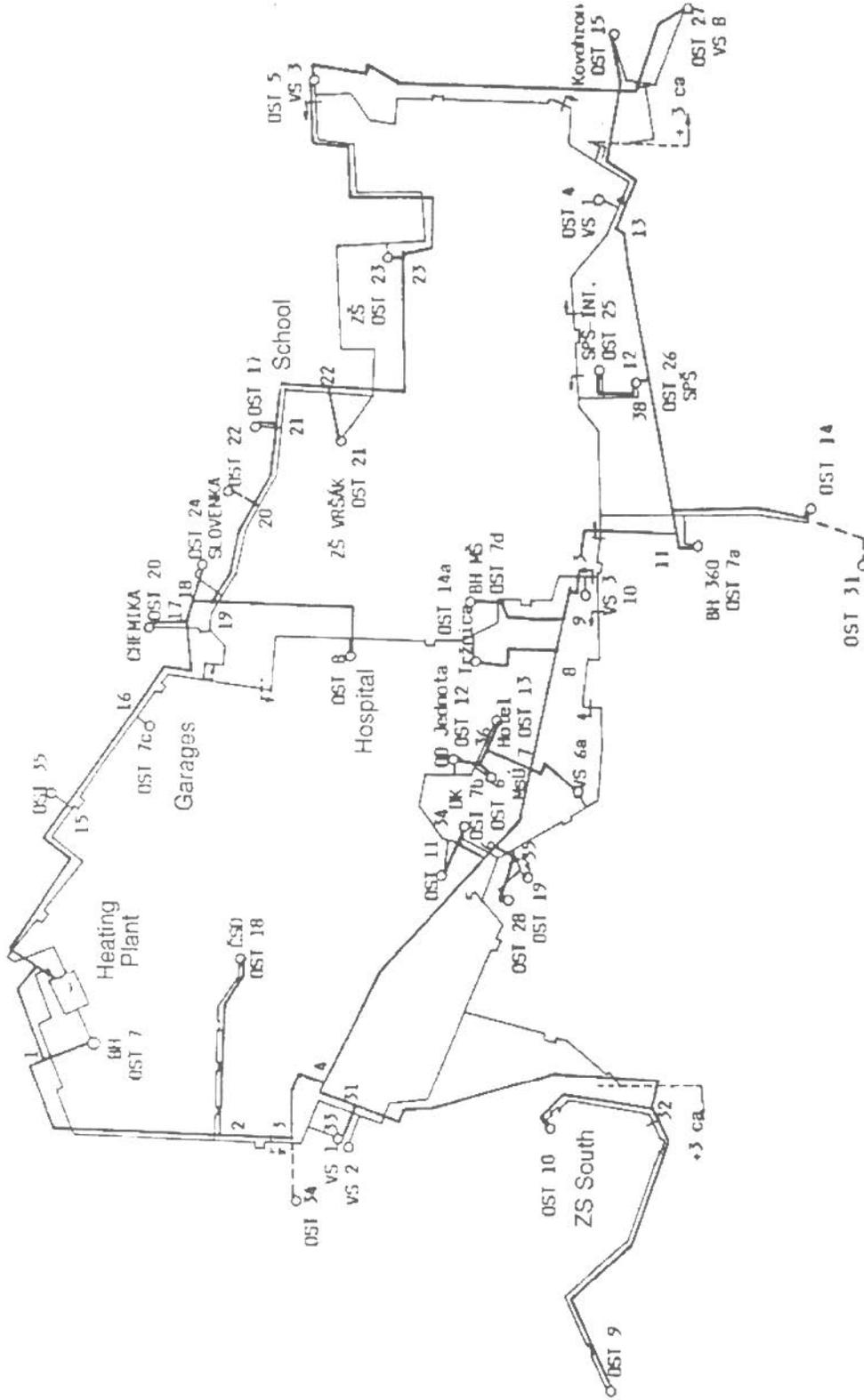


Figure 2.1. Layout of the Handlova District Heating System

**Table 2.1.** Heat Balance Summary for Handlova Heating System

Energy Use Category	Total Handlova Consumption (GJ/Year)		System Only District Heating(GJ/Year)	
Space and Water Heating				
Residential	331,340	35.5%	251,033	30.7%
Non-Residential	107,225	11.5%	92,054	11.3%
Industrial	107,671	11.5%	107,671	13.1%
District Heating Losses				
Heating Plant	275,778	29.5%	275,778	33.7%
Distribution System	91,744	9.8%	91,774	11.2%
Other System Losses				
Residential	17,442	1.9%	0	—
Non-Residential	2,380	0.3%	0	—
Total:	933,610	100%	818,310	100%

### 2.1.2 Fuel Availability

The parent company to Sub Bana Handlova, the State Upper Nitra Coal Mines (Hornonitrianske Bane) with headquarters in Prievidza, Slovakia, has, in its letter of August 14, 1993, to SEP Bratislava, guaranteed supply of standard quality coal up to year 2020. The following coal quality was guaranteed:

Heating value	Qa	=	10.5 MJ/kg
Ash content	A	=	36.38%
Water	W	=	21.46%
Sulfur	S	=	1.55%
Carbon	C	=	66.51%
Hydrogen	H	=	5.4%
Nitrogen	N	=	1.28
Oxygen	O	=	25.49%

Handlova is a coal mining community. The coal mine is the largest local employer and has a major impact upon the local social environment. The coal used in the heating plant (~ 70,000 tons/year) is approximately 16% of the industrial grade coal from the mine. If it were not used in the Handlova heating plant, it could likely be sold in another market, but at reduced price. Coal is currently sold to the heating plant under annual contracts. In the interest of maintaining a long-term customer, the Handlova Coal Mine is interested in a long-term supply contract with the owners of the new heating plant.

The Slovak Gas Company (Slovensky Plynarensky Podnik), the local gas utility, with headquarters in Prievidza, Slovakia, is able and willing to provide a sufficient gas supply to satisfy the needs of the City of Handlova. Currently, the low-pressure gas distribution network in Handlova is in use and serves only small users (residences). A decentralized heating system would require installation of a new piping system.

## 2.2 The Energy Consumption System

For the purpose of this study, the city was divided into three energy consumption sectors: residential, non-residential and industrial. These sectors were then further subdivided, and the specific parameters needed to support the energy efficiency analyses were identified. Energy consumption in Handlova for space heating, for water heating, and for industrial processes in 1992 is summarized by fuel type in Table 2.2.

**Table 2.2.** City Energy Consumption (GJ/yr)

Energy Use Category	Sectors			Total Energy	
	Residential	Non-Res.	Industrial	GJ/Year	%
Local					
Coal	29,559	0	0	29,599	5
Gas	66,950	50	0	67,000	12
Electricity	1,200	1,684	0	2,884	1
Boiler Houses					
Coal	0	11,080	0	11,080	2
Gas	0	4,737	0	4,737	1
District Heat	251,033	92,054	107,671	450,758	80
Total	348,782 62%	109,605 19%	107,671 19%	556,058 100%	100

### 2.2.1 The Residential Sector

Residential building data were acquired from the Building Management Company in Handlova (Bytovy podnik Mesta Handlova), from the Administration Office of the City Hall, and from AGS Atelier Company which was involved in city development studies. The residential sector was divided into 7 representative residential building types, as follows. Energy use for these buildings is summarized in Table 2.3.

Res-1	Apartment buildings 2 to 3 floors	[1951-1952]
Res-2	Apartment buildings 3 to 7 floors	[1954-1957]
Res-3	Pre-fab buildings T 06 B	{1968-1984}
Res-4	Pre-fab buildings	[1962-1965]
Res-5	Pre-fab buildings P1-15-NKS	[1982-1991]
Res-6	Two-family detached houses	
Res-7	Single-family detached houses	

For building types Res-1 through Res-5, the years in which these buildings were constructed is provided in brackets. The data indicate that approximately 27% of residential heated floor space is in brick-built apartment buildings from the 1950s (Res 1-2), 49% in the pre-fab multifamily housing (Res 3-5), and the remaining 24% in detached single- and two-family houses.

**Table 2.3. Residential Building Thermal Energy Consumption Summary**

<b>Number of Buildings by Energy Source</b>					
<b>Building Group</b>	<b>District Heat</b>	<b>Coal</b>	<b>Gas</b>	<b>Electric</b>	<b>Total</b>
#1 Apt. Bldg, 2-3 floors	0	0	22	0	22
#2 Apt. Bldg., 3-7 floors	40	1	6	0	47
#3 Pre-Fab Apt. (68-84)	29	0	0	0	29
#4 Pre-Fab Apt. (62-65)	10	0	0	0	10
#5 Pre-Fab Apt. (82-91)	16	0	0	0	16
#6 Duplexes (2 family)	0	5	128	0	133
#7 Single-Family House	0	256	284	20	560
<b>Total</b>	<b>95</b>	<b>262</b>	<b>440</b>	<b>20</b>	<b>817</b>
<b>Number of Apartments by Energy Source</b>					
<b>Building Group</b>	<b>District Heat</b>	<b>Coal</b>	<b>Gas</b>	<b>Electric</b>	<b>Total</b>
#1 Apt. Bldg., 2-3 floors	0	0	232	0	232
#2 Apt. Bldg., 3-7 floors	1,198	12	114	0	1,324
#3 Pre-Fab Apt. (68-84)	1,567	0	0	0	1,567
#4 Pre-Fab Apt. (62-65)	376	0	0	0	376
#5 Pre-Fab Apt. (82-91)	868	0	0	0	868
#6 Duplexes (2 family)	0	10	256	0	266
#7 Single-Family House	0	256	284	20	560
<b>Total</b>	<b>4,009</b>	<b>278</b>	<b>886</b>	<b>20</b>	<b>5,193</b>
<b>Heated Area by Energy Source (m<sup>2</sup>)</b>					
<b>Building Group</b>	<b>District Heat</b>	<b>Coal</b>	<b>Gas</b>	<b>Electric</b>	<b>Total</b>
#1 Apt. Bldg., 2-3 floors	0	0	12,517	0	12,517
#2 Apt. Bldg., 3-7 floors	70,471	632	7,943	0	79,046
#3 Pre-Fab Apt. (68-84)	89,719	0	0	0	89,719
#4 Pre-Fab Apt. (62-65)	20,639	0	0	0	20,639
#5 Pre-Fab Apt. (82-91)	54,947	0	0	0	54,947
#6 Duplexes (2 family)	0	694	18,412	0	19,106
#7 Single-Family House	0	24,421	34,069	2,511	61,001
<b>Total</b>	<b>235,776</b>	<b>25,747</b>	<b>72,941</b>	<b>2,511</b>	<b>336,975</b>

### 2.2.2 The Non-Residential Sector

Non-residential buildings are classified into 7 sectors, as depicted in Table 2.4 below. In general, these buildings were not characterized to the same degree as the residential building stock since resources were limited and each of the non-residential building types represents a very small fraction of the total energy consumption (maximum 3.5%). All non-residential buildings together represent less than 20% of total energy consumption.

**Table 2.4.** Non-Residential Building Energy Consumption Summary

Commercial Sector	Local			Boiler House		District	Total	
	Coal	Gas	Electric	Coal	Gas	Heat	GJ/yr	%
Education	0	0	1,097	5,000	0	45,565	51,662	47.1
Culture	0	0	0	0	0	5,312	5,312	4.8
Health	0	0	200	0	0	19,531	19,723	18.0
Sports	0	0	0	6,080	0	5,850	11,930	10.9
Office	0	0	0	0	0	928	928	0.8
Service	0	50	387	0	4,737	9,687	14,861	13.7
Hotels	0	0	0	0	0	5,181	5,181	4.7
Total	0 0%	50 0.1%	1,684 15%	11,080 10.1%	4,737 4.3%	92,054 84%	109,605 100%	100

### 2.2.3 The Industrial Sector

The industrial sector in Handlova is represented by the following firms: Coal Mine Handlova including garages, Slovenka, Lahke Universalne Konstrukcie, AMK, Chemika, CSD station and State Agricultural Farm. At each of these sites, thermal energy is used only for space and water heating; industrial use of thermal energy is negligible. Except for the coal mine industry, this energy demand sector is relatively small and was not characterized in detail because of the time and budget limitations of the project (see Table 2.5).

## 2.3 Forecast for Load Growth

The load growth projections for the system are based upon the Urban Development Plan for the City of Handlova. This study, performed by AGS Atelier for the City Hall in 1993, predicted that the city population would increase from 18,332 in 1992 to 19,500 by the year 2010. Extrapolating the growth curve at a conservative rate produces an estimate that the city population will reach 19,750 by 2022. This is a population increase of approximately 1400 people, or 5.22%. Industrial activity in this scenario was assumed to stay at the 1992 level with no increase in thermal energy demand. Under these assumptions, energy demand for space heating and water heating would increase by 18,206 GJ, or 3.22% of 1992 demand levels. The comparable increase in district heating demand is estimated at 11,268 GJ, or 4.5%.

**Table 2.5. Energy Demand in the Industrial Sector**

<b>Industrial Users</b>	<b>Heating GJ/yr</b>	<b>%</b>	<b>Industry Category</b>
Sub Bana Handlova	76,736	71	Handlova Coal Min
Chemika	5,684	5	Small chemical plant
Lahke Konstrukcie	19,177	18	Light steel fabrication
Slovenka	2,114	2	Textile factory
AMK	188	0	Automobile repair
CSD Station	2,079	2	Railroad station
State Farm	1,693	2	Farm
Total	107,671	100	

### 3.0 Description of the Proposed System Upgrade

The existing central plant will be upgraded to a dual-fuel cogeneration facility, and the existing steam distribution system will be replaced with a modern hot water two-pipe system with pressure independent heat exchanger stations and a central pumping station located at the central heating plant. Under this supply configuration, the winter peak load is supplied by the baseload (coal) steam boilers, which also provide steam to the electrical turbine. This generally occurs when the average ambient air temperature drops below 12°C, or about 5,200 hours per year, and is estimated to result in approximately 22.4 GWh/year of electricity generation. During the summer peak, the load is supplied only by the gas-fired boilers, and no electricity is produced.

In the central plant, the plan is to have the two existing boilers and hot water manifolds rebuilt, as well as the fuel supply and ash removal equipment. In addition, a new chemical plant will be established for water treatment, and additional equipment procured, including new gas-fired hot water boilers, a 6.2-kV electrical distribution center, a new mechanical room, a new hot water heat exchanger station, and limestone preparation equipment. Finally, a new ash dump site will be prepared. The total cost estimate for the central plant is about 200 million Slovakian Crowns (SK) (1997 price levels). Detailed equipment specifications are provided in the supply-side report.

The system will use pre-insulated pipe that is buried alongside the existing steam distribution system. Construction is expected to take two years (1995 and 1996) with heat exchanger replacements made during the summer period. Preliminary hydraulic and engineering calculations have been completed, and preliminary cost estimates have been made based upon averages of several quotes secured from different manufacturers. The cost for the distribution system is estimated at 73 million SK, with replacement of the heat exchangers estimated at 60 million SK (1997 price levels).

Total capital required for the system is then about 333 million SK (1997 price levels). Operating parameters are summarized below:

Energy Produced		
Thermal Energy	640,320	GJ/year
Electricity	22,400	MWh/year
System Consumption		
Thermal Energy	110,234	GJ/year
Distribution Losses	26,942	GJ/year
Electricity	1,790	MWh/year
Energy Delivered		
Hot Water	530,050	GJ/year
Electricity	20,610	MWh/year
Fuel & Consumables		
Coal (10.5 MJ/kg)	69,307	tons/year
Gas (33.4 MJ/m <sup>3</sup> )	3,947	10 <sup>6</sup> m <sup>3</sup>
Limestone	6,931	tons/year
Ash Production	25,218	ton/year

### 3.1 Demand-Side (Efficiency) Plans

A thorough analysis was made of the space and water heat efficiency measures that are available to minimize the system load and reduce energy costs for Handlova's citizens. The efficiency measures that were found to be cost-effective were as follows:

- insulate building side walls
- weatherstrip elevator penthouse, stairways, doors, and windows
- weatherstrip doors and windows
- install revolving or double doors in vestibules
- install storm windows
- install zone valves on radiators
- install central thermostats with "on-time" counter in each apartment
- install heat recovery vent system in basements
- install heat reflectors behind each radiator or heater
- remove draperies from radiator
- install low-flow shower heads
- install flow restrictors on faucets
- insulate hot water pipes in unconditioned spaces
- install hot water flow meters
- install waste water heat recovery heat exchangers.

The potential is substantial: up to 20% of the current residential district heating load could be eliminated by efficiency measures at current fuel prices. Most of this efficiency is found in the large prefabricated apartments (*residential building groups 2-5*). The total cost of implementation for efficiency in the residences heated by the district heating system is approximately 131 million SK (1997 price levels).

It is expected that full implementation of cost-effective measures will take 5 years or more. The overall plan is to install supply-side capacity that is as small as possible for meeting today's energy demands and then meet any load growth through efficiency measures. This approach has worked very well in the United States and other parts of the world, and we expect it to prove successful here as well. About 60% of all the buildings that are candidates for efficiency retrofits are owned by the City, and the remaining are owned by building cooperatives. Thus, gaining access for implementation and periodic maintenance should not be a problem.

### 3.2 Preliminary Estimate of Investment Requirements and Schedules

Table 3.1 is a preliminary estimate of investment requirements and expenditure schedules. All investment requirements are expressed in 1997 price levels.

**Table 3.1.** Preliminary Estimate of Investment Requirements and Expenditure Schedules

<b>Investment Category</b>	<b>Investment (1000 SK)</b>	<b>Schedule of Expenditures</b>
Central Plant Upgrade	200,414	1995-1996
Distribution System	73,282	1995-1996
Heat Exchangers	59,957	1995-1996
Efficiency Upgrades	131,301	1997-2001
Total	464,954	

## **4.0 Organization and Management**

The heating plant and distribution system are currently operated by a staff of highly experienced personnel. The corporation is committed to creating a management structure that will continue to utilize the expertise of these staff and assure sound control of the operations and continuing cooperation between various departments, such as administrative, marketing, engineering, facilities, etc. The company is also making the commitment to support continuing management development of the personnel and to adopt sound environmental and social policies. Management will be responsible to the Board of Directors of the corporation.

### **4.1 Organizational Structure**

The proposed joint stock company will be organized according to Slovakian General Business Law 513/1991. Accordingly, the management structure will comprise shareholders, an Audit Council, and a Board of Directors.

#### **4.1.1 Shareholders**

The joint stockholders will own the company and exercise their management rights through shareholder meetings, which will be held at least annually.

#### **4.1.2 Audit Council**

The Audit Council is established and operates according to the General Business Law. Its responsibilities and authorities are set by company bylaws developed by the shareholders. Its responsibilities include review of accounting practices and oversight of management implementation of shareholder directives.

#### **4.1.3 Board of Directors**

The Board of Directors, which directly oversees company management, is elected by the shareholders. At the current time, the plan is to structure the Board as follows:

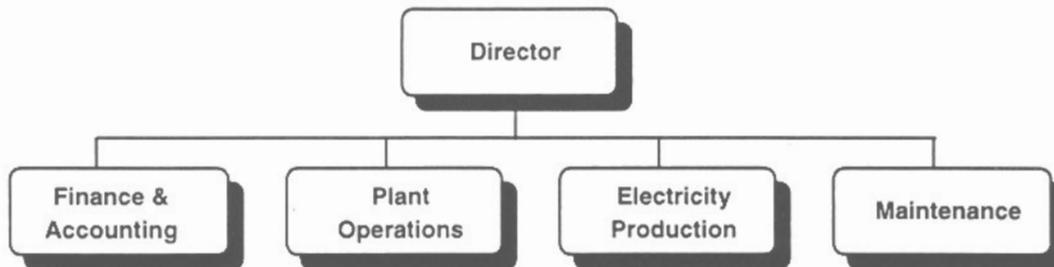
Chairman: 1 representing ENO (Electric Power Company Novaky)

Members: 1 representing ENO  
1 representing the City of Handlova  
1 representing the Coal Mine  
1 Director of Operations at the heating plant  
1 (or more) member(s) representing the financing source(s).

Note that ENO is the subsidiary of SEP that currently manages the heating plant and will provide SEP representation on the privatized company.

## 4.2 Management Structure and Key Personnel

The existing management structure is effective and will be retained in its current form. Lower levels of management will be developed as appropriate to provide effective customer-oriented service.



### **Director of Heating Plant: Mr. Josef Britan**

Mr. Britan holds a Master's degree in Mechanical and Electrical Engineering from the Technical university in Zilina, Slovakia, and attended several courses in management and accounting at the University of Economy in Bratislava. He has 20 plus years of experience in the energy generation business. From 1974 to 1991, he worked in the Electric Power Company Novaky as the maintenance department head (7 years) and as shift director (10 years). In 1991 he was promoted to director of Heating Plant Handlova. Mr. Britan is a seasoned plant manager with excellent managerial and decision-making abilities. He is 46 years old.

### **Deputy Director for Finance and Accounting: Mrs. Anna Madolova**

Mrs. Madolova holds a BS degree in Economics from the College of Economics, Prievidza, Slovakia, and has completed several courses in accounting, financing, and general economics. She has 39 years of experience in accounting and economics. She has worked in different departments of the Heating Plant Handlova since 1956. Since 1972, she has been head of the plant Department of Finance and Accounting. Mrs. Madolova has a superior knowledge of the plant operation and financial performance, a high level of personal commitment to the company, and an excellent professionalism. She is 54 years old.

### **Deputy Director for Production: Mr. Tibor Janoska**

Mr. Janoska holds a BS degree in Mechanical Engineering from the Technical School in Handlova, Slovakia, and has completed several technical and management courses organized by Swiss-based educational organization. He has 13 years of experience in technical management of the Heating Plant Handlova. He has proven technical and managerial capability and an excellent ability to manage heat production and distribution. He is 45 years old.

#### **Deputy Director for Electricity Production: Mr. Miroslav Marko**

Mr. Marko holds a BS degree in Electrical Engineering from the Technical School in Handlova, Slovakia, and has completed courses in controls, regulation, and data acquisition technologies. He has 35 years of experience, with 33 in management positions. During his professional life, he worked in several electric power companies as engineer, foreman and shift manager. Since 1991, he has managed the plant electric department. Mr Marko is 56.

#### **Deputy Director for Maintenance: Mr. Dusan Weiss**

Mr. Weiss holds a BS degree from the Technical School in Handlova, Slovakia, and has attended several technical and management courses. He has 26 years of technical and management experience. He has been with the Heating Plant Handlova since 1968, working in several departments. He has managed the maintenance department since 1991. Mr Weiss is 45.

### **4.3 Relationship to External Parties**

#### **4.3.1 Coal, Gas, Water, and Ash Disposal Suppliers**

The coal necessary for the plant is available from Sub Bana Handlova, the coal mine that sits adjacent to the heating plant. Coal extracted from the mine is transferred directly to the heating plant via conveyor belt. The coal mine has recently undergone a resource assessment which assured that the coal supply will be plentiful well into the 21st Century. Should coal not be available from the mine for some unforeseeable reason, there are four other coal mines in the Slovak Republic that could supply the plant. Costs would likely rise, however, by about 50 SK/ton, to account for transportation costs. Ceilings for coal tariffs are set by the Ministry of Finance. Individual coal mines are free to negotiate prices lower than the ceiling.

Discussions with Ing. Anton Ondrejko, the Technical Director of the coal mine, indicate that the coal mine is eager to cement a long-term relationship with the heating plant. Mr. Ondrejko indicated that the coal mine would consider a long-term contract with the heating plant (to replace the current annual contracts), with a significant price reduction possible.

Essentially 100% of the gas available to the heating plant is foreign, supplied through the Slovak Gas Company, a monopoly supplier. Its gas is provided through a 1994 agreement with Russia, but there are no long-term international guaranteed contracts. However, the dual-fuel cogeneration system will be able to weather any natural gas shortages without affecting heat deliveries.

Surface water supplies are ample for all plant operations. The ash disposal system currently used by the heating plant is operated by the national government. It has capacity well into the next century and has been approved for operation through the year 2021.

#### **4.3.2 Labor Market**

Jobs at the heating plant are considered prized positions among the citizens of Handlova. Managers of the current plant have had no problems identifying and attracting as many capable staff as they have

required, and they do not expect this situation to change. As indicated above, each of the key management positions is staffed by a qualified professional, and each of these has qualified back-up staff available. The plant maintains a full engineering staff.

### **4.3.3 District Heating Customers**

Approximately 62% of the residential load on the district heating system is in city-owned buildings, with the remaining 38% owned by individual building cooperatives. The City is willing to commit to minimum heat deliveries.

Each building is metered individually. Heating bills are allocated within each building according to a pre-arranged formula, which provides for 30% allocation by square footage and 70% allocation according to readings on radiator evaporative meters. Hot water consumption is generally metered directly in each apartment. Building owners are billed directly by the heating plant and are responsible for paying the bills. The owners, in turn, collect from building residents and apply for appropriate subsidies from the government.

There is a movement among some individual building owners to convert to decentralized gas boilers. This movement is likely to die out when the go-ahead for the new heating system has been given, however, since the delivered cost of heat has been demonstrated to be significantly lower from the district system than from distributed gas boilers. Additionally, the heat supply from the district system will be secure, whereas gas-fired systems may suffer from politically caused supply shortages.

In the past, there have been problems collecting revenues from some building owners, largely because of disagreements on billing practices. These problems are being resolved. In general, collection of revenues should not be a problem because 1) the national government subsidizes the cost of heat to all qualified individuals who are serviced by the district heating system; 2) if an individual cannot pay the costs remaining after the subsidies, a welfare system ensures that bills are paid; and 3) there are laws that allow the heating company to attach bank accounts of customers who can pay, but refuse to do so.

### **4.3.4 Electricity Sales**

Electricity will be sold to the national grid, which is run by Slovensky Energeticky Podnik (SEP), the majority owner of the proposed joint stock company. The tariffs are set by the Slovak Ministry of Finance. SEP believes that there will be a ready market for electricity generated by the plant. In addition, the Handlova coal mine could serve as a ready market for the entire electricity output of the plant.

## 5.0 Regulatory, Legal, and Tax Considerations

The Handlova Heating Plant, like the nation in which it resides, is in a state of flux brought about by its rapid privatization. As such, there is some uncertainty concerning relevant legislation and regulation. In order to clarify the situation, a meeting was held with 1) Ing. Frantisek Kubica, Deputy Director of the Department of Manufacturing Industry, Ministry of Economy, Slovak Republic, who is the Chairman of the Branch Committee for Privatization, and 2) Ing. Lubomir Florian, Advisor for Legislation for Privatization, Ministry of Economy, Slovak Republic. The following information was gathered and should help to clarify this uncertainty.

### 5.1 Accounting Requirements, Price Controls, and Subsidies

The price of energy charged to residential customers of a district heating system is regulated by the state government. The Slovak Ministry of Finances, through Public Law 526/1990, as amended by 09/1993 (October 20, 1993), imposed the continuation of price control of thermal energy for residential space and water heating for an unspecified transition time period. Under these price controls, unmetered residential customers can be charged a maximum of 137 SK/m<sup>2</sup> of heated space annually; metered residences can be charged a maximum of 120 SK/GJ. There are no controls on prices for non-residential (commercial) and industrial use. The government subsidizes the difference between the cost of delivered heat and its controlled residential price and regulates the level and conditions of subsidy to the users.

The state subsidies for residential space and water heating are based on the difference between the cost of heat and the maximum price allowed by the government. The subsidies are disbursed directly to home owners or to the building management/accounting institution. Owners of single/two-family houses connected to the district heat system are not eligible. Subsidy eligibility is a subject of occupant citizenship and permanent residency, subject to prime residency only, and is subject to minimum efficiency requirements tested by the State Energy Inspection. Eligibility is randomly checked by the Tax Office.

The Ministry also issued mandatory directives "Method and Provisions for Determination of the Price of Thermal Energy by the Thermal Energy Suppliers." This document specifies allowable costs for energy price calculations. In general, these rules are in accord with GATT conventions, and the price can include depreciation of capital, overhead expenses, direct labor, and operation and maintenance costs. Depreciation schedules are specified by Tax Law 286/1992 and generally call for *straight-line depreciation over the expected lifetime of the investment*.

### 5.2 Efficiency and Environmental Requirements

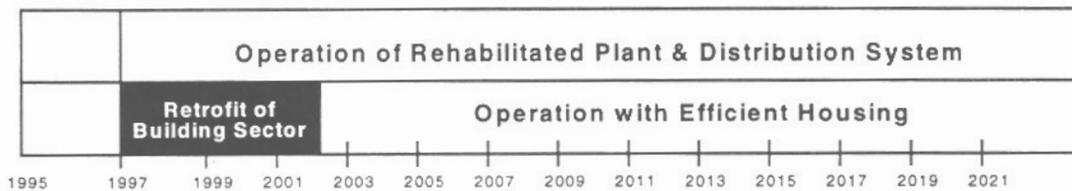
The heat supplier is required to comply with minimum efficiency standards and is responsible for inspection by the State Energy Inspection. Failure to meet minimum efficiency requirements results in a mandatory 10% reduction of the maximum allowed price of delivered heat.

### **5.3 Taxes**

The corporation will pay taxes to the State on its taxable income, as defined by Tax Law NR SR 124/1993, and on certain assets such as real estate. (The company will not be subject to any city or local taxes.). An analysis of these taxes indicates that the effective tax rate on taxable income will be approximately 40%. On December 15, 1993, a new law, established as Amendment #326/93 to Law 826/92ZB, declared a "tax holiday" of 5 years for any new cogeneration facilities without capacity restriction. The new joint stock company will qualify for this 5-year tax holiday.

## 6.0 Major Milestones

The overall goal of this plan is to acquire adequate capital investment in the near term to enable the Heating Company to retrofit the heating plant, the distribution system, and the heat exchanger stations by 1997, when operation of the new system is scheduled to begin. Once the supply and delivery elements have been rehabilitated, the focus will shift to upgrading the demand-side with retrofit of energy systems in the city's building stock. It is expected that this will take approximately 5 years to fully implement. The overall schedule is depicted below.



Several near-term requirements are now being addressed:

- Legal separation of the existing heating plant from the larger state-owned Slovensky Energeticky Podnik (SEP) so that it can stand alone as a privately owned joint stock company and enter into negotiations with suppliers, customers, and potential investors.
- Legal establishment of the joint stock company, including allocation of ownership shares among the participating entities; election of officers; development of corporate bylaws; and establishment of the stockholder's committee.
- Closure on a formal long-term contract with the City of Handlova for take-or-pay heat delivery contracts that define minimum quantities of heat that will be purchased by the City Housing Authority. Pursuit of similar contracts with other residential (apartment cooperatives), commercial, and industrial customers.
- Closure on a long-term coal purchase contract with Sub Bana Handlova, the coal mine, that specifies minimum coal purchases over an extended period in return for guaranteed quantity and prices over the life of the contract.
- Closure on a long-term gas purchase contract that specifies minimum gas purchases over an extended period in return for guaranteed quantity and prices over the life of the contract.
- Closure on a heat delivery metering and information system that is accepted both by the joint stock company and its customers as a basis for billing and for resolving billing disputes.
- Development of approaches for streamlining management of the new company, with an emphasis upon quality and reduced costs. The management style needs to have a "customer focus," seeking to enhance the reliability of the overall system, as well as an effective trouble-shooting capability to deal effectively and quickly with consumer complaints.

- Development of a management approach for reducing accounts receivable to "acceptable" levels.
- An effective information dissemination program for the citizens of Handlova that assures them of the viability of the centralized system and the economic benefits of remaining on the district heating system, rather than defecting to distributed gas boilers.

In the meantime, the financial projections presented here are being fine-tuned in accordance with the long-term supply and demand contracts being developed and to reflect improvements in management operations.

## 7.0 Financial Analysis

The heating plant has been owned and operated as part of the much larger Slovensky Energeticky Podnik (SEP) since its inception in the 1930s. It has not been operated as an independent entity or as a profit-making business; as a result, there are only limited historical data on costs and revenues upon which to develop an understanding of the health of the underlying company. For the purposes of this business plan, SEP has assembled the best data available for 1993 and formatted them according to GATT standards. The historical costs presented here represent best estimates of Handlova-specific costs as extracted from company-level financial data.

### 7.1 Historical Financial Information

The estimated balance sheet for the heating plant as of 31 December 1993 is shown in Table 7.1.

**Table 7.1.** Estimated Balance Sheet for Heating Plant as of 31 December 1993

Assets (1000 SK)		Equity and Liabilities (1000 SK)	
Intangible Assets	0	Capital Stock	59,333
Tangible Fixed Assets	48,072	Reserves & Provisions	-31
Financial Fixed Assets	0	Retained Earnings	-5,858
Fixed Assets	48,072	Equity	53,444
Cash and Securities	4	Long-term Liabilities	10,690
Accounts Receivable	33,604	Short-Term Liabilities	16,569
Inventories	4,798	Total Liabilities	27,259
Prepayments	-5,775		
Current Assets	32,631		
Total Assets	80,703	Equity and Liabilities	80,703

An (estimated) statement of cash sources and uses is provided in Table 7.2.

**Table 7.2.** Estimated Statement of Cash Sources and Uses

Cash Flow Elements	Uses (1000 SK)	Sources (1000 SK)
Total Profit/Loss after tax	5,858	
Depreciation of fixed assets		2,918
Increase of pre-payments		82
Credits paid to affiliated undertakings		14,004
Increased short-term liabilities		2,565
Increased long-term liabilities		10,608
Capital stock		59,333
Inventories	4,798	
Increases in Accounts Payable	33,604	
Prepayments of accrued income		5,775
Adj. value in liquidated tangible assets	50,990	
Increase in working funds	31	
Increase in current accounts	4	
Total Cash Flow	95,285	95,285

An (estimated) 1993 profit and loss statement for the Handlova heating plant is presented in Table 7.3.

**Table 7.3.** Estimated Profit and Loss Statement for the Handlova Heating Plant

<b>Costs</b>	<b>SK</b>
Fuel cost	46,573,972.00
Material cost	4,460,580.79
Energy purchases	8,917,154.91
Repairs and maintenance	17,018,172.82
Depreciation of property	2,918,437.00
Other services	1,903,874.05
Direct labor cost	11,366,900.00
Miscellaneous labor cost	69,558.00
Labor prepaid	59,232.00
Compulsory social insurance	4,934,125.00
Retirement	225,103.00
Salary reimbursement	1,607,079.00
Taxes and fees	1,020,948.00
Travel expenses	35,007.60
Advertising	5,083.30
Materials sold	148,968.39
Fines and charges	108,498.00
Other operation costs	554,681.00
Interest paid	20,177.00
Losses due to currency exchange	98,050.63
Other financial costs (banking?)	31,897.70
Reserve fund deposits	82,419.00
Cost of technological changes	65,994.00
Inventory discrepancies	108,115.00
Corrections to previous statement	-962,243.00
Internal expenses	95,927,282.83
<b>Total Costs</b>	<b>197,299,068.02</b>
<b>Revenues</b>	
Revenues from heat production	92,263,313.00
Value added tax 5% received	357,000.00
Value added tax 23% received	104,453.00
Value added tax 23% foreign	2,912.00
Revenue from services	1,080,345.00
Value added tax 6% received	255,000.00
Value added tax 25% received	17,520.00
Value added tax 25% foreign	454.00
Internal services	635,012.00
Revenues from materials sold	906,665.00
Other revenues	3,465.00
Other one-time revenues	12.00
<b>Total Internal revenues</b>	<b>95,815,010.00</b>
<b>Total Revenues</b>	<b>191,441,161.00</b>
<b>Net Loss</b>	<b>5,875,097.02</b>

## 7.2 Cash Flow Projections

Cash flow projections are provided for the proposed joint stock company in the following two tables. These projections are made on a real basis, with general inflation factored out of the analysis. The projections were made using the information provided in the supply and demand reports. The difference between the two tables is that Table 7.4 assumes a 10-year loan for the "supply" capital, whereas Table 7.5 assumes a 20-year loan (which, given available loan terms, may be unlikely, but could be achieved by rolling over a 10-year loan with a balloon payment into a second 10-year loan).

In the cash flow forecasts, the price for heat (SK/GJ) was set on an annual basis so that the cash flows that result would just cover operating costs and loan repayment (principal plus interest). It was assumed that the company would be operated to deliver the lowest possible cost of heat for the citizens of Handlova—hence, there are no earnings to be retained by the company or returned to the stockholders as dividends. These assumptions can easily be modified to simulate other operating models.

The projections assume the following conditions:

- a 5-year tax holiday from 1997-2001 (tax rate = 0), followed by a 40% tax on earnings from 2002 through the remaining outyears
- a 10-year (20-year in the second case) loan at a 10% real interest rate. The loan, which is used to upgrade the central plant and distribution system, is for 333,653,000 SK (1997 price levels). The loan is taken out over the 1995-96 period, and payments start in 1997.
- a series of five 10-year loans to cover building efficiency improvements. The loans are taken out from 1997 through 2001 and total 131,301,000 SK (1997 price levels).
- real escalation rates as follows:

	1997-2005	2006-2021
Natural gas	2.85%	1.4%
Coal	2.7%	2.7%
Electricity (sales)	6.0%	6.0%
Labor	4.1%	2.5%
Repairs/supplies	3.0%	2.0%
General overheads	3.7%	2.3%

Table 7.4. Cash Flow Forecast: Price Set to Meet Loan Repayments (10-year loan)

Financial Information	Real Escalation (1997-2005 and 2006-2021)																			
	1998	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Electricity Quantity Sold (GWh)	20.35	19.13	19.91	19.69	19.46	19.2	19.25	19.27	19.28	19.28	19.34	19.34	19.34	19.34	19.36	19.37	19.38	19.39	19.39	19.39
Electricity Price (\$/MWh)	1.309	1.472	1.561	1.654	1.754	1.859	1.970	2.089	2.214	2.347	2.487	2.637	2.795	2.963	3.140	3.329	3.529	3.740	3.965	4.205
Electricity Revenues (1,000 \$K)	28,266	29,636	31,069	32,567	34,133	35,770	37,508	40,338	43,277	45,264	48,008	50,918	54,004	57,276	60,750	64,433	68,339	72,482	76,875	81,526
Heat Demand below Efficiency (TJ)	518.8	519.3	519.8	520.2	520.7	521.2	521.7	522.2	522.7	523.2	523.7	524.2	524.7	525.2	525.7	526.2	526.7	527.2	527.7	528.2
Efficiency Potential (TJ)	518.8	509.2	499.7	490.1	480.6	471.0	461.5	452.0	442.5	433.0	423.5	414.0	404.5	395.0	385.5	376.0	366.5	357.0	347.5	338.0
Heat Quantity Sold (TJ)	548.7	537.6	526.5	515.3	504.2	493.0	481.8	470.6	459.4	448.2	437.0	425.8	414.6	403.4	392.2	381.0	369.8	358.6	347.4	336.2
Heat Quantity Generated (TJ)	302.87	214.68	272.89	241.72	258.49	241.15	332.36	335.95	340.27	345.44	350.61	355.78	360.95	366.12	371.29	376.46	381.63	386.80	391.97	397.14
Heat Price (\$/GJ)	105.303	109.326	113.873	118.473	123.260	128.179	133.204	138.343	143.587	148.936	154.390	159.948	165.611	171.379	177.252	183.231	189.314	195.501	201.792	208.188
Heat Sale Revenues (1,000 \$K)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Direct Subsidies (1,000 \$K)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenues (1,000 \$K)	133,558	138,962	144,941	151,040	157,393	164,048	171,007	178,271	185,844	193,726	201,917	210,416	219,224	228,341	237,766	247,499	257,541	267,892	278,551	289,518
Coal Consumption (tons/year)	68,509	67,831	67,152	66,474	65,796	65,118	64,440	63,762	63,084	62,406	61,728	61,050	60,372	59,694	59,016	58,338	57,660	56,982	56,304	55,626
Coal Price (\$/ton)	680	698	717	737	756	777	798	819	842	866	891	917	948	984	1026	1074	1128	1188	1254	1326
Coal Cost (1,000 \$K/year)	46,586	47,370	48,163	48,964	49,773	50,590	51,415	52,248	53,089	53,938	54,795	55,659	56,529	57,405	58,287	59,174	60,066	60,964	61,867	62,774
Gas Consumption (1,000 M3/year)	3,875	3,814	3,753	3,692	3,631	3,570	3,509	3,448	3,387	3,326	3,265	3,204	3,143	3,082	3,021	2,960	2,899	2,838	2,777	2,716
Gas Price (\$/M3,000M3)	3,350	3,445	3,544	3,645	3,749	3,855	3,965	4,078	4,194	4,314	4,436	4,561	4,689	4,821	4,957	5,097	5,241	5,389	5,541	5,697
Gas Cost (1,000 \$K/year)	12,962	13,142	13,300	13,457	13,612	13,765	13,917	14,068	14,218	14,366	14,513	14,659	14,804	14,948	15,091	15,233	15,374	15,514	15,653	15,791
Total Fuel Cost (1,000 \$K/year)	59,548	60,512	61,463	62,414	63,365	64,316	65,267	66,218	67,169	68,120	69,071	69,999	70,928	71,857	72,786	73,715	74,644	75,573	76,502	77,431
Efficiency Expenditures (1,000 \$K)	26,260	27,048	27,859	28,695	29,556	30,442	31,349	32,277	33,226	34,196	35,187	36,199	37,232	38,285	39,358	40,450	41,561	42,691	43,840	45,008
Overhead Labor (1,000 \$K)	8,750	9,109	9,482	9,871	10,276	10,697	11,136	11,592	12,067	12,562	13,076	13,609	14,161	14,732	15,322	15,931	16,559	17,206	17,872	18,557
Overhead (1,000 \$K)	3,000	3,112	3,228	3,349	3,474	3,604	3,739	3,878	4,023	4,174	4,331	4,494	4,663	4,838	5,019	5,205	5,396	5,591	5,791	5,995
Maintenance & Repairs (1,000 \$K)	5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,719	6,919	7,124	7,334	7,548	7,766	7,988	8,214	8,444	8,678
Depreciation (1,000 \$K)	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902
Environmental Fees (1,000 \$K)	2,359	2,362	2,341	2,319	2,297	2,273	2,249	2,224	2,200	2,176	2,152	2,128	2,104	2,080	2,056	2,032	2,008	1,984	1,960	1,936
Total Operating Costs (1,000 \$K)	119,839	122,195	124,581	126,997	129,443	131,919	134,426	136,963	139,531	142,130	144,761	147,424	150,119	152,846	155,605	158,396	161,219	164,074	166,960	169,877
Operating Profit - Before Tax (1,000 \$K)	13,729	16,767	20,361	24,685	28,742	32,559	36,131	39,474	42,600	45,516	48,221	50,726	53,031	55,136	57,041	58,746	60,251	61,556	62,661	63,566
Operating Margin, %	10.3%	12.1%	14.0%	16.5%	18.3%	20.5%	23.2%	26.1%	29.2%	32.5%	36.0%	39.6%	43.4%	47.3%	51.3%	55.4%	59.6%	63.9%	68.3%	72.8%
Operating Profit - After Tax (1,000 \$K)	13,729	16,767	20,361	24,685	28,742	32,559	36,131	39,474	42,600	45,516	48,221	50,726	53,031	55,136	57,041	58,746	60,251	61,556	62,661	63,566
Cash Flow from Operations, After Tax	28,831	31,669	35,263	38,921	42,778	46,822	51,055	55,478	60,091	64,894	69,897	75,100	80,603	86,306	92,209	98,312	104,615	111,118	117,821	124,724
Working Capital (1,000 \$K)	5,400	5,991	6,134	6,280	6,396	6,540	6,700	6,875	7,064	7,267	7,484	7,714	7,957	8,214	8,484	8,767	9,063	9,371	9,691	10,024
Change in Working Capital (1,000 \$K)	591	143	148	106	154	132	137	137	140	145	151	157	164	171	178	185	192	199	206	213
Net Fixed Assets, Start of Year (1,000 \$K)	0	333,653	318,751	303,849	288,946	274,910	260,874	246,838	232,802	218,766	204,730	190,694	176,658	162,622	148,585	134,549	120,513	106,477	92,441	78,405
Capital Expenditures (1,000 \$K)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation (1,000 \$K)	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902
Net Fixed Assets, End of Year (1,000 \$K)	333,653	318,751	303,849	288,946	274,910	260,874	246,838	232,802	218,766	204,730	190,694	176,658	162,622	148,585	134,549	120,513	106,477	92,441	78,405	64,369
Net Operating Assets (1,000 \$K)	324,742	309,983	295,226	281,296	267,414	252,014	238,110	224,211	210,315	196,424	182,532	168,640	154,748	140,856	126,964	113,072	99,180	85,288	71,396	57,504
Increase in Net Operating Assets (1,000 \$K)	324,742	-14,759	14,756	-13,930	-13,882	-15,400	-13,899	-13,899	-13,899	-13,915	-13,912	-13,909	-13,906	-13,902	-13,899	-13,896	-13,893	-13,890	-13,887	-13,884
Net Cash Flow from Operations After Tax	28,840	31,528	35,117	38,815	42,624	46,612	50,781	55,120	59,629	64,308	69,157	74,176	79,365	84,734	90,283	96,012	101,921	108,010	114,279	120,728
Interest Rate on Supply Loans: 10%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Rate on Efficiency Loans: 10%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loan Term (years): 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loan Amount: 333,653	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Funds Borrowed (1,000 \$K)	333,653	26,260	27,048	27,859	28,695	29,556	30,442	31,349	32,277	33,226	34,196	35,187	36,199	37,232	38,285	39,358	40,450	41,561	42,691	43,840
Loan Balance @ Beginning of Year (1,000 \$K)	0	333,653	338,978	341,349	343,697	346,022	348,334	350,633	352,919	355,192	357,453	359,702	361,939	364,164	366,377	368,578	370,767	372,944	375,109	377,262
Principle Repaid	0	20,935	24,676	28,841	33,473	38,621	44,338	50,664	57,640	65,296	73,662	82,768	92,644	103,320	114,836	127,222	140,508	154,724	169,894	186,048
Loan Balance @ End of Year (1,000 \$K)	0	312,718	314,301	312,508	306,894	296,968	282,186	263,415	240,766	215,270	188,008	159,040	128,276	95,706	62,334	29,162	2,190	-28,982	-69,183	-128,386
Total Interest Payments (1,000 \$K)	0	33,365	33,898	34,135	34,037	33,559	32,652	31,319	29,564	27,397	24,821	21,837	18,453	14,669	10,496	5,934	1,000	-4,206	-11,251	-20,000
Total After Tax Loan Repayments (1,000 \$K)	0	54,300	58,574	62,976	67,510	72,180	77,000	82,072	87,396	92,974	98,806	104,892	111,232	117,821	124,664	131,766	139,126	146,749	154,635	162,785
Total Loan Repayments (1,000 \$K)	0	54,300	58,574	62,976	67,510	72,180	77,000	82,072	87,396	92,974	98,806	104,892	111,232	117,821	124,664	131,766	139,126	146,749	154,635	162,785
Return to Equity Holders (1,000 \$K)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cumulative Retained Earnings (1,000 \$K)	0	62.6	60.1	57.6	55.1	52.6	50.1	47.6	45.1	42.6	40.1	37.6	35.1	32.6	30.1	27.6	25.1	22.6	20.1	17.6
Post-Efficiency Flat Consumption (GJ/year)	12,710	12,905	13,128	13,320	13,491	13,649	13,797	13,936	14,066	14,187	14,300	14,405	14,511	14,618	14,726	14,834	14,942	15,051	15,160	15,270
Cost per Typical Flat (1 \$K/year)	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16	235.16

Table 7.5. Cash Flow Forecast: Price Set to Meet Loan Repayments (20-year loan)

Financial Information	Real Escalation (1997-2005 and 2006-2021)																			
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Electricity Quantity Sold (GWh)	20.35	20.13	19.91	19.69	19.46	19.2	19.25	19.27	19.28	19.29	19.30	19.31	19.32	19.33	19.34	19.35	19.37	19.38	19.38	19.39
Electricity Price (\$/kWh)	1.389	1.472	1.561	1.654	1.754	1.859	1.970	2.089	2.214	2.347	2.487	2.637	2.795	2.963	3.140	3.329	3.529	3.740	3.965	4.205
Electricity Revenues (1,000 \$K)	28,266	29,636	31,069	32,567	34,133	35,770	37,398	40,238	42,677	45,264	48,008	50,918	54,004	57,278	60,750	64,433	68,339	72,482	76,875	81,517
Heat Demand before Efficiency (TJ)	518.8	519.3	519.8	520.2	520.7	521.2	521.7	522.2	522.7	523.2	523.7	524.2	524.7	525.2	525.7	526.2	526.7	527.2	527.7	528.2
Heat Quantity Sold (TJ)	518.8	509.2	499.7	490.1	480.6	471.1	472.0	472.5	473.0	473.4	473.9	474.4	474.9	475.4	475.9	476.4	476.9	477.4	477.9	478.4
Heat Quantity Generated (TJ)	548.7	537.6	526.5	515.3	504.2	493.0	483.6	484.2	484.7	485.3	485.8	486.4	486.9	487.4	487.9	488.4	488.9	489.4	489.9	490.4
Heat Price (\$/GJ)	173.85	185.01	197.63	210.69	225.05	237.43	252.46	263.34	269.22	274.55	278.21	281.40	284.37	287.25	290.05	292.79	295.49	298.15	300.77	303.35
Heat Sale Revenues (1,000 \$K)	90,193	94,217	98,763	103,363	108,150	113,146	118,349	123,769	129,414	135,294	141,428	147,816	154,459	161,358	168,514	175,928	183,602	191,536	199,741	208,287
Direct Subsidies (1,000 \$K)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenues (1,000 \$K)	118,459	123,852	129,832	135,930	142,283	148,916	155,767	162,847	169,778	176,442	182,821	188,935	194,774	200,339	205,624	210,633	215,368	220,000	224,529	228,962
Coal Consumption (ton/year)	68,509	67,831	67,152	66,474	65,796	65,118	65,440	65,762	66,084	66,406	66,728	67,050	67,372	67,694	68,016	68,338	68,660	68,982	69,304	69,626
Coal Price (\$/ton)	680	688	696	704	712	720	728	736	744	752	760	768	776	784	792	800	808	816	824	832
Coal Cost (1,000 \$K/year)	46,596	47,370	48,144	48,918	49,692	50,466	51,240	52,014	52,788	53,562	54,336	55,110	55,884	56,658	57,432	58,206	58,980	59,754	60,528	61,302
Gas Consumption (1000m <sup>3</sup> /year)	3,875	3,814	3,753	3,692	3,631	3,570	3,509	3,448	3,387	3,326	3,265	3,204	3,143	3,082	3,021	2,960	2,899	2,838	2,777	2,716
Gas Price (\$/1,000m <sup>3</sup> )	3,350	3,445	3,540	3,635	3,730	3,825	3,920	4,015	4,110	4,205	4,300	4,395	4,490	4,585	4,680	4,775	4,870	4,965	5,060	5,155
Gas Cost (1,000 \$K/year)	12,982	13,142	13,302	13,462	13,622	13,782	13,942	14,102	14,262	14,422	14,582	14,742	14,902	15,062	15,222	15,382	15,542	15,702	15,862	16,022
Total Fuel Cost (1,000 \$K/year)	59,578	60,512	61,446	62,380	63,314	64,248	65,182	66,116	67,050	67,984	68,918	69,852	70,786	71,720	72,654	73,588	74,522	75,456	76,390	77,324
Efficiency Expenditures (1,000 \$K)	26,260	27,048	27,836	28,624	29,412	30,200	31,000	31,800	32,600	33,400	34,200	35,000	35,800	36,600	37,400	38,200	39,000	39,800	40,600	41,400
Direct Labor (1,000 \$K)	8,750	9,109	9,468	9,827	10,186	10,545	10,904	11,263	11,622	11,981	12,340	12,700	13,059	13,418	13,777	14,136	14,495	14,854	15,213	15,572
Overhead (1,000 \$K)	3,000	3,112	3,224	3,336	3,448	3,560	3,672	3,784	3,896	4,008	4,120	4,232	4,344	4,456	4,568	4,680	4,792	4,904	5,016	5,128
Maintenance & Repairs (1,000 \$K)	5,000	5,150	5,300	5,450	5,600	5,750	5,900	6,050	6,200	6,350	6,500	6,650	6,800	6,950	7,100	7,250	7,400	7,550	7,700	7,850
Depreciation (1,000 \$K)	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902
Environmental Fees (1,000 \$K)	2,359	2,362	2,365	2,368	2,371	2,374	2,377	2,380	2,383	2,386	2,389	2,392	2,395	2,398	2,401	2,404	2,407	2,410	2,413	2,416
Total Operating Costs (1,000 \$K)	119,839	122,195	124,551	126,907	129,263	131,619	133,975	136,331	138,687	141,043	143,399	145,755	148,111	150,467	152,823	155,179	157,535	159,891	162,247	164,603
Operating Profit - Before Tax (1,000 \$K)	-1,380	-1,657	-1,934	-2,211	-2,488	-2,765	-3,042	-3,319	-3,596	-3,873	-4,150	-4,427	-4,704	-4,981	-5,258	-5,535	-5,812	-6,089	-6,366	-6,643
Operating Margin, %	-1.2%	-1.3%	-1.4%	-1.5%	-1.6%	-1.7%	-1.8%	-1.9%	-2.0%	-2.1%	-2.2%	-2.3%	-2.4%	-2.5%	-2.6%	-2.7%	-2.8%	-2.9%	-3.0%	-3.1%
Operating Profit - After Tax (1,000 \$K)	-1,300	-1,657	-1,934	-2,211	-2,488	-2,765	-3,042	-3,319	-3,596	-3,873	-4,150	-4,427	-4,704	-4,981	-5,258	-5,535	-5,812	-6,089	-6,366	-6,643
Cash Flow from Operations, After Tax	13,522	16,560	20,153	23,811	27,668	31,625	35,682	39,839	44,096	48,453	52,910	57,467	62,124	66,881	71,738	76,695	81,752	86,909	92,166	97,523
Working Capital (1,000 \$K)	5,400	5,991	6,134	6,280	6,386	6,445	6,465	6,445	6,386	6,280	6,134	5,991	5,848	5,705	5,562	5,419	5,276	5,133	4,990	4,847
Change in Working Capital (1,000 \$K)	0	333,653	318,751	303,849	288,946	274,910	260,874	246,838	232,802	218,766	204,730	190,694	176,658	162,622	148,586	134,549	120,513	106,477	92,441	78,405
Net Fixed Assets, Start of Year (1,000 \$K)	333,653	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capital Expenditures (1,000 \$K)	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902	14,902
Depreciation (1,000 \$K)	333,653	318,751	303,849	288,946	274,910	260,874	246,838	232,802	218,766	204,730	190,694	176,658	162,622	148,586	134,549	120,513	106,477	92,441	78,405	64,369
Net Fixed Assets, End of Year (1,000 \$K)	324,742	309,843	295,276	281,296	267,414	252,014	238,110	224,211	210,315	196,424	182,530	168,636	154,742	140,848	126,954	113,060	99,166	85,272	71,378	57,484
Net Operating Assets (1,000 \$K)	324,742	-14,759	-14,759	-13,900	-13,882	-15,400	-13,904	-13,899	-13,896	-13,891	-13,886	-13,881	-13,876	-13,871	-13,866	-13,861	-13,856	-13,851	-13,846	-13,841
Increase in Net Operating Assets (1,000 \$K)	12,931	-14,417	-20,007	-23,705	-27,514	-31,422	-35,430	-39,538	-43,746	-48,054	-52,462	-56,970	-61,578	-66,286	-71,094	-75,902	-80,710	-85,518	-90,326	-95,134
Net Cash Flow from Operations After Tax	12,931	-14,417	-20,007	-23,705	-27,514	-31,422	-35,430	-39,538	-43,746	-48,054	-52,462	-56,970	-61,578	-66,286	-71,094	-75,902	-80,710	-85,518	-90,326	-95,134
Debt Source Information																				
Debt Source Information																				
New Funds Borrowed (1,000 \$K)	333,653	26,260	27,048	27,836	28,624	29,412	30,200	31,000	31,800	32,600	33,400	34,200	35,000	35,800	36,600	37,400	38,200	39,000	39,800	40,600
Loan Balance @ Beginning of Year (1,000 \$K)	0	333,653	354,087	373,080	390,381	405,713	418,777	430,264	440,882	450,531	459,214	466,932	473,685	479,474	484,299	488,161	491,061	492,998	494,972	496,985
Principle Repaid	0	5,825	8,056	10,558	13,362	16,499	20,003	22,004	24,200	27,873	32,027	36,763	42,189	48,316	55,145	62,676	70,909	79,844	89,480	99,916
Loan Balance @ End of Year (1,000 \$K)	0	327,828	346,032	362,522	377,018	390,214	401,777	412,277	421,682	430,011	437,247	443,474	448,693	452,906	456,111	458,316	459,521	459,726	458,931	457,136
Total Interest Payments (1,000 \$K)	0	33,365	35,409	37,508	39,658	41,857	44,106	46,405	48,754	51,153	53,602	56,101	58,650	61,249	63,898	66,597	69,346	72,145	75,000	77,909
Total After Tax Loan Repayments (1,000 \$K)	0	39,191	43,464	47,866	52,400	57,070	61,884	66,842	71,945	77,194	82,589	88,130	93,817	99,650	105,629	111,754	118,025	124,442	131,005	137,716
Total Loan Repayments (1,000 \$K)	0	39,191	43,464	47,866	52,400	57,070	61,884	66,842	71,945	77,194	82,589	88,130	93,817	99,650	105,629	111,754	118,025	124,442	131,005	137,716
Return to Equity Holders (1,000 \$K)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cumulative Retained Earnings (1,000 \$K)	0	62.6	60.1	57.6	55.1	52.6	50.1	50.1	50.1	50.1	50.1	50.1	50.1	50.1	50.1	50.1	50.1	50.1	50.1	50.1
Post-Efficiency Flat Consumption (GJ/year)	10,886	11,122	11,386	11,621	11,837	12,096	13,148	13,142	13,154	13,188	13,246	13,336	13,464	13,628	13,828	14,064	14,336	14,644	15,000	15,404
Cost per Typical Flat (\$/kYear)	232.87	242.87	252.87	262.87	272.87	282.87	292.87	302.87	312.87	322.87	332.87	342.87	352.87	362.87	372.87	382.87	392.87	402.87	412.87	422.87

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Handlova District Heating System  
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- growth rates as follows:

electricity sales—the assumption is that all electricity generated can be sold. The rate of generation is a function of heat generated by the central system.

heat sales—the population of Handlova is expected to increase by 5.22% (total) through 2022. It is assumed that this total increase would be covered by the heating plant. Further, it is assumed that 15% of the total energy consumption can be eliminated through strategic development of efficiency resources from 1997 through 2001.

Also calculated in the cash flow forecasts is the cost per typical flat (SK/year). This is calculated by taking the current annual energy consumption per Handlova apartment (~62.6 GJ/year in 1997 and reduced for the next 5 years through efficiency investments) and multiplying by the price of energy. The result is 12,710 SK/year in 1997 (10,886 SK/year for the 20-year loan scenario), which compares favorably with the 10,000-12,000 SK/year expended today by Handlova residents.

A 25-year levelized energy cost was also calculated for the two financing scenarios. For the 10-year supply loan, the levelized cost is estimated to be 235.15 SK/GJ; for the 20-year supply loan, the levelized cost is estimated at 232.87 SK/GJ. Both life-cycle costs are expressed in real terms (without inflation).

### 7.3 Correlation of Historical and Projected Cost Streams

The projected cost streams were developed before actual cost data could be obtained and are based upon best engineering estimates. These estimates were reviewed with management of the existing heating plant and were determined to be feasible. A comparison of projected and historical costs provides the following findings:

- Fuel costs—Engineering estimates of fuel consumption were used as the basis for cost projections. Coal consumption and the overall cost of coal seems reasonable when compared with historical estimates.
- Labor costs—Historical labor costs are approximately 13.0 million SK/year (including social insurance and retirement costs), whereas projected labor costs are about 8.7 million SK for 1997. The assumption is that with a new plant and profit-oriented management, current labor costs can be substantially reduced. Approximately 120 staff are now employed to run the plant, reflecting the inefficient staffing of former state-run operations and the outdated and unreliable nature of the physical plant. Discussions with heating plant staff indicate that this number can and will be reduced to 55 staff.
- Maintenance and repairs—Historical maintenance costs are about 21.4 million SK/year (including labor and materials purchases), compared with 5 million SK/year for the cost projections. This very substantial reduction in costs reflects the change from a physical plant that has reached the end of its life to a new, more efficient system that will be substantially more reliable.

- Environmental fees—The current environmental fees are about 108,000 SK/year, whereas the projection calls for approximately 2.4 million SK/year to be paid. This is one area where the projections are significantly above current payments.
- General overhead—If all of the remaining costs are considered as "general overhead," the historical costs are about 11.4 million SK/year versus the projected assumption of 3 million SK/year. Discussions with plant management indicate that a streamlined, efficiently run company can manage with this lower level of overhead costs.

## 7.4 Heating Plant Fixed Assets

A thorough investigation has been made to determine the value of existing fixed assets now owned by the City which will be signed over to the heating plant in return for company stock. The analysis evaluates six main categories of assets

- Buildings
- Land and rights-of-way
- Power-related machinery
- Machine shop equipment and tools
- Special devices and engineering equipment (kilns, lab instruments, etc.)
- Transport means (cranes, conveyors, etc.).

The assessment was done in accordance with the directives provided by the Slovak Ministry of Finance through Edict #465 (25 October 1991), Edict #608 (7 December 1992), Ruling #6/55/1992, and the 10 August 1993 expert standard guideline from the Ministry of Justice. The approach comprehensively identifies all assets and individually values them by two methods, book value and replacement cost (taking into account new cost, age, and current condition). The report is available for inspection. The total market value of these assets is 342,913,000 SK, as summarized below.

### 7.4.1 Buildings and Land

The value of heating system buildings and land, according to replacement value, totals 94,498,000 SK, as detailed below in Table 7.6.

**Table 7.6.** Value of Heating System Buildings and Land

Central Plant Facilities	Production Building	Administrative Building	Cableway	Miscellaneous Facilities			
Year Built	1,953	1,940	1,958	1959-68			
Covered Area (m <sup>2</sup> )	19,222	4,939	5,700	6,369			
Building Value (1,000 SK)	32,417	8,792	12,817	14,911			
Total Value of Lands:		1,729,000 SK					
Total Value of Buildings:		68,939,000 SK					
Total Value of Central Plant:		70,688,000 SK					
Heat Exchanger Stations	ES1	ES2	ES3	ES4	ES5	ES7	ES8
Year Built	1957	1958	1965	1961	1975	1984	1989
Covered Area (m <sup>2</sup> )	207	157	168	436	396	145	183
Land Area (m <sup>2</sup> )	214	707	619	592	432	864	xxx
Land Value (1,000 SK)	449	1,484	1,623	404	295	888	xxx
Building Value (1,000 SK)	1,467	1,494	1,762	246	6,702	2,900	4,115
Total Value of Lands:		5,143,000 SK					
Total Value of Buildings:		18,167,000 SK					
Total Value of HX Stations:		23,830,000 SK					

#### 7.4.2 Other Non-Cash Assets

The total market value of equipment and machinery has been estimated as follows. The value of rights-of-way is now being determined. No value has been estimated for access to existing markets.

SK	Equipment Category
136,650,000	Power-related machinery
1,651,000	Machine shop equipment and tools
641,000	Special devices and engineering equipment (kilns, lab instruments, etc.)
15,475,000	Transport means (cranes, conveyors, etc.)
154,417,000	Total Value

## 8.0 Related Publications

This report is one of four reports containing an energy assessment of options for upgrading the district heating system of the City of Handlova in the Republic of Slovakia:

*Assessment of Supply-Side Alternatives for the Handlova Heating System.*

*An Assessment of the Building Sector Efficiency Resource for the Town of Handlova*

*Integrated Assessment of Supply and Efficiency Resources for the District Heating System, City of Handlova, Republic of Slovakia.*

*Preliminary Business Plan - District Heating Company for the City of Handlova, Slovakia*

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