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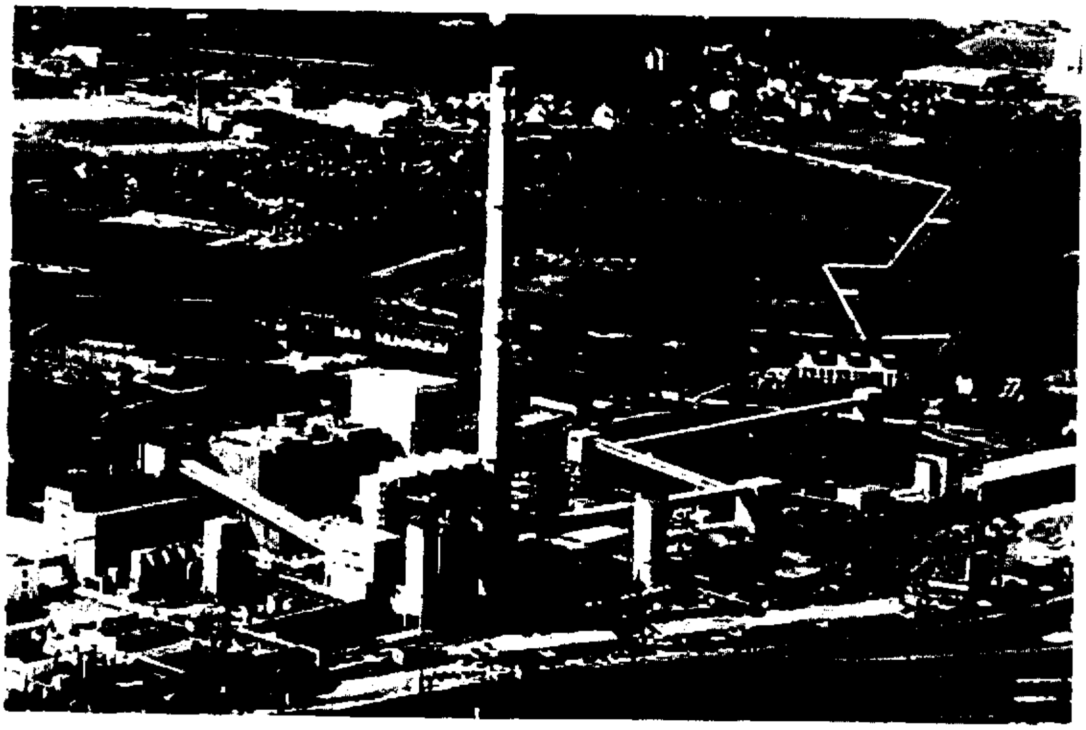
CZE

Plzenska Teplarenska



Waste-to-Energy

Final-Feasibility Study Report

HDR FVB ENERGY INC

June, 2003

This report was funded by the U.S. Trade and Development Agency (TDA), an export promotion agency of the United States Government. The opinions, findings, conclusions, or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position or policies of TDA.

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WASTE-TO-ENERGY PROJECT FEASIBILITY STUDY

FOR

PLZEŇSKÁ TEPLÁRENSKÁ, a. s.

PLZEN, CZECH REPUBLIC

June, 2003

Presented by:

HDR Engineering, Inc.
6190 Golden Hills Drive
Minneapolis, Minnesota 55416

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I. EXECUTIVE SUMMARY

Introduction

HDR Engineering and sub-consultant FVB Energy along with local assistance from ORTEP s.r.o. prepared this waste-to-energy feasibility study for Plzenská teplárenská with funding provided by the US Trade and Development Agency. The study focus is on the feasibility of using incineration as one element of satisfying the European Union requirements and certain Czech Republic decrees for the reduction of bio-wastes in landfills and possible energy recovery for the Plzen, Czech Republic region.

The study considers material resource recovery as well as heat and electric energy recovery from incineration of municipal solid wastes, and discusses the technical issues of the combustion process, the constituents of the waste, and the probable use of recovered energy. Possible environmental impacts and regulatory requirements are analyzed and site requirements that will maximize potential energy recovery while minimizing traffic, capital costs, noise, and public concerns are discussed for four potential sites.

Waste Considerations

The West Bohemia region of the Czech Republic is dominated by the City of Plzen, and comprises a territorial area of approximately 7,560 square kilometers (2,920 square miles), and a population of about 554,000 people. Mixed communal wastes, referred to in this study as Municipal Solid Waste (MSW), are made up primarily of household and residential wastes and are the wastes specifically put into the regional landfills. These wastes are typically collected curbside by private haulers who are licensed by the municipalities. Total annual waste generation in West Bohemia is about 227,000 tonnes with MSW making up about 151,000 tonnes.

Waste-to-Energy Technology Assessment

After a preliminary review of available technologies the technology assessment focused on two region incineration and resource recovery systems that could meet the following broad general criteria:

- Waste diversion from landfills
- Energy recovery (heat and/or electric by product generation)
- Capable of meeting stringent environmental requirements.
- Long term operating experience

- Predictable operating costs
- Potential to provide an economic return to the operator

Mass burn and prepared fuel systems (also known as refuse derived fuel RDF) were selected for study development.

Environmental Considerations

The Czech Republic and the European Union have promulgated decrees and directives related to the construction and operation of waste landills and waste to energy facilities. Emissions of dust, noise, odors and gaseous combustion products must be limited. The control technologies and construction methods were examined and selected in consideration of meeting or exceeding these stringent requirements. The estimated annual emissions for the selected systems are well within the requirements.

Site Comparisons

HDR evaluated the following four sites all located within the City of Plzen.

Central Plant	The Central Plant location is the Central heating plant of Plzenská teplárenská in Doubravka.
Roudna	The Roudna site is located on undeveloped flood-prone property approximately 1.2 km northeast of the Central Plant.
Bory	The Bory site is located at the Plzenská teplárenská's satellite heating plant. The property is developed and space is severely limited. The property is approximately 3.5 km to the southeast of the Central Plant in the Plzen district of Doudevce.
Plzenská energetiká	The Plzenská energetiká site is located on apparently undeveloped property in the Karlov district of Bory. This property is approximately 3.2 km east, southeast of the Central Plant.

To assist the site evaluation process HDR prepared model layouts of both the Mass Burn and RDF technologies using the 100,000 tonne per year size as the template. The model layouts were then laid over the subject site to determine if the site was sufficiently large. Construction and operating costs were estimated and the site evaluated in broad terms. From these costs and evaluations, HDR and FVB determined that the Central Plant site was the more cost effective site to build on.

Economic Assessment

The goal of the economic assessment was to estimate the cost per tonne (tipping fee) of waste processed considering the fixed and operating costs of a waste-to-energy facility and to provide a return on Plzenská teplárenská's investment. The costs associated with a waste-to-energy facility will be more than the current cost of landfilling and it is important for civil authorities to understand these cost differences. Plzenská teplárenská will require support from the community as represented by the local government.

Put into perspective, a self-sufficient operation without outside financial support and with a respectable rate of return, the tipping fees of a waste-to-energy facility could range from 2,670 to 3,170 Kč/tonne ($88.9 to $105 per tonne), and up to 3,700 Kč/tonne ($123 per tonne) if for whatever reason, an operator cannot take advantage of the economies of scale of a larger facility. When compared to the current cost of landfilling, which is about 830 Kč/tonne ($28/tonne), one can see that a waste-to-energy facility will be expensive. In one sense, if landfilling is not an option it is inappropriate, to compare waste-to-energy with landfilling; however, there is a practical benefit to alert the community about what the cost impacts might be.

The initial screening examined two potentially attractive technologies; Mass Burn and refuse derived fuel (RDF). To show the economies of scale, two sizes of plants were evaluated; 100,000 and 50,000 tonnes per year. Additionally, the economics associated with constructing a waste-to-energy facility at the various sites under investigation were assessed. From the screening analysis the one most attractive alternative, a Mass Burn Facility located at the Central Plant site (Base Case), was examined further, and sensitivity analyses were made to examine how key variables might affect the tipping fee, that is, the cost that must be born by the community.

One sensitivity that was actually built in to the Base Case was to reduce the rate of return from near 13% to 5%. With this built-in assumption, the revenue requirement of the Base Case project—100,000 tonne/year, mass burn at the Central Plant site—was estimated be 2,119 Kč /tonne ($70.6/tonne) tipping fee. (For reference the revenue requirement of the 50,000 tonne/year project was estimated to be 3,011 Kč /tonne ($100/tonne) tipping fee).

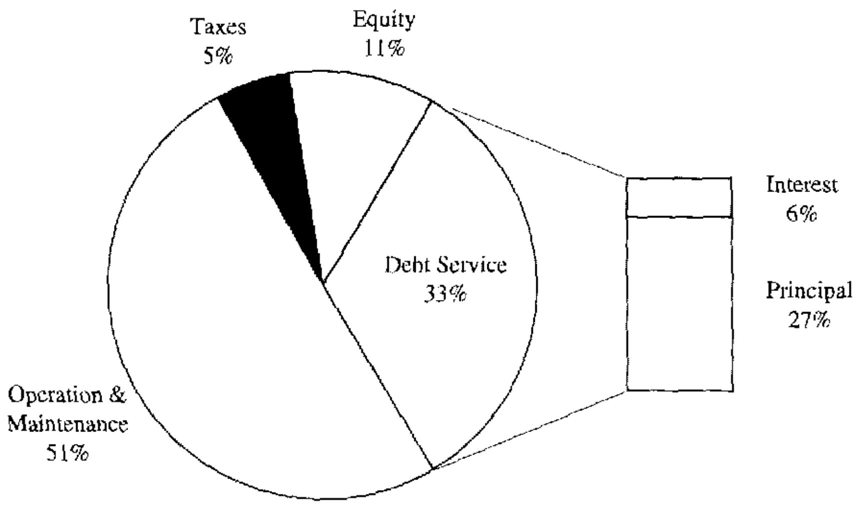
Other sensitivities were performed to examine how key variables might affect the financial performance. Since the heating value we deduced from the waste information provided to us seemed rather low, the first sensitivity was to increase the thermal production by 10%. The analysis demonstrated the financial performance was rather insensitive to thermal production. The 10% increase in thermal output reduced the tipping fee by only 1.2%. A second sensitivity was to increase the district heat sale price. Plzenská teplárenská noted during discussions that since the project might not be completed until 2010, it might be reasonable to place a higher value on the project's heat output. By 2010, it was reasoned, additional boiler capacity might be needed, and thus the waste-to-energy project could receive capacity value in addition to avoided variable costs (coal primarily). It was Plzenská teplárenská's opinion that heat could be valued at 110 Kč /GJ ($3.87 /MMBtu). The assumption of a near 90% increase in heat revenue had the expected outcome of significantly reducing the tipping fee.

Plzenská teplárenská also noted that the unsubsidized project tipping fee might be too high to be accepted in the community, and wanted to know what impact grants might have on the project. Naturally, if the project does not have to support a large capital expense burden, the tipping fee can be reduced.

Summarizing the findings of the various sensitivities we find the following.

1. The technology comparison showed that Mass Burn was less expensive than RDF—about 14%.
2. The capacity comparison showed that although the smaller facility required less capital to build, the unit revenue requirement (Kč/tonne, $/tonne) was higher; in fact much higher—almost 40%. Clearly the larger more cost effective project should be pursued if at all possible.
3. The site comparison showed the Central plant site was more economical than either of the other two, Roudna and Plzenská energetiká. The Bory site is space-constrained and is not suitable for WTE development.
4. Reducing the rate of return from near 13% to 5% reduced the tipping fee from 2,670 Kč /tonne ($88.9/tonne) to about 2,119 Kč /tonne ($70.6 /tonne), but the breakeven point increased from 12 years to about 16 years.
5. The project financial performance was rather insensitive to thermal production. A 10% increase in heat production only reduced the tipping fee by 1.2%
6. If the value of thermal energy were increased from 58 Kč /GJ (the avoided variable cost) to 110 Kč/GJ, the tipping fee decreased from 2,119 Kč /tonne ($70.6 /tonne) to 1,831 Kč /tonne ($61/tonne).
7. The tipping fee could be reduced if grants or other subsidies were available to reduce the debt burden.
8. Over the 20-year study period, the bulk of the tipping fees will go to pay for operating and maintenance expenses, debt retirement, equity, and taxes. Figure VII-7 below shows the distribution of how the revenues are used.

Figure VII-7
Uses of Revenue



Conclusions

Capital Cost

			Estimated Costs[1]
I.	SITE ACQUISITION		$0
II.	SITE DEVELOPMENT		$ 840,000
III.	SCALE HOUSE AND SCALES		$156,000
IV.	BUILDINGS		$6,455,700
V.	PROCESSING EQUIPMENT		$566,000
VI.	MOBILE EQUIPMENT		$420,000
VII.	POWER BLOCK EQUIPMENT		$35,523,000
	SUBTOTAL CONSTRUCT AND EQUIPMENT		**$43,960,700**
	CONTINGENCY	10%	$4,396,000
	DESIGN/ENGINEERING	5%	$2,418,000
	PERMITTING (ESTIMATED)	2.3%	$1,112,000
	CONSTRUCTION AND INSPECTION	5%	$2,418,000
	TOTAL CAPITAL COST (FACILITY IMPLEMENTATION)		**$54,304,700**

Operating Costs

			Estimated Costs[2]
I.	LABOR		$491,000
II.	FACILITY MAINTENANCE		$ 1,556,000
III.	UTILITIES		$162,000
IV.	PROCESS RESIDUE HAUL AND DISPOSAL		$894,000
V.	ROLLING STOCK O&M COSTS		$109,300
VI.	MISCELLANEOUS COSTS		$138,000
	SUBTOTAL OPERATIONS AND MAINTENANCE		**$3,350,300**
	CONTINGENCY	10%	$335,000
	ACCOUNTING, SUPPLIES, MISC.	5%	$184,000
	ADMINISTRATION	3%	$1,112,000
	TOTAL OPERATIONS AND MAINTENANCE		**$3,980,300**

Plzenská teplárenská is in a good position to venture into the waste incineration business. They have a reasonably sound financial position; they are experienced with operating complex combustion equipment; and they have a proven reliability track record. Waste incineration provides the Plzen area with an alternative to landfilling which will meet the objectives of the European Community at large using proven technologies. District heating is by its nature seasonal, and revenues from waste incineration would help even out the cash flow. Additionally, the factors that affect waste generating entities are different than the factors that affect district heating customers. Even if a commercial heating customer goes out of business, the flow of community waste will change little.

Adequate waste is available in the Plzen area to provide fuel to a waste-to-energy facility of up to 100,000 tonnes/year throughput, and there is adequate space at the Central Plant site to build and operate such a plant. A waste-to-energy facility can be built to meet or exceed Czech Republic and European Union environmental requirements.

The full capital and operating cost summaries and analysis may be found in the body of the report and the appendices. Summarized below are the estimated capital and operating costs of the defined "Base Case" facility.

2,670 Kč /tonne ($88.9/tonne)	Similar to Base Case but with near 13% rate of return
2,119 Kč /tonne ($70.6/tonne)	**Base Case** (includes 5% rate of return)
2,094 Kč /tonne ($69.8/tonne)	Base Case with 10% higher heat output
1,831 Kč /tonne ($61/tonne)	Base Case with higher heat sale price (value)

II. INTRODUCTION AND BACKGROUND

Project Origination

In 2001, the U.S. Trade and Development Agency (TDA) contracted a definitional mission (DM) for possible environmental projects in the Czech Republic. The contracted DM consultant visited the Czech Republic in October of 2001 to review with various potential sponsors of projects and based on preliminary assessments certain sponsors were asked to submit formal requests for TDA grants for technical assistance with their proposed projects. The TDA subsequently granted the Plzenská teplárenská a.s. funds for contracting a "Waste-to-Energy" study to determine the feasibility of incinerating municipal solid waste for the generation of thermal and electric energy. The facility would augment the thermal and electric production capabilities of the Plzenská Teplárenská.

Plzenská teplárenská a.s. (PT) is principally a thermal energy generator and distributor in the West Bohemian City of Plzen. PT was incorporated as a joint stock company in 1999. The majority of stock is held by the City of Plzen (82.80%) and E. ON Energi AG (15.68%). The remaining stock (1.52%) is either traded on the open market or reserved for the company staff.

Plzenská teplárenská has been authorized by the City of Plzen to develop a project to incinerate municipal solid waste (MSW) generated by the City of Plzen and its surrounding communities. The impetus for the project is twofold. One, the recent adoption of European Union (EU) regulations and new laws by the Czech Republic concerning waste reduction in landfills, and two, the incineration of waste to provide additional thermal and electric energy generation for use in the community or in the case of electricity for use on the electric grid.

Background

During and even before the implementation of Waste-to-Energy projects, developers and designers must address various technical, financial, environmental and social issues in an effort to determine the most appropriate systems for the treatment of wastes and the recovery of materials and energy.

Where land is available at low costs the predominate method of refuse disposal has been and continues to be placement in sanitary landfills. Significant increases in the generation of wastes as the populace has become more affluent and urbanized has created ever increasing mountains of solid waste relegated to landfills. Land suitable for landfilling purposes is becoming increasingly scarce. Many landfills are associated with nuisances associated with open dumping – odors, airborne litter, the presence of disease vectors such as rats and mice and ground water contamination. Sanitary landfills remain attractive, however, for their general economy associated with rather simple operation of the physical plant. Although large process scrap are recycled at their source, potentially reusable materials in the general waste stream end up in the landfill. Salvaging of these materials requires expenditure of labor and energy in subsequent sorting and separation operations. In some cases the mixing of recyclable materials with municipal refuse renders the potential recyclable unusable.

Energy recovery systems (incineration) are designed to retrieve the energy contained in the combustible fraction of the solid waste stream. Utilization of this energy source decreases the rate of depletion of non-renewable resources such as coal or oil. The concept of energy recovery from waste is not new. It has been practiced and improved over the last sixty plus years in Europe, the United States and Asia.

With the advent of the European Union and the promulgation of recent directives of the European Parliament which set requirements for waste processing, the energy recovery from refuse becomes an attractive and a regulatory acceptable method of refuse disposal.

Report Focus

This report is concerned with the feasibility of using incineration as a major method of satisfying the EU requirements for energy recovery and the reduction of bio-wastes in landfills in the Plzen region.

The report considers material resource recovery as well as heat and electric energy recovery from the process. Feasibility considers the technical issues of the combustion process, the constituents of the waste, and the use of the energy recovered. Costs for construction and operation are considered. Possible environmental impacts and regulatory requirements are analyzed. Revenues from by-product energy production, in the form of heat and electricity, are examined and probable financial requirements are reviewed.

The feasibility also considers siting requirements which will maximize potential energy recovery while minimizing traffic, noise and public concerns.

Staged Progress

The study progressed in three essential stages as follows:

Investigation:

Discussions and information requests were initiated by HDR for the purpose of securing sufficient background information for developing the technical design criteria, possible site locations and possible integration of a waste-to-energy (WTE) facility into the business operations of Plzenská teplarenska.

A list of areas investigated is as follows:

- Waste quantities available for incineration.
- Waste characterization of the available waste.
- Possible locations for the incineration facility within the study area.
- Waste handling and landfilling operations in the study area.
- Possible by-product generation of a WTE facility for use or sale by Plzenská teplarenska.
- Determination and review of EU Environmental requirements

Preliminary Study Preparation:

Using the information provided by Plzenská teplarenska and others, HDR prepared an initial evaluation of technologies. This allowed us to determine and focus on the technologies that would be most appropriate for the facility.

A preliminary technology evaluation identified several developed and emerging technologies, which provided thermal destruction and energy recovery.

Emerging technologies such as gasification and anaerobic digestion were eliminated from further study for lack of history for operational facilities. Significant facilities are Demonstration Units or are being proposed. However, reliable operating and cost data are not available for these facilities.

The study then focused on the primary incineration technologies that have long developmental histories with reliable cost and operating data available. The design basis for the various facility configurations was then developed to assist in the preparation of estimated costs for initial construction and operations. Two facility types are considered: Mass burn and Refuse Derived fuel (RDF) processing with incineration. Both facilities recover energy from the wastes in the form of heat and electricity. The study considers, but was not limited to:

- Waste quantities and quality
- Construction and Operating Costs
- Business Opportunity and Risks
- Sites and Site Access
- Environmental Issues

The study then further refines the design basis and costs to provide a recommended facility design for a preferred location within the City of Plzen.

Technology Integration with Regional Planning

The Czech Republic is in the process of preparing a Comprehensive Waste Management Plan for the entire country. As part of the process, each region will provide recommendations in the form of a regional plan. The regional plans will form the basis for the comprehensive state plan. The Plzen region is in the final stages of their regional plan. HDR has briefly discussed this plan with Mr. Zdenek Skorepa of Bohemiaplan Ltd., Plzen. Of interest in the regional planning are the variant schemes for waste handling. One of the suggested regional variants in the plan will incorporate a central incineration facility.

This report focuses on the development of the incineration facility that may fulfill the expectations of that plan variant.

III. WASTE CONSIDERATIONS

General

The West Bohemia region of the Czech Republic dominated by the City of Plzen comprises a territorial area of approximately 7561 square kilometers (2,920 square miles). Figure III-1 depicts the Plzen region in relation to the Czech Republic. Demographic information provided by PT indicates a regional population of 553,741 inhabitants.

The region has been further subdivided into seven (7) districts as follows: (Fig. III-2)

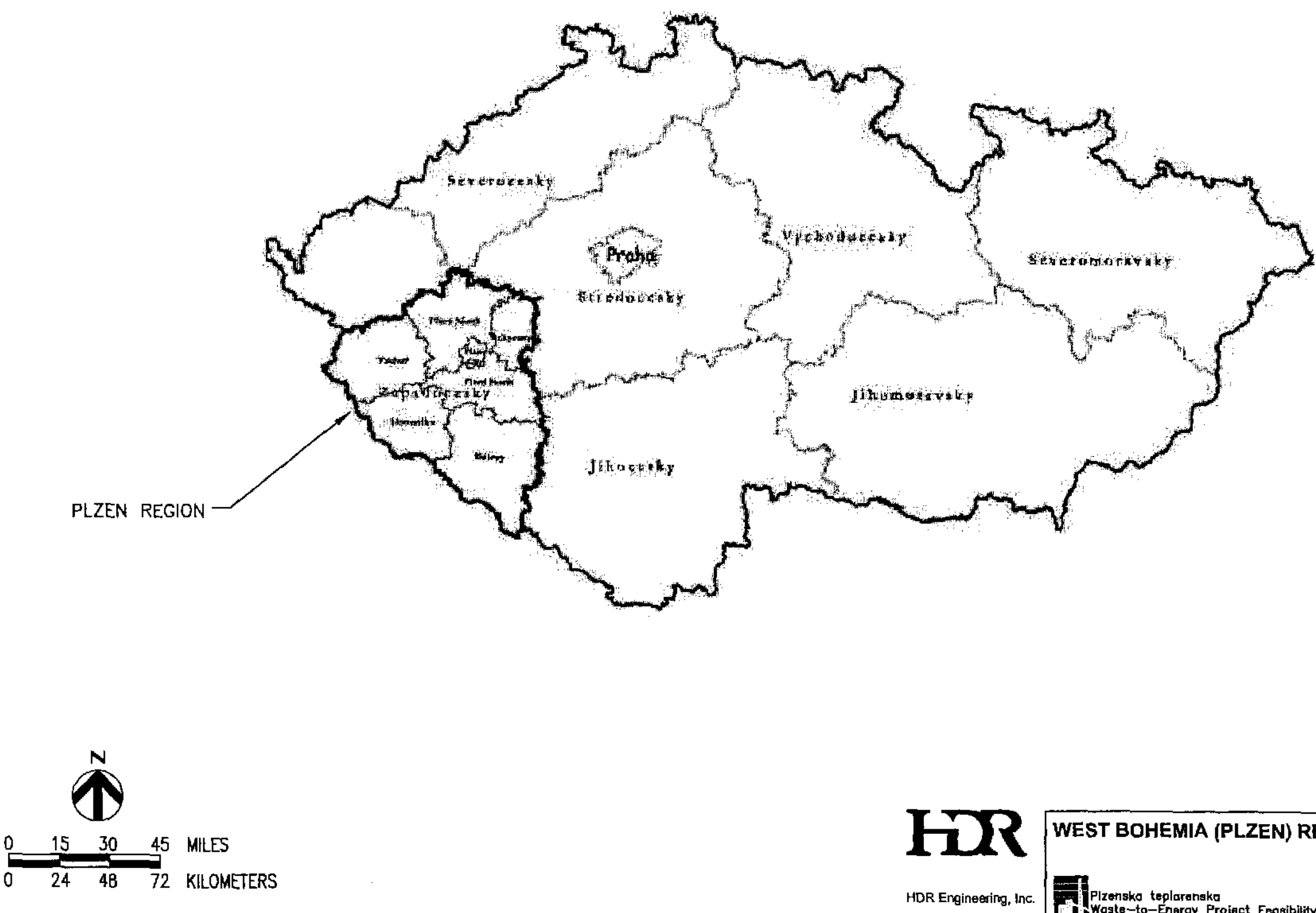
Districts	Population*	Percent (%) Population
Plzen – City (Mesto)	166,274	30.0
Plzen – North (Sever)	73,548	13.3
Plzen – South (Jih)	68,411	12.3
Rokycany	46,009	8.3
Domazlice	59,148	10.7
Klatovy	88,543	16.0
Tachov	51,808	9.4
	553,741	100%

*Note: Depiction of numbers follows the U.S. convention – thousand separators are shown as commas and a period is used as a decimal indicator.

Waste Collection and Disposal

Data regarding the waste collection and handling practices in each of the districts is limited. In the major population areas, however, wastes are generally collected by private haulers under license to the specific city or municipality.

The wastes generated by each of the districts is presented in Figure III-3. The wastes may be generally characterized as "source separated", "mixed communal", or "other wastes".



HDR

HDR Engineering, Inc.

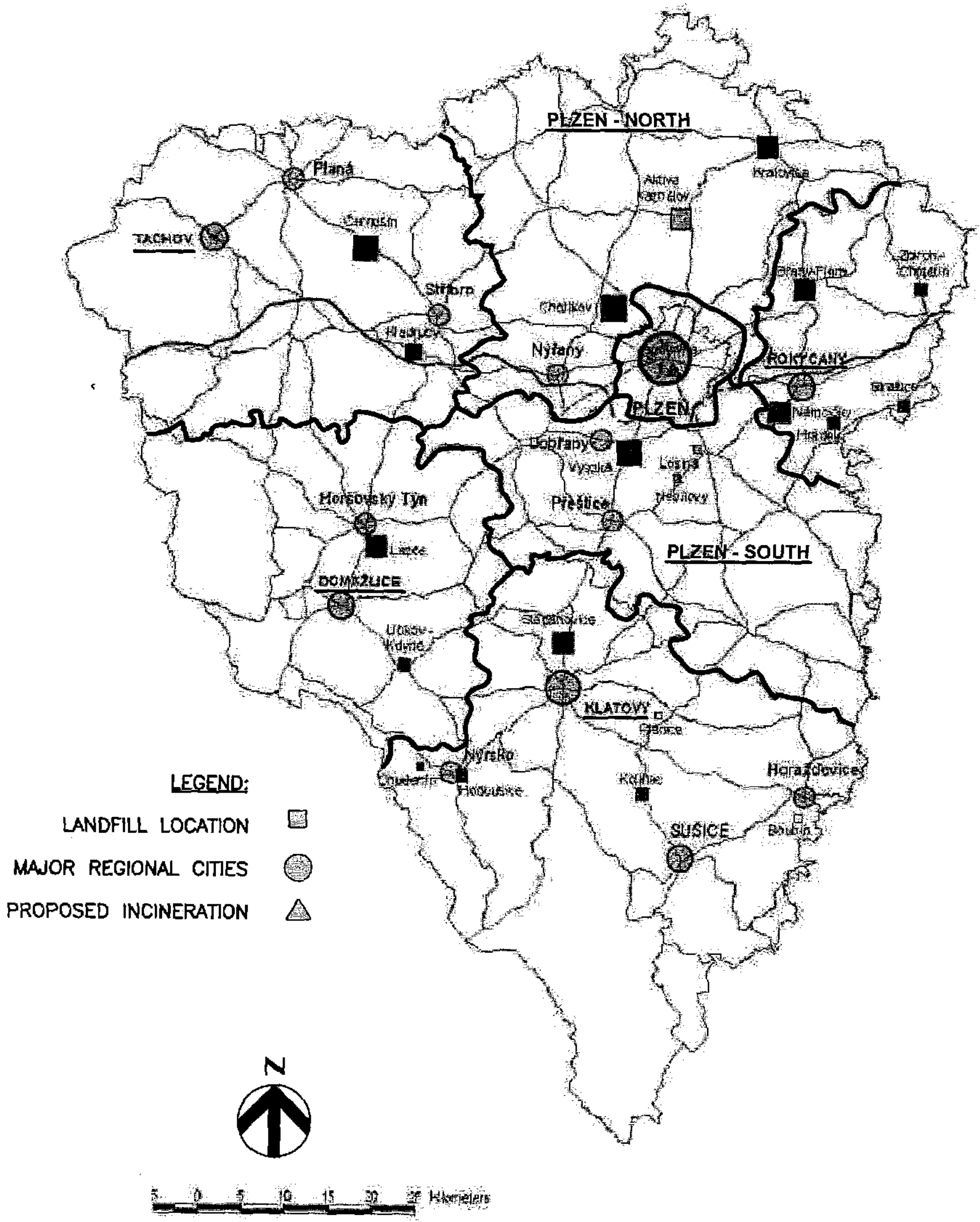
WEST BOHEMIA (PLZEN) REGION

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. III-1

01/27/03



HDR Engineering, Inc.

PLZEN REGION DISTRICTS

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date
6/2003

Figure
III-2

INCLUDES BOTH RESIDENTIAL AND COMMERCIAL WASTE

	Code	Material Description	Celkova (Annual Metric Ton)	A City (Plzen-mesto)	B North (plzen-sever)	C South (Plzen-jih)	D Rokycany	E Domazlice	F Klatovy	G Tachov
SOURCE SEPARATED WASTE	200101	Paper and/or Carton	8,055.34	3,723.10	930.80	354.78	1,259.60	456.87	587.79	742.40
	200102	Glass	5,380.08	2,639.53	215.60	581.43	172.08	830.62	624.31	316.51
	200103	Petty Plastic Article	1,478.22	538.60	128.69	229.13	87.67	167.37	250.54	76.22
	200104	Other Plastic	877.81	436.22	11.20	72.79	25.90	117.52	69.48	144.70
	200105	Petty Metalic Article	614.90	29.04	13.90	64.12	0.68	90.03	408.66	8.47
	200106	Other Metalic	2,844.31	210.10	326.44	884.52	42.21	815.11	261.63	504.30
	200107	Wood	657.21	302.36	73.00	3.50	0.00	252.60	21.45	4.30
	200108	Organic. Compost Kitchen Waste	482.26	147.50	3.90	65.71	34.60	41.11	55.44	134.00
	200109	Oil and/or Fat	9.64	1.71	0.00	0.45	0.95	0.60	4.47	1.46
	200110	Clothing	710.28	40.30	667.98	0.00	0.00	0.00	0.00	2.00
	200111	Textile Material	377.48	265.48	1.50	5.88	6.90	93.43	1.21	3.10
	200112	Color. Paste. Resin	48.68	15.34	2.07	3.08	6.40	11.50	5.77	4.52
	200113	Resolvent	2.17	1.14	0.24	0.04	0.04	0.05	0.14	0.52
	200114	Acid	0.53	0.17	0.00	0.16	0.18	0.00	0.01	0.01
	200115	Hydroxide	122.54	0.04	0.00	0.00	0.00	0.00	122.50	0.00
	200116	Detergenty. Degreasing Means	1.87	0.11	1.68	0.00	0.02	0.00	0.03	0.03
	200117	Fotochemicals	0.43	0.40	0.00	0.00	0.03	0.00	0.00	0.00
	200118	Farmacenticals	47.49	0.87	0.30	45.30	0.01	0.55	0.10	0.36
	200119	Biocide	0.28	0.20	0.00	0.08	0.00	0.00	0.00	0.00
	200120	Galvanic Cell Dry-Cell Battery	35.01	2.60	0.65	8.36	5.20	3.57	4.72	9.91
	200121	Fluorescent Lamp. Other Waste With Mercury	36.25	15.40	2.71	1.67	7.30	2.13	4.24	2.80
	200122	Pot of Spray	0.69	0.04	0.01	0.34	0.18	0.01	0.11	0.00
	200123	Fluorescent Lamp with Chlorine. fluorine. Hydrocarbon	244.09	89.21	18.27	7.67	2.62	34.61	33.67	48.04
	200124	Electronic Waste	673.94	207.09	137.10	53.82	25.78	107.80	96.84	45.51
	200199	Waste Specific More Closely Unresolved	180.52	97.06	2.36	0.74	18.30	0.57	61.44	0.05
	200201	Compost Waste	2,639.91	1,148.55	772.18	237.34	81.82	110.55	211.67	79.80
	200202	Mold and/or Stones	7,474.64	1,099.58	0.00	1,954.26	3.60	0.00	0.00	4,417.20
	200203	Other Uncomposted Waste	2,658.12	442.22	91.27	284.30	230.20	183.00	1,198.96	228.17
		Source Separated Sub Total	35,654.69	11,461.96	3,401.65	4,859.45	2,012.27	3,119.60	4,025.18	8,774.38
		% by District		32.15%	9.54%	13.63%	5.64%	8.75%	11.29%	19.00%
MSW		Mixed Communal Waste	150,774	49,680	19,411	14,821	12,561	14,761	23,979	15,558
		% by District		32.95%	12.87%	9.83%	8.33%	9.79%	15.90%	10.32%
OTHER WASTE	200302	Waste From Market Place	863.28	823.89	0.00	28.34	0.00	2.80	10.25	0.00
	200303	Rubbish From Street	3,628.83	936.69	978.92	235.74	625.42	38.57	518.12	295.37
	200304	Sediment From Septic. Cesspools	35,570.62	2,683.60	3,854.70	5,278.12	3,170.90	12,658.65	5,824.55	2,100.10
	200305	Auto Wreck (Car Wreck)	12.92	4.92	0.00	0.00	0.00	0.00	0.00	8.00
	200399	Waste Specific More Closely Unresolved	205.13	137.04	0.00	0.00	0.00	0.04	68.05	0.00
		Other Wastes Sub Total	40,280.78	4,586.14	4,833.62	5,540.20	3,796.32	12,700.06	6,420.97	2,403.47
		Total Wastes Generated	226,709.58	65,728.17	27,647.27	25,221.15	18,370.09	30,581.39	34,425.66	24,735.85
		% by District		28.99%	12.20%	11.12%	8.10%	13.49%	15.18%	10.91%

HDR

HDR Engineering, Inc.

WASTE GENERATION IN THE PLZEN REGION FOR THEYEAR 2000

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. III-3

SOURCE: BOHEMIA PLAN SRO

The source-separated wastes of 35,664 tonne, represent approximately sixteen percent (16%) of the annual regional waste stream. Most source-separated wastes are collected from community collection site containers. These collection containers are typically placed in high population density areas or centrally located in smaller communities. Typical collection sites will have containers designated specifically for paper, plastic and glass which appears to make up about forty-four percent (44%) of the source separated material. Paper, glass and plastics are reported to be recycled. Anecdotal evidence provided by P.T. and others, however, indicates that much of this source separated material is land filled due to lack of appropriate markets.

Other wastes, street rubbish, septic tank and cesspool sediment and auto wrecks are collected and treated separately. They are not considered in this study.

Mixed communal wastes are the wastes specifically land filled in the regional landfills. Mixed communal waste, referred to in this study as Municipal Solid Waste (MSW), is made up primarily of household and residential wastes. These wastes are typically collected curbside by private haulers who are licensed by the municipalities. Curbside collection is generally five days per week throughout the year.

Waste Quantities and Characterization

MSW represents approximately sixty-seven percent (67%) of the regional waste generated.

Table III-1 data, which has been extracted from Figure III-3, shows the per capita waste generation for each of the Plzen districts.

TABLE III-1
WASTE GENERATION

District	Population	Total Annual Waste (Tonne)	Annual MSW (Tonne)	Daily Waste Generation (g/Capita)	Daily MSW Generation (g/Capita)
Plzen – City (Mesto)	166,274	65,729	49,680	1,083	819
0Plzen – North (Sever)	73,548	27,647	19,411	1,030	723
Plzen – South (Jih)	68,411	25,221	14,821	1,010	594
Rokycany	46,009	18,370	12,561	1,094	748
Domazlice	59,148	30,581	14,761	1,417	684
Klatovy	88,543	34,426	23,979	1,065	742
Tachov	51,808	24,736	15,558	1,308	823
	553,741	226,710	150,774	1,144	733

In estimating projected solid waste quantities the most accepted prediction method is to establish unit waste generation factors based upon the contributing population. The unit factors presented in Table III-1 provide an average daily generation rate for MSW and total wastes for the region. Additional statistical data has not been made available. Published information, however, has indicated a Czech Republic national daily average of approximately 1.20 g/Capita (2.65 lb/Capita) for 1998.

Population data available, on the Internet, through POPIN (population information network) for the Czech Republic indicates a relative static population from 1993 until the present. Expectations and projections by POPIN indicate a static population and possible slight negative growth through the year 2003.

From these projections we anticipate little growth in waste quantities, from population increases, for the immediate future.

Waste Composition

The waste composition is the basis for calculating the quantities of recoverable materials as well as the potential energy yield. The anticipated energy yield is crucial to the selection of major heat and power generation equipment.

The MSW composition as provided by PT is presented in Table III-2 below. "Source separated" and "other wastes" are not included. A more definitive waste composition study must be completed before a final selection of combustion and emissions control equipment is undertaken.

TABLE III-2
WASTE COMPOSITION

Component	% by Weight
Paper and Cartons	17.0
Plastic	13.5
Compost Waste	18.7
Textile Material	5.7
Other Burnable Waste	12.2
Disparate Waste (size '<40mm)	20.5
Glass	2.7
Metal	3.6
Mineral Waste	1.9
Dangerous Waste	0.2
Other (undefined)	4.0
	100%

The predicted energy value presented by PT ranges from 8-16 MJ/kg (3440 Btu/lb to 6880 Btu/lb). This large variation has been further refined by selected equipment vendors to predict performance of their various equipment. A value of 10.1 MJ/kg (4326 Btu/lb) has been calculated, for the high heating value (HHV), on the basis of information provided.

In terms of Refuse Derived Fuel (RDF) and energy recovery, the solid waste stream may be categorized into processable and non-processable factions. Based upon the waste characterization presented, we have estimated that the processable waste fraction available for RDF incineration will be approximately seventy percent (70%) of the MSW waste stream. Higher heating values for processed (RDF) wastes will generally vary between 11.5 and 15 MJ/kg (5000 and 6500 Btu/lb).

A value of 11.9 MJ/kg (5100 Btu/lb) has been calculated from the data provided.

Waste Overview

Waste quantities for each of the Plzen regional districts are presented in Figure III-3.

The City of Plzen (Plzen City Mesto) generates sufficient quantities of MSW to support waste processing and incineration facilities with an annual nominal capacity of 50,000 tonnes per year.

The districts of Plzen-North, Plzen-South and Rokycany, which abut the City of Plzen, generate an additional 46,795 tonnes MSW annually. Presently this waste is land filled in eleven (11) landfills, which range from 10 Km to 30 Km from the Plzen City Center (Figure III- 2). These three districts and the City of Plzen account for approximately sixty-two percent (62%) of the total MSW generated regionally.

Based upon the data provided, it is anticipated that the four districts could nearly support a Waste-to-Energy Facility of a nominal annual process capacity of 100,000 tonne. They have a combined waste total of 96,475 tonne. Additional wastes would be considered from the three remaining districts. This may require the establishment of waste transfer stations in those districts.

Process

Based on available information HDR, in consultation with representatives from Plzenska teplarenska, has estimated that the waste available in the region will support a processing unit size of 50,000 tonne per year. With contribution of other districts in the region a facility of 100,000 tonne per year could be supported. These tonnages were all assumed available for purposes of this study.

IV. WASTE TO ENERGY TECHNOLOGY ASSESSMENT

Introduction

HDR previously prepared a preliminary technology assessment overview for Plzenská teplárenská (PT) as part of this Waste-to-Energy (WTE) feasibility assessment to screen the potential technologies for use in Plzen, Czech Republic. This feasibility assessment provided a general review of the proven and effective alternative technologies for energy recovery from MSW that have provided, worldwide, environmentally sound waste disposal solutions while reducing reliance on landfilling.

The assessment identified two major categories of MSW processing systems meeting the following broad general criteria established for this project:

- Waste diversion from landfills
- Energy recovery in form of electricity and heat (by-product production)
- Capable of meeting stringent environmental regulations
- Long-term operating experience
- Predictable operating costs
- Potential to provide an economic return to the operator

The two major MSW processing system categories that were identified in the assessment are described in the following:

- ***Mass-Burn Systems:*** Waste is burned with little or no preprocessing. The "as received" waste is fed into a furnace/boiler system for combustion and subsequent production of steam for electric generation, industrial processes, or district heating purposes. Material recovery in conjunction with mass burn is normally limited to source separation and / or post combustion processes.

- ***Prepared Fuel Systems***: The primary goal of the prepared fuel system is the production of a refuse-derived fuel (RDF) for combustion in a dedicated furnace/boiler to generate steam for electric generation, industrial processes or for district heating purposes. The fuel product may vary from a powdered to a densified pellet form to a simple shredding for size. Recovery of recyclable materials such as glass, ferrous and nonferrous metals typically occurs incidental to the fuel preparation.

Two other processing systems, gasification and anaerobic digestion, were eliminated from further consideration since these technologies did not meet all of the criteria described above. The following general descriptions summarize the principal features that differentiate these systems and the operational histories of the two MSW processing categories. These general descriptions are followed by a more detailed technology description which includes conceptual arrangements for WTE facilities, sited in Plzen. These conceptual arrangements are intended to allow a more in-depth assessment of the suitability of the technologies for meeting regional waste processing requirements and Plzenska teplarenska's energy recovery and production needs.

Mass-Burn Systems

The mass-burn for energy recovery requires little or no pre-processing of the waste. Waste pre-processing before combustion is typically limited to the mixing of the waste to provide a more homogeneous fuel and the removal of objectionable or bulky materials, such as water heaters, appliances or tree stumps from the "as received" waste. Some facilities recover materials prior to burning, however material recovery is normally limited to post-combustion processes that recover aggregate, ferrous metals and non-ferrous metals.

Mass burn combustion systems can be subdivided into two categories – small *modular systems* and large *field-erected systems*. Only the larger field-erected systems are considered in this study. Field-erected units have been developed in two basic furnace configurations. One having a refractory-line furnace chamber and a separate waterwall boiler, referred to as "*refractory systems*". The other having an integrated refractory lined waterwall furnace and boiler, referred to as "*waterwall systems*". Both types are essentially field erected. Grates and heat recovery surfaces are usually fabricated in modules for ease of field assembly.

Refractory systems are generally available in individual units with combustion capacities ranging from 20 Tonnes per day (tpd) to 450 tpd. Individual units for waterwall systems generally range in size from 100 to 900 tpd.

Operational Experience

The mass-burn technology for energy recovery was developed in Europe in the first half of the 20th century and has been successfully applied worldwide for decades. Some European facilities have operating lives exceeding 40 years. Although the Untied States used incinerators for waste volume reduction during early 20th century also, energy recovery did not become wide spread until the 1970's. Worldwide, there are more than 500 facilities in operation. Over the years of operation, equipment designs have been modified to improve combustion efficiency, efficiency of energy recovery and reduction of certain emissions. Therefore, the technology is proven and performance is reasonably predictable.

Grate designs have been refined to address wear, slagging, and proper agitation of the waste to assure complete combustion. Boiler corrosion and erosion has been and continues to be a concern due to the acid gases created in the combustion process. These problems have been largely mitigated through the use of refractory, the proper choice of steaming temperatures and pressures, and the use of spiral metal overlayment of boiler tubes. Soot blowers and rappers are generally used to reduce boiler tube fouling and minimize downtimes. Boiler design operating temperatures have been adjusted to reduce the frequency of heating surface fouling and failure and subsequent replacement. Ash handling systems have been revised to address the solidification issues resulting from the use of lime for acid gas controls.

The control of certain combustion gas constituents, such as dust (particulate), sulfur, various organic compounds and oxides of nitrogen and carbon, to significantly small levels has been accomplished through the use of dry scrubbers, fabric filters, SNCR (selective non-catalytic reduction) and chemical injection combined with the use of continuous emissions monitoring devices that monitor exit gas conditions and adjust the burning rates and chemical feed rates to control certain emission spikes due to the heterogeneity of the fuel.

The key planning considerations using the mass burn approach are:

- Waste composition and calorific value
- Quantity of the waste to be processed
- Environmental regulatory requirements for:
    - Air emissions
    - Water emissions
    - Noise control
    - Odors
- Vehicle traffic flow and queuing
- Alternative disposal or bypass wastes
- Waste storage management
- Ash / Residue management
- Operational flexibility and maintenance
- By-product recovery or production and use
- Future expansion needs

Prepared Fuel Systems

MSW is a heterogeneous material whose composition varies on a seasonal and even daily basis. MSW processing systems have been developed in an attempt to produce a more homogeneous, easier-to-handle material for use as a more efficient refuse (waste) derived fuel and to recover material byproducts for sale. These prepared fuel systems reduce the size of the waste, increase the density, enhance the calorific value and generally remove metals, glass, grit and other non-combustibles or objectionable materials.

The product of such prepared fuel systems is designated as "refuse-derived fuel" (RDF). This fuel can be used as:

- Primary fuel, in a dedicated furnace-boiler unit, specifically designed for RDF combustion

- Supplemental fuel, which means firing with another fuel (i.e., co-firing) in existing industrial or utility combustion systems which have been modified for the fuel

RDF will have an average calorific value comparable to or slightly greater than, the brown coal typically available in the Czech Republic and is comparable in its low sulfur content, making it a desirable fuel to reduce combustion gas emissions of sulfur dioxide (SO_2). However, it tends to have a higher chlorine content, which increases potential emissions of HCl, due to the concentrations of plastic. Emissions of SO_2 and HCl are effectively controlled by appropriately designed flue gas cleaning equipment.

Since there is a wide variety of processing equipment that might be used in RDF preparation, the American Society of Testing and Materials (ASTM) has developed seven RDF categories based on the principal characteristics of the fuel product. The ASTM classifications are as follows:

- RDF-1 – As-Received MSW (i.e., mass-burn)
- RDF-2 – Coarse particle size with or without ferrous separation (95% by weight passes through 6-inch (152.4 mm) square mesh)
- RDF-3 – Small particle size (95% by weight passes through 2-inch (50.8 mm) square mesh)
- RDF-4 – Powder form of RDF (95% by weight passes through a 0.035-inch (0.9 mm) mesh)
- RDF-5 – Densified RDF compressed into the form of pellets, slugs or briquettes
- RDF-6 – Processed into a liquid fuel
- RDF-7 – Processed into a gaseous fuel (methane)

assumptions and facility features assumed to be included in the Base Case conceptual facilities. The site specific aspects of each site are further discussed in Section VI – Site Considerations.

Mass-Burn Facility Concept

The mass-burn WTE facility would receive MSW for combustion without pre-processing, except for the removal of materials that are too large to be placed in the furnace or hazardous to the processing system. The following paragraphs describe a Base Case mass-burn facility which would have an annual combustion capacity of 100,000 tonnes, assuming an 85% capacity factor located at the Central Plant in Plzen. However, considerations for a reduced capacity facility, handling an annual combustion capacity of 50,000 tonne, have also been provided.

General Design Criteria and Assumptions

The combustion facility would operate 24-hours per day 7-days per week, to maximize energy production and maintain steady state conditions. Although, combustion system vendors will typically only guarantee an operating capacity of 85% of the rated facility capacity, historically operating data indicates that most facilities operate at a capacity factor at or above 90% except during years of major boiler repairs such as tube replacements (every 3 to 5 years). For the purpose of this analysis, the normal guaranteed 85% capacity factor is assumed.

During short periods when waste cannot be processed by the combustion units, it can be held in the storage pit, which is sized to store up to 4-days of average waste deliveries. It is assumed that the waste would be diverted to the regional landfills during periods of extended downtime when facility storage capacity is exceeded. The storage pit would allow for continuous operation over non-delivery periods such as weekends or holidays.

It is assumed that Plzenska teplarenska would operate the completed facility.

Facility Components

Solid Waste Receiving

An electronic scale system is provided for weighing inbound collection and transfer vehicle traffic. The inbound scale would be monitored from a proposed scale house at the mass-burn WTE facility's main site entrance. From the scale area, vehicles would proceed to a maneuvering area and an enclosed receiving, tipping, and storage area.

Waste deliveries are anticipated during normal working hours (0600-1500) 5 days per week, by varying sized vehicles. Allowances have been made for large transfer vehicles as well as normal twenty-tonne packer vehicles Receiving on a five day per week basis will require the delivery of approximately four hundred fifty (450) tonne of waste during the eight hour period or approximately three (3) x 20 tonne trucks per hour.

All incoming transfer and collection vehicles would discharge their payload into the storage pit located in the enclosed tipping area. After unloading, the trucks would be routed away from the tipping area to the main entrance. Vehicles, which are not tare weighed, would be required to cross an outbound scale.

Fuel Feed System

Two over-head traveling cranes are provided that are used to mix the refuse and feed the furnace charging hopper. The cranes would also be used to extract bulky and unacceptable waste for load-out through a rejects hopper. Each crane would be capable of handling the total charging rate of the furnace. The combustion unit is equipped with charging hopper and feed chute designed and contoured to provide an air seal while avoiding bridging of waste. Beneath this feed chute a hydraulic feed ram is used to push the fuel onto the stoker grate at a controlled rate. The hydraulic rams stroke forward very slowly and then retract quickly to provide a continuous flow of fuel into the furnace. The feed rams provide the positive, continuous fuel feed necessary for good combustion and are simple to control by adjusting either the speed of travel or the frequency of stokes.

Combustion System

The combustion unit anticipated is a refractory-lined waterwall furnace equipped with under-fire air reciprocating stoker grates. The combustion and grate system as described herein was provided by Babcock and Wilcox (B&W), a major U.S. vendor of incineration systems. The grate speed would be controlled automatically to assure a consistent combustion.. This system can be classified as a forward moving reciprocating grate stoker. This grate is designed with alternate moving and stationary rows of grates arranged with a downward slope to aid in conveying the refuse through the furnace. Each row of grates overlaps the row beneath it. Alternating grate rows are supported either on a stationary frame or on a moving frame that is driven by hydraulic cylinders. The moving grates push the refuse over the stationary grates, where it is picked up by the next row of moving grates and is thus advanced through the furnace. The action of these reciprocating grates causes a tumbling and mixing of the refuse, constantly exposing combustible material to the high temperatures and allowing the combustion air to contact all the burning refuse. These moving grates also provide a consolidating action that helps to maintain a uniform density in the fuel bed and reduces or eliminates any voids or blowholes.

The grates are typically constructed in a series of standard modules with independent drives and air plenums. This modular construction allows any size stoker to be constructed from a small number of standard grate modules. A typical stoker is usually from 2-5 modules in length and 1-5 modules in width. This method of construction also allows for complete zoned air control to the individual burning areas of the grate and provides complete freedom in the operating speed of the individual grate modules to provide the required feed rate along the grate to assure complete burnout of the fuel. The economic benefits associated with modularized construction include reduced field erection and the duplication of parts for efficient maintenance and repair.

Heated primary (under grate) air from the forced draft fan passing through a steam coil air heater is distributed to separately controlled plenums below the stoker. A control damper and air-measuring devices are provided at the entrance to each plenum to control the flow of air to each section of the grate.

The stoker grate bars contain small openings through which the under grate air passes in order to enter the combustion chamber. These air ports are designed to meter and uniformly distribute the primary combustion air to the refuse burning on the surface of the grate. The air ports comprise approximately 3% of the total grate surface and develop a sufficient pressure drop to assure effective penetration of the air through the fuel bed regardless of the depth of refuse on the grate.

The steam coil air heater is provided to preheat the under grate air to allow combustion even when high moisture refuse is being burned. The preheated under grate air partially dries the refuse and helps maintain adequate furnace temperatures for efficient combustion.

MSW is composed of a significant percentage of volatiles. In order to effectively combust the volatiles, an over-fire air (OFA) system would deliver approximately 40% of the high-pressure combustion air into the furnace as secondary (overfire) air through ports in the furnace front and rear walls above the stoker to complete the combustion process.

The shape of the combustion zone above the stoker along with the location, size and orientation of the OFA nozzles are critical to achieving complete combustion and low flue gas emissions. The OFA system is designed not only to provide an adequate amount of combustion air but also to create a turbulent atmosphere within the lower furnace to ensure proper mixing of the air and volatiles.

Hot gas from the furnace passes across the pendant superheater that is located in the convection pass outside the high radiant heat transfer zone of the furnace. The gas continues across the boiler surface to the boiler exit, turns downward, crosses the horizontal economizer and enters the air pollution control (APC) system before exiting the stack to the atmosphere.

Auxiliary Burner

The auxiliary input burner consists of a single fuel element (interchangeable from gas to No. 2 oil) down the center of an air sleeve. The purpose of the auxiliary input burner is to maintain combustion conditions during start-up, low firing conditions, and shutdown of the system in order to meet regulatory temperature and emission criteria. Typically combustion air is ducted directly to the air sleeve from the overfire air fan. Inside the sleeve, combustion air is first distributed by a perforated plate and then spun by swirl vanes at the burner throat. Nominal burner capacity is 26.38 GJ/hr (25 MMBtu/hr). A high-energy spark igniter is used for ignition. Both the igniter and the fuel element are inserted/retracted by pneumatic cylinders.

An isolation damper is used to shield an idle burner from furnace radiation and slag deposition. It is generally supported directly by the furnace sidewall and is housed in a wall box on which the burner is mounted. A pneumatic cylinder horizontally drives the damper blade, which consists of a rectangular silicon carbide ceramic slab in a metal jacket. In the firing position, a hole in the damper blade is aligned with the burner. In the isolation position, the damper blade blanks off the burner opening.

This system has been developed specifically for auxiliary fuel input on refuse boilers. Major advantages are its relatively compact size, the elimination of a dedicated FD fan and motor, the elimination of a large wind box and the ability to isolate the burner from furnace radiation and fouling when the burner is not in operation.

Steam Boiler

The steam-generating unit is a balanced-draft single drum power boiler. It is arranged with a water-cooled furnace, superheater, boiler generating bank, economizer and steam coil air heater components. The furnace walls would be gas-tight and are of membrane construction, with the boiler unit is supported from the top for expansion downward. The unit is designed to utilize MSW fuel at the design feed rate with a range of heating values between 9 and 11.9 MJ/kg (4000-5200 Btu/lb).

The pendant type superheater is comprised of primary and secondary stages with an inter-stage spray attemperator located in the piping between the primary and secondary stages of the superheater.

The feed water enters the bottom header of the economizer. The water passes upward through the economizer and discharge through the outlet into piping, which transports it to the steam drum.

Although these classifications provide an industry model for describing the prepared fuel, system designers often require more detailed information for the fuel product. RDF-2 and RDF-3 have proven to be the most successful prepared fuel systems in the U.S. marketplace. RDF-4, RDF-5, RDF-6 and RDF-7 production are generally more expensive to build and operate, do not have long operational experience or have not demonstrated sufficient benefits for the development of sustained support in the marketplace.

Operational Experience

MSW fuel preparation systems (RDF-2 and RDF-3) have been principally developed in the U.S. and have operated there for over 25 years. However, a variety of MSW fuel preparation systems have evolved, been developed and been installed in both Europe and the U.S. It difficult to quantify the number of prepared fuel systems in the world, since fuel preparation is used in conjunction with so many different waste-processing applications. This multi-faceted application has, however, resulted in equipment design improvements. Therefore, the component equipment technology is considered proven and performance is reasonably predictable depending on the material recovery desired and the fuel requirements of the combustion system.

Many of the RDF systems in the U.S. have been closed primarily due to the higher costs associated with operating these systems (compared to landfilling or mass-burn), the loss of the governmental ability to direct the flow of waste and difficulties in marketing RDF except under long term agreements. Facilities in Europe and Japan have not experienced these same problems, largely due to larger population densities, different regulatory controls and higher costs for land disposal options. The key planning considerations for RDF systems include those considerations previously cited for the mass burn systems.

RDF, however has additional design considerations for storage and retrieval because of the physical character of the processed material. These characteristics include the following:

- Tendency to compact and agglomerate
- Decomposition of the putrescible fraction
- Combustibility / explosive components
- Potential for worker exposure to health hazards
- Abrasiveness
- Presence of long stringy items
- Generation and containment of dust and odors

These characteristics can lead to blockage of flow openings, arching or bridging of material, spontaneous combustion in stagnant storage areas, excessive wear, entanglements in rotating equipment, additional cleaning, and odor and dust management systems. Since MSW may occasionally contain household materials that might be hazardous to plant workers under certain conditions, more care must be taken in the sorting of the materials and the size reduction process. Health and safety considerations for process plant employees should include emergency exposure equipment, respiratory protection, protective clothing and vaccinations for hepatitis B.

RDF storage, metering and feed subsystems are designed to function together. Bulk storage is used to provide long-term storage (two to four days) to provide a continuous supply of fuel to the boilers when the process lines may not be operating. Surge storage is used for short-term feed management (five to thirty minutes) to smooth out surges in feed rates. Boiler metering systems are used to control the actual feed rate and control operating temperatures. Feed and distribution systems are designed to provide a uniform distribution of the fuel in the furnace.

Conceptual Facility Comparisons

In order to better assess the feasibility of a "Waste to Energy (WTE)" facility as a part of the Plzenska teplarenska system, base case conceptual facility layouts were prepared for a Mass Burn facility and an RDF incineration and processing facility. These conceptual presentations are found in Appendix A.

The mass burn base case was developed for a facility located at the central plant (Refer to Figure VI-8) which will process 100,000 tonne MSW annually while operating on a seven day per week schedule. Annual operation, for evaluation purposes, allowing for maintenance and outages is three hundred ten (310) days. This coincides with typical guarantees provided by combustion equipment manufacturers of 85% availability. The daily plant throughput is three hundred twenty two tonne per day (322 tpd).

The RDF incineration and processing facility was developed for the Roudna site (Refer to Figure VI-13) which will process 100,000 tonne MSW annually. Operation of the incineration is anticipated seven days per week. The processing of waste for the production of RDF is anticipated five days per week on a two shift operation.

Conceptual layouts for other sites were also prepared to provide for site specific comparisons of facilities. Based on these conceptual layouts, cost estimates were prepared for construction and facility operations on a site by site basis.

Analysis was also conducted to identify facility modifications for a smaller facility in order to assess the economic impact at 50,000 tonne annual capacity. The following sections describe the design criteria, By means of natural circulation, the water flows from the steam drum down through the rear boiler bank tubes to the generating bank lower header. Flow is then divided between the steam generating tubes of the boiler bank and the distributor tubes supplying the lower furnace wall headers.

The steam generating tubes of the boiler bank circulate steam-water mixtures back to the steam drum. From the lower furnace headers, steam-water mixture rises through the front, rear and sidewall tubes to the upper furnace headers and through connecting risers to the steam drum.

Cyclone steam separators that provide essentially steam-free water for the downcomer circuits separate the steam-and-water mixture in the steam drum. Steam is further purified passing through primary and secondary scrubbers.

Steam passes through multiple connections from the drum to the inlet header of the primary superheater and through the primary superheater to its outlet header. Connecting piping, equipped with a spray attemperator conveys the steam to the secondary superheater.

The steam then enters the secondary superheater inlet header and flows through the secondary superheater to the outlet header and to a discharge pipe connection that terminates adjacent to the penthouse.

Turbine Generator

Steam from the boiler is directed to a backpressure turbine-driven electric power generator. The turbine generator is designed to operate continuously and have approximate rated capacity of 5.0 MW for the Base Case mass-burn WTE facility. Inlet steam would be at 5.2 MPa and 371 °C (750 psig/700 °F) with probable exhaust steam conditions compatible with heat recovery to the PT district heating system.

Conceptual diagrams (refer to Appendix C) for the turbine generator exhaust schemes are shown for two anticipated configurations. Figure VI-2 anticipates the incineration facility location at the Dobravka Central Plant site. Figure VI-4 anticipates the incineration facility at a location along the district heating supply and return line system. An exhaust pressure and temperature was selected to coincide with the average exhaust conditions of the Dobravka heating plant turbine generator Number 1 of 0.06 MPa @ 114 °C (8.F psig @ 238°F).

The turbine generator skid would include:

- Steam turbine with gland steam and lube system, rotating at 6000 rpm
- Synchronous Generator
- Single reduction
- Gearbox, turning gear and couplings
- Instrumentation and control system (electronic governing)
- Lube Oil System
- Values and piping
- Electrical protection

It is estimated that the entire combustion system, including the Air Pollution Control System, would require approximately twelve percent (12%) of the gross power generation for in-house power needs. It is assumed that approximately one percent of in house power production would be purchased power during facility outages. Electric generation above in house needs would be available for export to Plzenska teplarenska or to the grid.

Emissions Controls

The APC system is designed to treat the flue gases for removal of HCl, SO_2, particulates, mercury and NO_x. The system consists of a spray dryer absorber (SDA), fabric filter, carbon injection equipment, SNCR, and reagent receiving, storage and processing equipment.

A continuous emission monitoring (CEM) system is required to measure the emissions of SO_2, NO_x, Total Organic Compound (TOC's), HCl, HF, CO and particulate (total dust). The CEM system uses a precision spectrometer for measurement of the oxides of Sulfur, and Nitrogen, and an interferometer based instrument for CO, HCl, HF, and H2O. A remote data terminal located near the stack is provided with keyboard, display, monitor switch, modem switch and signal I/O with a temperature and humidity controlled cabinet for the analyzers. Remote readouts would be available in the facility control room. The data provided by the CEM system is used to adjust combustion conditions and reagent flows for the APC system.

The acid gas (SO_2, HCL) scrubbing system includes a pebble lime storage silo, lime slakers, slurry tanks, slurry pumps, piping, reaction chamber with slurry atomizers, process controls, and other accessories. Usage may be anticipated in a range of 60 to 260 kg/hr (145 to 630 lb/hr).

The mercury emissions control system includes a pneumatic feed system, which injects dry activated carbon directly into the flue gas ductwork, downstream of the economizer. The carbon injection train includes a carbon storage silo, a surge bin, gravimetric feeder, blower, eductor, piping, wiring, process controls and other accessories needed for a complete, independent, operational system.

The carbon system would have a nominal carbon feed rate ranging from 4.5 to 18 1kg/hr (10 to 40 lb/hr). The carbon, containing adsorbed mercury, would be captured in the fabric filter for disposal along with the lime and combustion fly ash.

A Selective Non Catalytic Reduction (SNCR) system for control of NO_x consisting of aqueous ammonia storage, pumps, piping, and spray nozzles for injection of the ammonia in specific combustion zones of the boiler is also provided. Usage may be anticipated in a range of 25 to 80 kg/hr (10 to 33 lb/hr).

Auxiliary Equipment

The facility process control system includes a central control panel, interlocks, process sensors and local/manual override features to properly monitor and control all waste processing and combustion activities. A solid state microprocessor, digital logic-based distributed control system would be provided to control combustion, boiler, turbine generator, APC systems and auxiliaries.

Other facility support systems (auxiliaries) would include:

- Auxiliary cooling water system
- Condensate system
- Circulating water system
- Water treatment and feed water system
- Waste water system (zero discharge systems require additional water treatment)
- Fire protection
- Compressed air system

Ash/Residue Handling and Disposal

Boiler bottom ash is discharged from the grate to a conveyor system through a water quench ash discharge system. The discharge system quenches, cools, and partially dewaters the ash. Once discharged to the conveyor system the ash is transported to the ash storage building. At intermediate points ferrous metals are removed and prepared for recycle. Non-ferrous metals are difficult to remove at this point and is not anticipated for this study. A conceptual ash removal system is shown in Figure VI-20 (Appendix C).

Flyash – ash from boiler back passes and the APC system is initially taken to a surge bin at the ash storage building where it is then conditioned and may ultimately be mixed with the bottom ash and removed to an approved landfill or it may be removed directly to an approved landfill.

A front end loader is provided to load the trailers and truck tractors that haul the filled ash and reject material trailers to the landfill for disposal as required. An ash storage building would be provided which would allow the ash/ transfer operations to be scheduled on an eight-hour per day, 40-hour per week basis.

Administration

If the waste-to-energy facility is located at the Plzenska teplarenska Central Plant (as envisioned in the Base Case), then additional administrative office areas would not be required. However, the operating personnel still will need office and control room areas. For those sties not at the Central Plant location – including the off-site RDF facility – the design would include, in addition to office and control room areas, areas such as lunch/break room, washroom/lock-room, conference room, maintenance shop and such.

Facility Capacity Reduction Considerations

Reducing the design capacity from the base case 100,000 tonne to 50,000 tonne per year would result in sizing changes for the truck maneuvering area, storage pit, combustion/boiler capacity and ancillary equipment. Ancillary equipment is also expected to allow equipment downsizing that would reduce capital costs. The duty rating on the cranes could also be reduced, which would reduce costs. Costs for turbine generator equipment would also be slightly reduced.

It is expected that operating staff reductions would only be nominally affected since twenty four hour staffing would still be required for the combustion facility. Ash disposal, utilities and reagent use would have a general proportionate reduction. Repair and maintenance are related to capital replacement cost and expected equipment life. Therefore, the maintenance costs would be proportionally reduced as reflected by the capital cost reductions.

Additional Considerations

The Base Case assumes that adequate water treatment and condensing facilities exist at the Central Plant site. An electric substation exists at the Central Plant and would require an additional transformer and appropriate switchgear. An alternate location may require the additional facilities for water treatment, condensing and electric transmission.

RDF Facility Concept

The Refuse Derived Fuel (RDF) Waste-to-Energy (WTE) facility is designed to receive and process solid waste into refuse derived fuel. The RDF would be mechanically conveyed or trucked to the RDF storage building and subsequently conveyed to the RDF combustion facility. The following paragraphs describe a Base Case RDF WTE facility which would have an annual processing throughput of 100,000 tonne (tpy), assuming a 70% fuel recovery process and an 85% combustion facility capacity factor located at the Roudna site in Plzen. However, economic analysis for a smaller facility handling an annual combustion throughput of 50,000 tpy has also been provided. The economic impacts and other identified considerations of locating the facility at other potential site locations identified by Plzenska teplarenska are also reviewed.

General Design RDF Process Criteria and Assumptions

The Base Case RDF processing facility is designed for an annual processing capacity of 100,000 tonne, in a two-shift operation and off-shift maintenance operation (five days per week). For the reduced capacity facility (50,000 tonne per year throughput), the same processing line is assumed using only one operating shift. This is due to equipment sizing constraints for effective processing.

A single base case combustion unit is designed to combust 161 tonne per day (tpd) of RDF with heating values ranging from 11.6 to 15 MJ/kg (5000 to 6500 Btu/lb). The combustion facility would operate 24-hours per day 7-days per week, to maximize energy production and maintain steady state conditions. Although, combustion equipment vendors will typically only guarantee an operating capacity of 85% of the rated facility capacity, historically operating data indicates that most facilities operate at a capacity factor of 90% or greater except during years of turbine maintenance or major tube replacements. For the purpose of this analysis, the normal guaranteed 85% capacity factor was assumed.

During periods when waste cannot be processed by the combustion units, it can be held in the receiving tipping floor, which is sized to store up to 4-days of average waste deliveries. It is assumed that the waste is diverted to the regional landfills during periods of extended downtime when facility storage capacity is exceeded.

Facility Components

Solid Waste Receiving

An electronic scale system is provided for weighing inbound collection and transfer vehicle traffic. The inbound scale would be monitored from a proposed scale house at the RDF processing facility's main site entrance. From the scale area, vehicles would proceed to the enclosed solid waste receiving and storage area.

All incoming transfer and collection vehicles would discharge their payload onto the tipping floor. After unloading, the trucks would be routed away from the processing building to the main entrance. Vehicles, which are not tare weighed, would be required to cross an outbound scale.

Necessary solid waste storage for daily processing operations would be provided on the tipping floor. A front-end loader equipped with an approximate 4.5 cubic meter bucket would initially screen the material for non-processable items and then stack the processable solid waste. The front-end loader would feed the process line and maneuver waste to maintain a clear space for truck deliveries. The loader would push the solid waste onto the apron of the infeed conveyor to the process line. Materials identified as non-processable would be picked from waste storage and loaded by an articulated crane into a 30 cubic meter container positioned adjacent to the apron conveyors. These containers would be hauled to the landfill disposal site, as necessary.

The storage area, as proposed, would be a free span enclosure of approximately 36 x 45 meters (120 ft x 150 ft). The minimum clear span height on the tipping floor level would be 6 meters (20 ft). Five meter (16 ft) wide roll-up doors are provided to allow adequate access to the tipping floor by the refuse hauling vehicles. Under emergency conditions, the solid waste receiving area has the capability to function as a transfer station with waste being loaded out and hauled to the landfill for disposal.

Waste Processing

Processable solid waste would undergo two stages of trommeling with shredding to produce an RDF fuel having a nominal three-inch material size. The general equipment layout for the proposed process lines is shown on Figure VI-6 in Appendix C of this report. The conceptual system arrangement minimizes the number of transfer points and total conveyor length.

At the design capacity operating condition, the process line is operated 16-hours (2 shifts) per day, five days a week, at a nominal rate of 28 tonne per hour to produce the maximum quantity of RDF. The processing system is automatically controlled from a central control room manned by a process line operator. Other equipment operators and general operations personnel would be required to monitor the load-out points in the processing system and continuously observe equipment operation. A schematic of the process flow line is shown in Figure VI-7 in Appendix C.

Solid waste is pushed from storage piles on the tipping floor onto the infeed apron conveyor of each operating process line. This material would be conveyed from the tipping floor level and would be discharged into a primary rotary trommel having 120 mm (4-3/4 in) diameter holes. This trommel would be equipped with spikes that will tear any bags and empty their contents. The trommel is also designed to break any glass or ceramics to allow for the screening of this material. Materials of a size greater than 120 mm (4-3/4 in) diameter (oversize materials) would pass through the trommel and be mechanically conveyed to a shredder for size reduction. The shredder would be equipped with explosion protection and designed to provide a size reduction such that 95 percent of the infeed material passes a sieve. A separate concrete enclosure would be provided around the 76 mm (3 in) shredders to protect personnel and equipment in the unlikely event of a shredder explosion. The shredder would have the capacity to shred 28 tonne of solid waste per hour. The shredded material would pass under a magnetic belt separator for ferrous metal recovery before being discharged onto the main RDF conveyor system for delivery to the fuel storage building.

The primary trommel undersize fraction (material that passes through the 121 mm (4-3/4 in) diameter holes would pass under a magnetic belt separator for ferrous metal recovery and then be conveyed to the two-stage secondary trommel. (The first stage would have 25 mm (1-in) diameter holes and the second stage would have 50 mm (2-in) holes). The oversized material that passes through the secondary trommel would have a size that is greater than the 50 mm in diameter but less than 121 mm. This material would also be conveyed to the main RDF conveyor. The first stage of the secondary trommel would provide for the removal of sand, gravel, glass, grit and like materials from the RDF. The undersized material removed in the first stage of the secondary trommeling process would be conveyed to the rejects load-out container and be hauled to the landfill as necessary.

The material fraction that passes through the second stage is conveyed directly to the main RDF conveyor system. The degree of separation achieved in this section of the secondary trommel provides an aluminum enriched process stream facilitating an anticipated aluminum recovery efficiency.

An elevated picking platform would be installed on either side of the secondary trommel "overs" conveyor belt that would allow manual separation of aluminum from the secondary trommel "overs" conveyor (C-7A, 7B, and 7C). The picking platform would be equipped with personnel to pick the aluminum and chutes directing the recovered aluminum to roll-off bins below the conveyor. This approach would require 4 pickers per process line per shift. The operating speed of this conveyor would be slow to facilitate the recovery of aluminum. This operation would result in the addition of 8 employees to the process plant-staffing requirement.

The ferrous metals, removed after shredding and during primary trommeling, would be conveyed to the ferrous load-out area for transport to the landfill or materials market if available. The flow rate of the ferrous metal is anticipated to be approximately 0.9 tonne per hour (0.4%). The remaining non-combustible waste fraction (rejects) would be mechanically conveyed to a load-out point in the processing facility. Based on the estimated materials balance, an anticipated 25 to 35 percent of the incoming municipal solid waste would be removed during RDF processing operations. All rejects from the processing system would be loaded into open-top transfer trailers and hauled to the landfill. It is anticipated that tractors and trailers would be required to transport process rejects from the processing facility to the disposal site.

A conveyor system would move solid waste materials between each equipment component in the process line. The material densities utilized in the design of the conveyors are summarized in Table IV-1. The conveyor system would be designed to handle surges equivalent to 125 percent of the peak-loading rate. The conveyor system conceptual layout emphasizes simplicity in order to minimize transfer points, turns, etc., that allows for a smooth continuous flow of materials through the process line at a minimum required level of maintenance and housekeeping. Based on the anticipated fuel composition computed from the material balance, it is estimated that the average higher heating value of the RDF produced would approximate 11.9 MJ/Kg (5100 Btu/lb) at 70% recovery or approximately 13.9 MJ/Kg (6000 Btu/lb) at 65% recovery.

TABLE IV-1

MATERIALS DENSITY FOR CONVEYING

Type of Material	Probable Range (Kg/m2)	Design (Kg/m2)
As Rec'd Solid Waste	189-236	189
Primary Trommel Undersize	236-551	236
Primary Trommel Oversize	126-315	126
Secondary Trommel Drop (minus 2.5 mm)	472-787	630
Secondary Trommel Drop (minus 50 mm)	47-126	63
Secondary Trommel Oversize	126-315	189
Shredded Solid Waste	47-126	63
RDF	47-94	63
Ferrous Metal	236-472	315
Rejects	551-630	630

RDF Storage and Feed System

The RDF would be transferred from the solid waste processing facility to the storage area by a series of enclosed conveyors. In the case of processing that is remote from the incineration system by truck or conveyor. Transport by truck has been assumed in the cost estimation for processing facilities that are remote from the incinerator.

The RDF storage building is sized to store up to 4-days of RDF storage to allow for continuous operation despite a five-day per week processing facility operation. The building would be equipped with a stacking conveyor, a front-end loader that would feed the RDF to a apron conveyor leading to the boiler feed metering system.

A number of devices have been utilized to meter RDF to boiler distributors. One type, jointly developed by B&W and Detroit Stoker uses two feed hoppers and one metering feeder for each air-swept distributor spout. Each metering feeder has an upper hopper kept full at all times by an overrunning conveyor. When RDF is fed out of the bottom of a full hopper, it would come out in an extruded form with unpredictable feeding and density characteristics. The ram feed from the upper, full hopper extrudes the RDF in this fashion. The lower hopper receives the extruded RDF and provides a method by which the RDF is kept in continuous movement to maintain a fluffed condition as it is being fed by the flights of the pan conveyor to the air-swept spout. This lower hopper is never permitted to completely fill and level switches in the lower hopper control the ram feed in the upper hopper. Thus, the flighted pan conveyor delivers a metered constant volume per flight with a consistent bulk density. The flighted pan conveyor is driven with a variable speed device receiving the signal from the combustion control system on fuel demand. It is necessary that a predictable volume and density characteristic be established in order to optimize the control of the fuel feed and subsequent stable boiler operation.

Air-swept spouts are ideal devices to distribute RDF into the furnace over the grate surface. There are no moving parts in an air swept spout to tangle with wire, rags, and long or string like items. An apron of air provides longitudinal distribution over the floor of the spout to carry the fuel into the furnace, assisted by closely spaced air jets located immediately beneath the spout. Good lateral distribution of RDF requires that a sufficient number of spouts be provided across the width of the stoker to prevent the formation of lanes of RDF as it is distributed on the grates. RDF is low in bulk density in its fluffed state, and various types of tramp material that passes by even a good preparation plant necessitate ample area for the fuel to pass through. Therefore, the distributor spouts must have an ample-size opening to prevent plugging. The distributor spouts should be located in close proximity to the spreader stoker grates. This would provide the best fuel distribution possible as well as introduce the fuel in the zone of highest temperature to provide maximum control of the combustion process.

To provide for maximum efficiency, minimum excess air, control of ash discharge, minimum slagging, and stoker grate temperature control, it is imperative that the fuel be continuously metered and controlled to each air-swept distributor spout. This requires individual control of the metering to each distributor spout, so that biasing functions can be accomplished to optimize the uniform release of energy in the combustion process of a spreader stoker. All current feeding devices are volumetric and they therefore must feed a material with a consistent bulk density and avoid sporadic feeding of compacted masses. With a fuel that has many variations in its inherent characteristics, the goal is to minimize any variations due to the design and operation of the metering and feeding equipment. Good control of the metering function permits an RDF-fired boiler to have good load following characteristics.

Combustion System

The combustion unit would be a waterwall furnace with an inconel overlay and a spreader-stoker-grate system. A spreader stoker would be located at the bottom of the furnace with fuel admission through air-swept spouts located in the furnace front wall above the stoker grate. The furnace walls are gas-tight and are of membrane construction.

The only type of grate that has been utilized for spreader stoker firing of RDF is the forward moving traveling grate. The traveling grate provides a platform with positive movement of the ashes to the front of the grate where tramp materials, or slag and clinkers, if they occur, can be dealt with. In order to provide as even air distribution as possible, it is necessary that the grate design be of a high air resistant type with a low percentage of air openings. Establishing the air resistance across the grates minimizes any variations in airflow through the grate surface. This permits a design with one plenum beneath the stoker without manual zoning dampers. Control is simplified and a variable requiring operator attention is eliminated.

The major areas of concern when designing a spreader stoker for firing RDF are grate heat release rate, grate speed, combustion air temperature, overfire air quantities and the number and type of distributors.

When firing RDF, grate heat releases are usually limited to 8.5 GJ/Sq meter/hr (750 K Btu/Sq.Ft./hr), since RDF has a very high proportion of cellular composition and has a high volatile to carbon ratio. There are two major reasons for this limitation. One is that higher releases produce hotter fires. When considering that the fusion characteristic of the non-combustibles in RDF is variable, care must be taken to prevent slagging and clinkering of the non-combustible ashes on the grates. The second reason, considering the high ash content of RDF, is that higher heat releases mean burning more fuel per square meter.

With high percentages of non-combustibles, and the nature of the non-combustibles being extremely abrasive, one must design for minimum wear from the movement of the grate. The heating value of the RDF, ash content of the RDF and length of the stoker are design variables for determining proper grate speed. Care is taken in using conservative values for heating value and ash content to maintain reasonable grate speeds. It should also be noted that the heating value of the RDF, ash content of the RDF and the depth of ash off the front of the grate are operating variables. Maximum depth of ash should be maintained to minimize grate speed. The permissible depth of the ash bed is to a great extent a function of how well the fuel is prepared, metered, and distributed evenly over the grate. An ash bed 200 to 250 mm is desirable. There are three major problems associated with spreader stoker firing of RDF. These are (1) Aluminum melting onto and through the grates, (2) Tramp materials jamming the mechanism, and (3) Abrasive non-combustibles causing high wear rates. This provides an additional rational for including aluminum recovery in the RDF processing.

Aluminum melting and solidifying on the grates can jam the mechanisms. Molten aluminum running through the grate surface and solidifying between the grates or in the air plenum can require shutdowns for removal. An operating technique to prevent this problem is to maintain a controlled, thick ash bed to cause the aluminum to solidify in the ash rather than on the grate. This is only possible with controlled metering of the RDF and proper fuel distribution over the grates.

Tramp material can cause physical damage as well as overheating of the grates. Large, dense objects can cause breakage by impact. Smaller, dense objects can jam conveyors, feeders or grates. Slag that falls from the furnace area above the grate can damage the grates and supporting structures as well as prevent airflow through the grates causing overheating. Heat resistant, tough materials are utilized with attention to design that minimizes jams.

The high percentage of very abrasive non-combustibles in RDF attacks all moving mechanical equipment with which it comes in contact. All moving parts and seals of the spreader stoker are manufactured from abrasion resistant materials.

Steam Boiler

The steam-generating unit for RDF firing would be similar to the mass-burn unit described previously. Notable exception is the fuel feeding which is now accomplished with a system of conveyors and air swept spouts.

Turbine Generator

The turbine generator unit for the RDF fired facility will be similar to the unit for the mass-burn facility. Capacity will differ slightly, however, other operating parameters will be identical. This difference is reflected primarily in pricing and revenue recovery from electric sales.

Emissions Controls

The RDF air pollution control equipment is similar to the control system provided for the mass-burn case. Slight differences in flue gas quantities are reflected in pricing.

Auxiliary Equipment (RDF processing)

To prevent damaging of processing equipment stationary cranes with an articulated arm are provided on the tipping floor to remove non-desirable materials, crank shafts, engine blocks, potentially explosive materials, household appliances and like materials. Although all such items should be removed while the waste is on the tipping floor, the stationary crane picking stations provide valuable and necessary back up to the waste previewing by front end loader operators and floor spotters, that could damage processing equipment, from the main process line infeed conveyors. Materials considered non-desirable include crankshafts, engine blocks, potentially explosive materials, white goods, etc. The articulated crane operation serves as a backup system for the visual screening and waste previewing performed by the front-end loader operators and floor spotters while the solid waste is on the receiving tipping floor.

The articulated crane would be positioned adjacent to the apron infeed conveyor. The articulated arm has a 10 meter reach and would be capable of lifting approximately 1,000 Kg at full extension. The materials removed by this operation would be deposited in 30 cubic meter roll-off containers positioned adjacent to the apron conveyor on the tipping floor.

Dust collection is an essential subsystem of a solid waste processing facility. In the process plant, local dust collection systems would be provided for the shredder. A separate central system would be provided for the remaining process equipment and conveyor transfer points on each process line. Each system would include enclosures and hoods, ductwork, a dry-type fabric filter and exhaust fan. The shredder dust collection would be separated from the other dust collection components on each process line to minimize the damage in the event that a shredder explosion occurs. All dust collected will be subsequently transported to the incinerator.

Facility process control is designed for the safety of the operating personnel and the protection of equipment. The control system must insure the smooth continuous flow of materials at the required production rate. Major components of the control system include a central control panel with telemetry, interlocks, process sensors, local and remote alarms, and local/manual override features to properly monitor and control all waste processing activities. All processing functions would be controlled from the central control room. The process area is provided a controlled atmosphere and the operators would be provided with visual aids such as closed circuit television monitoring, and intercom communication system with floor personnel and a strobe light indication system for process equipment operation status.

All electronic control devices such as control switches, meters, indicating lights, trouble alarms and other devices would be mounted on the main control panel. A graphic simulation panel display board would indicate the status of the processing equipment and be mounted directly above the central control panel. From this location, the process line operator can regulate the processing rates, modify the operating mode and start and stop equipment. Each process line would be equipped with an alarm panel, which visually indicates the malfunction of any major piece of equipment in the process lines.

Local manual override controls would be provided for the apron feed conveyors, the trommels, shredders, and magnetic separators. Local key-lock controls would be provided for emergency control on the working floor level to facilitate maintenance procedures by operations and maintenance personnel. In the event that the emergency control mode is activated, the equipment can only be restarted from the central control panel.

Other facility support systems would include:

- Waste water system
- Fire protection
- Compressed air system

Handling and Disposal

Process residue would be directly discharged into transfer trailer. A tractor would maneuver the loaded trailers to a storage location at the RDF processing plant and reposition empty trailer under the discharge chute in a continuous cycle.

Boiler bottom ash and fly ash will be handled separately and discharged to ash building. A loader loads the trailers and truck tractors haul the filled ash and residue transport at the trailers to the landfill or other disposal or end use facilities as dictated by its composition. Fly ash could be loaded directly to trailers for transport. The yard tractor would operate continuously while the other ash transfer operations would be scheduled on an eight-hour per day basis.

Administration

If the RDF waste-to-energy facility is located at the Central Plant then additional administrative office areas would not be required. However, the operating personnel still will need office and control room areas. For those sites not located at the Central Plant – including an off-site RDF Processing facility – the design will include, in addition to office and control room areas, areas such as lunch/break room, washroom/locker-room, conference room, maintenance shop, and such.

Siting Considerations

There is insufficient room at the Central Plant site to construct a processing facility, fuel storage building and RDF combustion facility. Therefore, RDF base case facility was sited at the Roudna site. This site is apparently flood prone and may require extensive earthwork to raise the site above flood elevation. A remotely located RDF processing facility (remote from the incineration facility) will require a material transport system for providing fuel to the combustion facility. In this study we have anticipated transport of RDF by truck

Design Basis Summary

The following summarizes the processing and operating conditions that are the basis for the feasibility analysis.

The combustor characteristics and general construction have been previously described in some detail along with the necessary emissions control of equipment. Type of construction and auxiliaries will be adjusted for waste throughput.

FUEL	MSW	MSW
Process Capacity	100,000 tonne annual	50,000 tone annual
Capacity Factor	85%	85%
Heating Value		
Mass-Burn	10.1 MJ/kg	10.1 MJ/kg
RDF	11.9 MJ/kg	11.9 MJ/kg
Steam Conditions		
Temperature	371 °C	371 °C
Pressure	5.2 MPa	5.2 MPa
Turbine/Generator		
Exhaust Temperature	114 °C	114 °C
Exhaust Pressure	0.06 MPa	0.06 MPa

Fuel compositions, combustion equipment and APC equipment have been described in some detail in the previous text. The type of construction and auxiliary requirements have been adjusted for site specific features.

Equipment Manufacturers

The following is a list of U.S. manufacturers who have provided and are capable of providing the major equipment described in this study.

Boilers (Combustion Equipment)

Babcock & Wilcox
20 South Van Buren
Barberton, OH 44203
Telephone – 330-753-4511
FAX – 330-860-1453
Mr. James (Jim) Malone

Foster Wheeler Power Group, Inc.
Perry Ville Corporate Park
Clinton, NJ 08809
Telephone – 719-685-1986
FAX – 719-685-1991
Mr. James Utt

Babcock Power, Inc.
5 Neponset Street
P.O. Box 15040
Worcester, MA 01615
Telephone – 508-854-3966
FAX – 508-854-4609
Mr. Bruce LeBlanc

Air Pollution Control (APC) Equipment (See above also)

Forney Corporation (Continuous Emission Monitors)
3405 Wiley Post Road
Carrollton, TX 75006
Telephone – 763-566-6960
FAX – 763-566-2465
Mr. Dan Anderson

Wheelabrator
441 Smithfield Street
Pittsburgh, PA 15222
Telephone – 412-567-7300
FAX – 412-562-7077
Mr. Augustus (Gus) McDonnough

Materials Handling/Waste Processing Equipment

Wolf & Associates, Inc.
19096 Industrial Boulevard
Elk River, MN 55330
Telephone – 763-576-9040
FAX – 763-576-9070
Mr. Adam Wolf

The Heil Co - Engineered Systems
205 Bishops Way, Suite 201
Brookfield, WI 53005
Telephone – 262-789-5535
FAX – 262-789-5508
Mr. Craig Grinsteiner

Hustler Conveyor Company
4101 Crusher Drive
St. Charles, MO 63304
Telephone – 636-441-8600
FAX – 636-441-8611
Mr. John Poppowski

Mayfran International
6650 Beta Drive
Cleveland, OH 44143
Telephone – 440-461-4100
FAX – 440-461-0147
Mr. John Misch

Fairfield Engineering Co.
240 North Boone Avenue
Marion, OH 43301
Telephone – 740-387-3327
FAX – 740-387-4869
Mr. Marvin McFann

Ash Handling Equipment

United Conveyor Corporation
2100 Norman Drive West
Waukegan, IL 60085
Telephone – 847-473-5900
FAX – 847-473-5959
Mr. ____________________

Beaumont Birch
185 Great valley Parkway
Malvern, PA 19355
Telephone – 610-648-8756
FAX – 610-648-8630
Mr. Sean Kochert

Environ Systems (Conditioners)
190 Summons Avenue
Pewaukee, WI 53072
Telephone – 262-692-3100
FAX – 262-691-3184
Mr. Roger Gladen

Overhead Crane Systems

Whiting Corporation
26000 Whiting Way
Monee, IL 60449
Telephone – 708-587-2000
FAX – 708-587-2001
Mr. Greg Ciecierskia

Material Handling Systems
1022 thousand Oaks Boulevard
Greenville, SC 29607
Telephone – 864-232-1468
FAX – 864-239-0382
Mr. Glenn Hagher

V. ENVIRONMENTAL CONSIDERATIONS

Incineration and the European Union

According to a recent article in *Waste Management World* (International Solid Wastes Association, May-June 2002), the first plant for the incineration of municipal solid waste (MSW) was built in Europe during the 1890s. And as with most industries, waste incineration has evolved over time from its original purpose. At the time of the first plants, incinerators were built for reasons of public hygiene; most notably to deal with cholera epidemics that occurred in heavily populated cities. During the 1900s, the industry began to recognize the benefits of incineration with regards to volume reduction of waste. And in the latter part of the twentieth century, the opportunity for energy recovery was recognized and incorporated into new facility design.

On 15 July 1975, Council Directive 75/442/EC on waste was issued. In addition to setting permit requirements for waste processing and disposal, the directive set forth the following waste management hierarchy:

1. Prevention
2. Reuse and Recycling
3. Energy Recovery

Despite the criticism of various international and local environmental groups regarding follow through on the first two options, MSW incineration with energy recovery fulfills the third item on this hierarchy for the volume of waste that cannot be prevented, reused, or recycled. The recovery of energy produced by the incineration of waste also fulfills the intent of a number of European Community Council Resolutions and various government decrees concerning energy efficiency and the promotion of combined heat and power (CHP) generation.

Several European countries have recently built, or have plans to build, new plants that include energy recovery. During the 1990s, the Netherlands completed construction of ten new high capacity plants, the United Kingdom constructed several new plants, and a new plant was put into operation in Basel, Switzerland. In addition, a number of new incineration plants have been constructed or are under construction in Denmark, Norway, and Sweden.

Regulatory

EU Directive 200/76/EC and Czech Republic Government Decree 354 (July 3, 2002)

A recent Directive of the European Parliament and of the Council (2000/76/EC), of 4 December 2000, provides operating criteria for waste incineration facilities. Embodied within Directive 2000/76/EC are a number of other European Community Action Programmes, Protocols, Conventions, World Health Organization research findings, Treaties, Policies, Communications from the Commission, Resolutions, Directives (including Directive 75/442/EC discussed above), Decisions, and other actions. Please see the text of Directive 2000/76/EC for a complete listing and description of these items. Czech Republic Government Decree 354 (July 3, 2002) implements the requirements of 2000/76/EC, as well as a few additional requirements.

As stated in item (12) of the Whereas section of Directive 2000/76/EC, the proposed PT facility is subject to the requirements of Directive 96/61/EC, which sets out an integrated approach to pollution prevention and control (IPPC regulatory system) in which all aspects of an installation's environmental performance are considered in an integrated manner. Further, item (13) of the Whereas section of Directive 2000/76/EC states the following:

> "Compliance with the emission limit values laid down by this Directive should be regarded as a necessary but not sufficient condition for compliance with the requirements of Directive 96/61/EC. Such compliance may involve more stringent emissions limit values for the pollutants envisaged by this Directive, emission limit values for other substances and other media, and other appropriate conditions."

In other words, the emission limits and other conditions contained in Directive 2000/76/EC are a minimum level of regulatory requirement and other more stringent limits or conditions may be applied if determined to be necessary. To gain a permit to operate the Owner/Operator will have to show that they have systematically developed proposals to apply the "best Available Techniques" (BAT) and meet certain other requirements, taking into account relevant local and regional factors.

The requirements of Directive 2000/76/EC and Decree 354 may be divided into the following four categories, each of which will be discussed in the following sections: General facility operating requirements, air quality requirements, water discharge restrictions, and residue related requirements. Following the discussion of these items will be a section regarding noise regulations that will apply to the facility.

General Facility Requirements

Permit To Operate

An incineration facility must obtain a permit to operate. Further, any substantial change to the facility after its initial permitting will be required to obtain a permit authorizing such a change prior to its implementation. The application for the permit to operate or to make a substantial change is required to contain a description of the measures to be employed that will guarantee that:

a. The plant is designed, equipped and will be operated in such a manner that the requirements of Directive 2000/76/EC are taking into account all categories of waste to be incinerated;
b. The heat generated during the incineration process is recovered to the extent practicable (e.g., through combined heat and power, generation of process steam or district heating);
c. The residues will be minimized in their amount and harmfulness and recycled where appropriate; and
d. The disposal of the residues that cannot be prevented, reduced or recycled will be carried out in conformity with national and Community legislation.

The application must also demonstrate that the facility will comply with the air quality and water discharge (if applicable) requirements of Directive 2000/76/EC. The permit that is issued must explicitly list the categories of waste that may be treated by the facility, include the processing capacity of the plant, and specify the sampling and measurement procedures to be used to demonstrate compliance with the permit requirements. Noncompliance with any conditions of the permit to operate will result in compliance enforcement by the implementing authority.

The operator must provide an annual report to the competent authority on the functioning and monitoring of the plant that will be made available to the public. At a minimum, the report must summarize the operation of the process and the emissions into the air and water as compared to the applicable emission limits.

Delivery and Reception of Waste

An incineration plant is required to take all necessary precautions concerning the delivery and reception of waste in order to prevent or to limit as far as practicable negative effects on the environment, including the pollution of the soil, air, surface water and groundwater as well as odors, noises and direct risks to human health.

Prior to accepting waste at the plant, the mass of each category, if possible according to the European Waste Catalogue (EWC) of waste must be determined. Each category of waste has been given an index number. Examination of the EWC shows that the index for Municipal Wastes and Similar Commercial, Industrial and Institutional Wastes Including Separately Collected Fractions is 20 00 00. Based on current information, the waste stream associated with the proposed facility is anticipated to be 100% of this index. (Refer to Section III, Figure III-3.)

Operating Conditions

Unless a competent authority specifically authorizes alternate conditions, the incineration plant is required to be designed and operated such that:

a. The slag and bottom ash total organic carbon (TOC) content is less than 3% or their loss on ignition is less than 5% of the dry weight of the material. Approved methods of waste pretreatment may be employed to achieve these levels.
b. The temperature of the gas resulting from the process is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavorable conditions, to a temperature of 850 °C, as measured near the inner wall (or other approved point) for two seconds.
c. Each line is equipped with at least one auxiliary burner that must be automatically switched on when the temperature of item b. above falls below 850 °C. It shall also be used during plant startup and shutdown operations to ensure that the 850 °C temperature is maintained at all times during these operations and whenever unburned waste is in the combustion chamber.
d. During startup and shutdown or when the temperature of the combustion gas falls below 850 °C, the auxiliary burner shall not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil as defined in Article 1(1) of Council Directive 75/716/EEC (no longer in force – superceded by Council Directive 1999/32/EEC), liquefied gas, or natural gas.
e. Reduces odor nuisance to a minimum. To accomplish this, the waste storage area shall be kept under vacuum and the exhausting air transferred into the grate. If combustion is not running the exhausting air is ducted away as authorized.
f. Any heat generated by the incineration process is recovered as far as practicable.
g. Clinical and veterinary waste which collection and disposal require special provisions should be placed directly into the furnace without first being mixed with other categories of waste and without direct handling.

The incineration plant must also have and operate an automatic system to prevent waste feed under the following conditions:

a. At startup, until the temperature of 850 °C has been reached;
b. Whenever the temperature of 850 °C is not maintained;
c. Whenever the continuous measurements required by the Directive show that any emission limit value is exceeded due to disturbances or failures of the purification devices (Air Pollution Control Equipment).

To safeguard human health and the environment, the incineration plant must be designed, equipped, built, and operated so that the air emissions do not result in a significant rise in ground-level air pollution. To ensure this, the exhaust gases must be discharged in a controlled fashion and in conformance with Community air quality standards. In addition, the management of an incineration plant must be in the hands of a natural person who is competent to manage the plant.

Emission Monitoring

The Directive-required emission measurement equipment must be installed and techniques used to monitor the parameters, conditions and mass concentrations relevant to the incineration process. These measurement requirements must be detailed in the facility's permit and the sampling or measurement points shall be located as determined by the competent authority. The appropriate installation and the functioning of the automated monitoring equipment for emissions into air and water are subject to control and to an annual surveillance test. Calibration of the equipment must be done by means of parallel measurements with a reference method at least every three years.

The periodic measurements of emissions into the air must be carried out representatively as given by CEN-standards. If CEN standards are not available, ISO standards, national or international standards that will ensure the provision of data of an equivalent scientific quality shall apply. Any measurement that shows an exceedance of any emission limit value for air must be reported to the competent authority without delay. Each periodic measurement must consist of three individual test runs.

Air Pollutant Monitoring

The following air pollutants must be measured continuously:

- Nitrogen Oxides (NO_x) expressed as Nitrogen Dioxide (NO_2)
- Carbon Monoxide (CO)
- Total Dust (particulate)

- Total Organic Carbon (TOC)
- Inorganic Chloride Compounds in gaseous phase expressed as Hydrogen Chloride (HCl)
- Inorganic Fluorine Compounds in gaseous phase expressed as Hydrogen Fluoride (HF)
- Sulfur Dioxide (SO_2)

The continuous monitoring of HF may be omitted if the approach used to control HCl ensures that the HCl limit will not be exceeded. And the continuous monitoring of HCl, HF, and SO_2 may be replaced with periodic measurements if it can be proven that the emissions of those pollutants can under no circumstances be higher than the prescribed emission limit values. In these cases, the frequency of HF, HCl, and SO_2 measurements is the same as that outlined below for heavy metals and dioxins and furans (not including the reduced frequency provisions).

During the first 12 months of operation, one measurement at least every three months must be made of heavy metals and dioxins and furans. After the first year, these measurements are required at least twice per year. The frequency of testing for heavy metals may be reduced to once every two years and dioxins and furans can be reduced to once per year provided that the emissions resulting from the incineration process are below 50% of the emission limits of Annex V of Directive 2000/76/EC (Annex 5 of Decree 354) and provided that the following criteria, at a minimum, are met:

a. The waste to be incinerated consists only of certain sorted combustible fractions of non-hazardous waste not suitable for recycling and presenting certain characteristics, and which is further specified on the basis of the assessment referred to in subparagraph d. of the directive;
b. national quality criteria, which have been reported to the Commission, are available for these wastes;
c. incineration of these wastes is in line with the relevant waste management plans referred to in Article 7 of Directive 75/442/EEC;
d. the operator can prove to the competent authority that the emissions are, under all circumstances, significantly below the emission limit values set out in Annex V of Directive 2000/76/EC (Annex 5 of Decree 354) for heavy metals, dioxins and furans; this assessment must be based on information on the quality of the waste concerned and measurements of the emissions of the said pollutants;

e. the quality criteria and the new period for the periodic measurements are specified in the permit; and

f. all decision on the frequency of measurement referred to in this paragraph, supplemented with information on the amount and quality of the waste concerned, is communicated to the Commission on an annual basis.

Member states may also fix measurements periods if they have set emission limit values for polycyclic aromatic hydrocarbons or other pollutants.

Operating Parameter Monitoring

The following process operation parameters must be continuously monitored:

- Temperature near the inner wall (or at another representative point of the combustion chamber as authorized by competent authority)
- Concentration of oxygen
- Pressure
- Temperature
- Exhaust gas moisture content (not required if the sampled exhaust gas is dried before the emissions are analyzed)

The residence time, minimum temperature, and oxygen content of the exhaust gases are subject to verification, at least once when the incinerator is brought into service and under the most unfavorable operating conditions anticipated.

Determination of Compliance

All measurement results must be recorded, processed, and presented such that the competent authority can verify compliance with the permitted operating conditions and emission limits contained in Directive 2000/76/EC (Decree 354) in accordance with procedures to be decided upon by those authorities.

To verify compliance with the air emission limits, the measurement results shall be standardized to a temperature of 273 K, pressure of 101.3 KPa, and 11% oxygen, dry gas, in the exhaust gas of the incineration plant. The monitoring method and frequency of the mass of pollutants in the treated wastewater must be conducted in accordance with Community legislation and as detailed in the facility permit.

The compliance determination for specific air emission limits is described in the following sections.

Air Quality Requirements

Tables V-1 through V-7 summarize the air quality emission limits with which the facility must comply. Member States may set emission limit values for polycyclic aromatic hydrocarbons or other pollutants. In addition, the plant must be designed, equipped, built, and operated so that the general odor emission limit values set out by Czech Republic Decree 356/2002 are complied with.

TABLE V-1

DAILY AVERAGE LIMITS – no exceedances allowed

Pollutant	Limit
Total Dust	10 mg/m^3
Gaseous and vaporous organic substances	10 mg/m^3, expressed as total organic carbon
Hydrogen chloride (HCl)	10 mg/m^3
Hydrogen fluoride	1 mg/m^3
Sulfur dioxide (SO_2)	50 mg/m^3
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	200 mg/m^3, expressed as nitrogen dioxide

Table V-2

HALF-HOURLY AVERAGE LIMITS

Pollutant	**Limit**
Total Dust	**Either** 30 mg/m^3, 100% of the time, **OR** 10 mg/m^3, at least 97% of the half-hourly average values over the year cannot exceed limit
Gaseous and vaporous organic substances	**Either** 20 mg/m^3, 100% of the time, **OR** 10 mg/m^3, at least 97% of the half-hourly average values over the year cannot exceed limit
Hydrogen chloride (HCl)	**Either** 60 mg/m^3, 100% of the time, **OR** 10 mg/m^3, at least 97% of the half-hourly average values over the year cannot exceed limit
Hydrogen fluoride	**Either** 4 mg/m^3, 100% of the time, **OR** 2 mg/m^3, at least 97% of the half-hourly average values over the year cannot exceed limit
Sulfur dioxide (SO_2)	**Either** 200 mg/m^3, 100% of the time, **OR** 50 mg/m^3, at least 97% of the half-hourly average values over the year cannot exceed limit
Nitrogen monoxide (NO) and nitrogen dioxide (NO_2)	**Either** 400 mg/m^3, 100% of the time, **OR** 200 mg/m^3, at least 97% of the half-hourly average values over the year cannot exceed limit

TABLE V-3

AVERAGE VALUE OVER SAMPLE PERIOD OF A MINIMUM OF 30 MINUTES AND A MAXIMUM OF 8 HOURS – no exceedances allowed

Pollutant	Limit
Cadmium & compounds, as Cd Thallium & compounds, as Tl	total 0.05 mg/m^3
Mercury & compounds, as Hg	0.5 mg/m^3
Antimony & compounds, as Sb Arsenic & compounds, as As Lead & compounds, as Pb Chromium & compounds, as Cr Cobalt & compounds, as Co Copper & compounds, as Cu Manganese & compounds, as Mn Nickel & compounds, as Ni Vanadium & compounds, as V	total 0.5 mg/m^3

TABLE V-4

AVERAGE VALUE OVER SAMPLE PERIOD OF A MINIMUM OF 6 HOURS AND A MAXIMUM OF 8 HOURS – no exceedances allowed

Pollutant	Limit
Dioxins and furans	0.1 ng/m3, toxic equivalence, (see Table 7 for equivalence factors)

TABLE V-5

ADDITIONAL CO LIMIT – excluding start-up and shut-down

Averaging Period	Limit
Daily	50 mg/m^3, at least 97% of the daily average values over the year cannot exceed this limit
10-minute or half-hour	150 mg/m^3 of at least 95% of all measurements determined as 10-minute average values, **OR** 100 mg/m^3 of all measurements determined as half-hourly average value values taken in any 24-hour period

TABLE V-6

DIOXINS AND FURANS TOXIC EQUIVALENCE FACTORS

Cogeneration	Equivalence Factor
2,3,7,8 – Tetrachlorodibenzodioxin (TCDD)	1
1,2,3,7,8 – Pentachlorodibenzodioxin (PeCDD)	0.5
1,2,3,4,7,8 – Hexachlorodibenzodioxin (HxCDD)	0.1
1,2,3,6,7,8 – Hexachlorodibenzodioxin (HxCDD)	0.1
1,2,3,7,8,9 – Hexachlorodibenzodioxin (HxCDD)	0.1
1,2,3,4,6,7,8 – Heptachlorodibenzodioxin (HpCDD)	0.01
– Octachlorodibenzodioxin (OCDD)	0.001
2,3,7,8 – Tetrachlorodibenzofuran (TCDF)	0.1
2,3,4,7,8 – Pentachlorodibenzofuran (PeCDF)	0.5
1,2,3,7,8 – Pentachlorodibenzofuran (PeCDF)	0.05
1,2,3,4,7,8 – Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,6,7,8 – Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,7,8,9 – Hexachlorodibenzofuran (HxCDF)	0.1
2,3,4,6,7,8 – Hexachlorodibenzofuran (HxCDF)	0.1
1,2,3,4,6,7,8 – Heptachlorodibenzofuran (HpCDF)	0.01
1,2,3,4,7,8,9 – Heptachlorodibenzofuran (HpCDF)	0.01
– Octachlorodibenzofuran (OCDF)	0.001

The half-hourly and 10-minute average values must be determined within the effective operating time (excluding the start-up and shut down periods while waste is not being fed) from the measured values after subtracting the value of the confidence interval listed in Table 7 below. The daily average values are determined using those validated average values. Further, to obtain a valid daily average value, no more than five half-hourly average values in any day can be discarded due to malfunction or maintenance of the continuous measurement system. No more than ten daily average values per year can be discarded due to continuous measurement system malfunction or maintenance.

As soon as appropriate continuous measurement techniques are available within the Community for heavy metals, dioxins and furans the Commission must decide the date from which such measurement will be required.

The permissible odor nuisance must be determined in the way and by means of procedures for odor emission measurement according to Decree 356.

TABLE V-7

95% CONFIDENCE INTERVALS

Pollutant	Value
Carbon Monoxide	10%
Sulfur Dioxide	20%
Nitrogen Dioxide	20%
Total Dust	30%
Total Organic Carbon	30%
Hydrogen Chloride	40%
Hydrogen Fluoride	40%

NOTE: At the daily emission limit value level, the values of the 95% confidence intervals of a single measured result shall not exceed the given percentages of the emission limit values.

Water Quality Requirements

Based upon the anticipated design of the facility, the air pollutant emissions will not be controlled using a water-based control approach that directly produces a water discharge (such as wet scrubbing or wet electrostatic precipitators). Therefore, the requirements in Article 8 of Directive 2000/76/EC and Section 7 of Government Decree 354 (Water discharges from the cleaning of exhaust gases) will not be applicable to the proposed facility.

Waste water will be generated by other activities at the facility, such as ash treating, that may be discharged to the local urban waste water treatment plant. Council Directive 91/271/EEC contains a number of general requirements for this type of activity. These general requirements, which must be authorized by competent authority or appropriate body, subject the waste water entering the collection system to such pre-treatment that is required to:

- protect the health of staff working in the collecting systems and treatment plant,
- ensure that the collecting systems, waste water treatment plant, and associated equipment are not damaged,
- ensure that the operation of the waste water treatment plant and the sludge treatment are not impeded,
- ensure that the discharges from the treatment plant do not adversely affect the environment, or prevent receiving water from complying with other Community Directives,
- ensure that sludge can be disposed of safely in an environmentally acceptable manned.

Residue Generation and Handling

The facility must be operated in a way that minimizes the amount and harmfulness of the residues that are generated. If appropriate, the residues are to be recycled, either directly in the plant or outside, in accordance with any applicable Community legislation. In addition, the transport and intermediate storage of dry residues (including boiler and collected dusts) must prevent dispersal of the residues into the environment (e.g., use of closed containers, wetting, etc.).

Prior to determining how the residues are to be recycled or disposed, appropriate testing must be performed to establish the physical and chemical characteristics and the polluting potential of the various incineration residues. The analysis is required to include total soluble fraction and heavy metals soluble fraction.

Abnormal Operating Conditions

The facility permit must include the maximum permissible period of any technically unavoidable stoppages, disturbances, or failures of the control equipment or measurement devices, during which the concentrations in the air discharges may exceed the prescribed emission limits. In the case of a breakdown, the facility will be required to reduce or cease operations as soon as practicable until normal operations can be restored. The operator must communicate the exceedance of emission limit values immediately to the competent air protection authorities.

Under no circumstances can the facility continne to incinerate waste for a period of more than four hours uninterrupted where emission limit values are exceeded. In addition, the cumulative duration of operation during such conditions must be less than 60 hours in any one year. This 60-hour duration value applies to those lines of the facility that are linked to a single flue gas-cleaning device.

The total dust (particulate) content of the emissions into the air from the incinerator cannot exceed 150 mg/m^3, expressed as a half hourly average, under any circumstances. In addition, the TOC and CO air emissions limits cannot be exceeded (see Tables V-2 and V-5 above). All other conditions listed under Operating Conditions above must also be complied with.

Noise Requirements

At this time, the EC does not appear to have specific restrictions on industrial noise impacts. However, Directive 2002/49/EC requires that member states submit to the Commission, no later than 18 July 2005, any relevant noise limit values in force within their territories or under preparation, along with an explanation as to the implementation of the limit values.

Estimation of Potential Emissions

An estimate of the facility's potential to emit the air pollutants regulated by Directive 2000/76/EC is presented as Table V-8. Estimates are provided for the following four potential facility designs:

1. 100,000 tonne annual
2. 50,000 tonne annual
3. 100,000 tonne annual 70% (RDF) unit processed from the waste stream)
4. 50,000 tonne annual (70% RDF unit processed from the waste stream)

Included, as Table V-9, is an estimate of the annual emission fees that can be expected with each of the design scenarios. As a note, these estimates are conservatively high because they are based on the facility operating at capacity and at each permitted emission limit every hour of the expected 85% operating time. Because actual pollutant emissions are expected to be less than these maximums, the fees are conservatively presented.

Estimated Reduction in Greenhouse Gas Emissions

MSW is managed by a variety of methods, including landfilling and various methods of combustion. Each of the management methods has a unique contribution to the generation and emission of greenhouse gases (GHG). In September 1998 US EPA produced a document titled "Greenhouse Gas Emissions from Management of Selected Materials in Municipal Solid Waste" that was developed to support climate change mitigation accounting for the various waste management methods. The analysis presented below uses the techniques presented in the EPA document to estimate GHG emissions for the following management approaches:

- 50,000 metric tons of waste landfilled compared to:
  - 50,000 tonne mass burn facility
  - 50,000 tonne RDF facility

- 100,000 metric tons of waste landfilled compared to:
  - 100,000 tonne mass burn facility
  - 100,000 tonne RDF facility

Note that all GHG emissions values are adjusted and presented in terms of tonnes of carbon equivalent per ton of MSW (MTCE/tonne), using the following equation.

$$\text{MTCE} = (\text{Mg of gas}) \times (\text{GWP}) \times \left(\frac{12}{44}\right)$$

MTCE is the standard GHG unit used in greenhouse gas discussions and is calculated by using the above equation for each individual greenhouse gas and summing the results for each greenhouse gas emitted by the process.

The greenhouse gas emissions from a landfill consist primarily of two constituents – carbon dioxide, with a GWP (Greenhouse Warming Potential) of 1, and methane, with a GWP of 21. As obtained from US EPA's greenhouse gas document referenced above, the net GHG emissions for a landfill without gas collection are 0.10 MTCE/tonne waste. The greenhouse gas emissions from an incineration process consist primarily of carbon dioxide. However, because the facility will generate power, the greenhouse gas emissions produced by the incinerator will offset those that would be otherwise produced by local power plants. As obtained from EPA's greenhouse gas document referenced above, the net GHG emissions for a mass burn facility with power generation is -0.03 MTCE/tonne waste and for an RDF facility with power generation is -0.02 MTCE/tonne waste.

Based on this information and the assumption that the landfilled waste would be placed in a facility without gas collection, the incineration of the waste is anticipated to reduce the amounts of greenhouse gases released to the air as compared to landfilling. For the 50,000 metric tonne case, the mass burn facility will result in a net decrease of 6500 MTCE/yr of greenhouse gases. For this same case, the RDF facility would result in a net decrease of 6000 MCTE/yr of greenhouse gases.

For the 100,000 metric ton case, the mass burn facility will result in a net decrease of 13000 MTCE/yr of greenhouse gases. For this same case, the RDF facility would result in a net decrease of 12000 MCTE/yr of greenhouse gases.

As a note, if the waste is landfilled in a facility that is equipped with a gas collection system and flare, the net GHG emission factor reduces from the 0.10 value referenced above to –0.09 MCTE/tonne of waste. If the landfill is equipped with a collection system and includes power generation from the collected gas, the net GHG emission factor reduces even further to –0.12 MCTE/tonne of waste.

Estimation of Potential Annual Emissions - Regulated Pollutants

	Case 1	Case 2	Case 3	Case 4
	100,000 Tonne Annual	50,000 Tonne Annual	100,000 Tonne Annual	50,000 Tonne Annual
Capacity (tonne per day	322	161	226	113
Stack Gas Temperature (°C) [a]	135	135	135	135
Dry Flue Gas Density (lb/ft^3) [b]	0.0563	0.0563	0.0563	0.0563
Stack Gas Flow (lb/hr) [a]	180,000	90,000	125,000	62,500
Stack Gas Flow (dacfm)	53,300	26,600	37,000	18,500
Stack Gas Flow (dscfm)	47300	23600	32800	16400
Stack Gas Flow (dsm^3/hr)	80400	40100	55700	27900

Pollutant	Limit (daily average) [c]	metric ton/yr [d]	metric ton/yr [d]	metric ton/yr [d]	metric ton/yr [d]
Total Dust	10 mg/m3	7.04	3.51	4.88	2.44
Gaseous and vaporous organic substances (TOC)	10 mg/m3	7.04	3.51	4.88	2.44
Hydrogen Chloride (HCl)	10 mg/m3	7.04	3.51	4.88	2.44
Hydrogen Fluoride (HF)	1 mg/m3	0.70	0.35	0.49	0.24
Sulphur Dioxide (SO_2)	50 mg/m3	35.22	17.56	24.40	12.22
Nitrogen Monoxide and Dioxide (NO_x)	200 mg/m3	140.86	70.26	97.59	48.88
Cadmium and Compounds (Cd)	total 0.05 mg/m3	0.035	0.018	0.024	0.012
Thallium and Compounds (Tl)					
Mercury and Compounds (Hg)	total 0.05 mg/m3	0.035	0.018	0.024	0.012
Antimony and Compounds (Sb)	total 0.5 mg/m3	0.35	0.18	0.24	0.12
Arsenic and Compounds (As)					
Lead and Compounds (Pb)					
Chromium and Compounds (Cr)					
Cobalt and Compounds (Co)					
Copper and Compounds (Cu)					
Manganese and Compounds (Mn)					
Nickel and Compounds (Ni)					
Vanadium and Compounds (V)					
Dioxins and Furans, Toxic Equivalence (TE)	0.1 ng/m3	0.070430400	0.035127600	0.048793200	0.024440400
Carbon Monoxide (CO)	50 mg/m3	35.22	17.56	24.40	12.22

[a] Obtained from predicted performance data Prepared by B&W

[b] Based on flue gas density engineering data for coal combustion.

[c] Total Dust, TOC, HCl, HF, SO_2, NO_x, and CO values based on daily average values and metals and dioxins/furans values based on 8 hour values of Annex V of Directive 2000/76/EC (4 December 2000).

[d] Assumes operation at capacity 8760 hours per year.

Table V-8

Estimation of Potential Annual Pollution Fees - Regulated Pollutants

	Case 1	Case 2	Case 3	Case 4	Emission Fee
	100,000 tonne/Year	50,000 tonne/Year	100,000 tonne/Year	50,000 tonne/Year	
Pollutant	metric ton/yr *	metric ton/yr *	metric ton/yr *	metric ton/yr *	CZK/ton
Total Dust	5.04	2.52	3.50	1.75	3000
Gaseous and vaporous organic substances (TOC)	5.04	2.52	3.50	1.75	2000
Hydrogen Chloride (HCl)	5.04	2.52	3.50	1.75	0
Hydrogen Fluoride (HF)	0.50	0.25	0.35	0.18	0
Sulphur Dioxide (SO_2)	25.21	12.59	17.51	8.75	1000
Nitrogen Monoxide and Dioxide (NO_x)	100.85	50.35	70.02	35.01	800
Cadmium and Compounds (Cd) Thallium and Compounds (Tl)	0.025	0.013	0.018	0.009	20000
Mercury and Compounds (Hg)	0.025	0.013	0.018	0.009	20000
Antimony and Compounds (Sb) Arsenic and Compounds (As) Lead and Compounds (Pb) Chromium and Compounds (Cr) Cobalt and Compounds (Co) Copper and Compounds (Cu) Manganese and Compounds (Mn) Nickel and Compounds (Ni) Vanadium and Compounds (V)	0.25	0.13	0.18	0.09	20000
Dioxins and Furans, Toxic Equivalence (TE)	0.050426460	0.025174500	0.035011920	0.017505960	0
Carbon Monoxide (CO)	25.21	12.59	17.51	8.75	600
Annual Cost USD**	**$4,567**	**$2,284**	**$3,176**	**$1,588**	

* Assumes operation at capacity 7446 hours per year (reflects design criteria of 85% of potential annual operating hours).
** Converts Kc to USD at a rate of Kc=$0.03

Table V-9

VI. SITE COMPARISONS

HDR evaluated four sites, selected by Plzenska teplarenska, located within the confines of the City of Plzen. Figure VI-1 (Appendix A) provides the relative location of each of the sites. Additional figures cited in this section are also found in Appendix A unless otherwise noted.

Central Plant - The Central Plant location is the Central heating plant of Plzenska teplarenska in Doubravka.

Roudna - The Roudna site is located on undeveloped flood-prone property approximately 1.2 km northeast of the Central Plant.

Bory - The Bory site is located at the Plzenska teplarenska's satellite heating plant. The property is developed and space is severely limited. The property is approximately 3.5 km to the southeast of the Central Plant in the Plzen district of Doudevce.

Plzenska Energēlika - The Plzenska Energēlika site is located on apparently undeveloped property in the Karlov district of Bory. This property is approximately 3.2 km east, southeast of the Central Plant.

To assist the site evaluation process HDR prepared model layouts of both technologies using the 100,000 tonne per year size as the template. The model layouts were then laid over the available sites to verify whether or not the site had sufficient space. Construction costs were estimated and the site evaluated in broad terms. From these costs and evaluations, HDR and FVB determined the advantages/disadvantages and economic prospects for Plzenská teplárenská. A brief description and evaluation of each site follows.

Central Plant: Located within the confines of the existing combined heat and power (CHP) facility in Doubravka 1. This area is industrial and is adequately serviced by both rail and road. The existing facility has a well-developed electrical distribution system and district-heating infrastructure with auxiliary equipment and resources already in place. The addition of an incineration facility is not anticipated to generate significant changes to the operation of the Central Plant.

A conceptual Mass Burn facility is shown in Figure VI-8. The space available appears adequate and although access appears sufficient from Doubraveka road, some changes to the site access may be anticipated to accommodate increased traffic flow. Utilities (sewer, water, and electric distribution) are well established for service to the existing facility and appear adequate.

A conceptual RDF facility for the Central Plant site is shown in Figure VI-12. The space available appears adequate for an RDF incineration facility, with on site fuel storage. However due to the additional space required for RDF processing structures and equipment it is anticipated that RDF processing will be off site. As with the Mass burn facility the access and utilities appear adequate or could be easily modified for the incinerator.

Roudna. The site is located on undeveloped land in the City of Plzen's Roudna district. Since Plzenská teplárenská already provides heat to the district at this site, access to the district heating system is readily available. However, utilities such as water, sewer and electricity do not appear to adequately serve this site so utility extensions may be required

Interconnection to the Czech Republic grid will require the construction of a complete substation and transmission interconnection. The closest interconnection point may be the Central Plant which is approximately 1.2 km directly southwest of the site. The site has good road access from the north via Na Roudna, however no rail access is available.

The site is subject to flooding and it will be necessary to raise its base elevation an estimated 3 meters. Considerable fill will be required and slope stabilization will be necessary.

Figure VI-9 depicts a conceptual mass burn facility and Figure VI-13 depicts a conceptual RDF incineration processing and fuel storage facility.

Plzenská electrika. This site is located on vacant land in the Karlov area of Plzen's Bory district with access most likely from the north at Borska road. Rail access is unlikely. Although access to the district heating system along Borska road is available, it is apparent that water, sewer, and electrical utility services may have to be extended into the site—particularly interconnection with the Czech electric grid. The space appears adequate for the mass burn facility as well as the RDF plant including incinerator and processing equipment.

Figure VI-11 and VI-15 show conceptual site layouts for the Mass Burn and RDF facilities respectively.

Bory. The Bory site is located in the City of Plzen's Doudlevce district—a site where Plzenská teplárenská already has a coal-fired satellite district heating plant. Street access to the site would be via Edvarda Benese, but rail access would be unlikely. Access to the district heating system would be reasonably straight forward, and utilities in general would be adequate, except the electrical interconnection with the grid system might have to be upgraded. The mass burn model is shown in Figure VI-10 and the RDF model—without the processing line—is shown in figure VI-14. The site space is limited for either technology. In fact this site is unattractive for two reasons; first there are a number of residential homes just east of the plant whose residents might object to having a "garbage burner" in their backyard and second, there really isn't enough room for a waste-to-energy facility unless the satellite plant's operation could be seriously impaired by taking over the coal storage area. But even if the space constraints could be overcome, the risk that residents would resist the project is so high that Plzenská teplárenská would be well advised to remove this site from further consideration.

VII. ECONOMIC ASSESSMENT

Introduction

The determination of the cost per tonne of waste processed (tipping fee) considering fixed and operating costs of a waste-to-energy facility (and to provide a return on Plzenská teplárenská's investment) is the primary focus of the economic assessment. The costs associated with a waste-to-energy facility will be more than the current cost of landfilling, and it is important for civil authorities to understand the cost differences since Plzenská teplárenská will require support from the community as represented by the local government.

Put this into perspective, as a self-sufficient operation without outside financial support and with a respectable rate of return, the tipping fees of a waste-to-energy facility could range from 2,670 to 3,170 Kč/tonne ($88.9 to $105 per tonne), and up to 3,700 Kč/tonne ($123 per tonne) if for whatever reason, the operator cannot take advantage of the economies of scale of a larger facility. When compared to the current cost of landfilling, which is about 830 Kč/tonne ($28/tonne), one can see that a waste-to-energy facility will be expensive. In one sense, if landfilling is not an option it is inappropriate to compare waste-to-energy with landfilling; however, there is a practical benefit to alert the community about what the cost impacts might be.

Plzenská teplárenská must also understand the financial risks and benefits of a waste-to-energy project relative to other projects that they could develop. Plzenská teplárenská is in a good position to venture into the waste incineration business. They have a reasonably sound financial position; they are experienced with operating complex combustion equipment; and they have a proven reliability track record. Waste incineration is a good business for Plzenská teplárenská to diversify into. District heating is by its nature seasonal, and revenues from waste incineration would help even out the cash flow. Additionally, the factors that affect waste generating entities should be different than the factors that affect district heating customers. Even if a commercial heating customer goes out of business, the flow of community waste will not change much.

The initial screening examined two potentially attractive technologies; Mass Burn and refuse derived fuel (RDF). Each of the two technologies offers advantages and disadvantages, and by evaluating both, we illustrate the relative economic benefits of choosing one over the other. To show the economies of scale, we evaluated two sizes of plants. Additionally, we assessed the economics associated with constructing a waste-to-energy facility at the various sites under consideration.

Finally we examined the one most attractive alternative from the screening analysis. We performed a variety of sensitivity analyses to examine how key variables might affect the tipping fee, that is, the cost that must be born by the community.

Methodology

Key Assumptions

Key assumptions and analysis findings are summarized on one page so that the impacts of changes in these assumptions can be readily determined. The findings show the level of tipping fee required to meet the target return on investment.

Key model input assumptions included:

- Financial parameters including debt interest rate, debt term, debt /equity ratio and target internal rate of return on equity.
- Revenue assumptions including the sale of electricity and heat.
- Unit costs for consumables such as electricity, makeup water and water treatment chemicals.
- Unit costs for consumables displaced from the existing central plant such as coal and absorbent.
- Depreciation provisions applicable to the assets based on Czech tax regulations.
- Taxes applicable to this business.
- Escalation rates for key costs and for the tipping fee.

Additional inputs to the analysis model included:

- The amount of input waste fuel processed each year
- Capital costs for construction of the waste-to-energy plant. In addition to the construction costs, design and financing costs were included.
- Operation and maintenance (O&M) costs. These costs were determined based on the type of plant capacity assumed. O&M costs included labor, electricity, emissions fees, water and sewer, water treatment chemicals, maintenance, ash disposal, and depreciation.
- Operating reserve fund. The operating reserve fund provides cash during years when expenses exceed income. In the screening analysis the fund was set at 96 million Kč ($3,200,000), and interest was assumed to accrue at the rate of 3.5% annually. In the Base Case final analysis, the operating reserve was not used.

Analysis findings included:

- Annual debt service
- Annual revenues generated through tipping fees, and electricity and heat sales
- Annual depreciation costs
- Annual property, income or other taxes

Net operating income and cash flow were calculated assuming:

- Net operating income based on total revenues minus total cash operating costs excluding debt service (principal and interest).
- Depreciation and interest costs were then deducted to determine net income. Cash flow was based on cash revenue and cash expenses.
- Income tax was calculated and subtracted from net income.
- Cash flow with residual value was calculated by adding the depreciated book value of the assets to the cash flow in the ending year of the economic analysis.
- Accumulated cash flow was calculated.

The internal rate of return on equity and breakeven point were then calculated. Internal rate of return represents the discount rate that makes the cash flow plus residual book value equal to the equity invested. The breakeven point is the year in which the cumulative cash flow equals zero; that is, the cumulative cash position turns from negative to positive.

Key Financial Variables

Financial success can be defined as achieving a target return on equity. The major assumptions affecting the financial success of a waste-to-energy project include variables relating to capital expense, financing, revenues, and operating costs.

Capital Expense

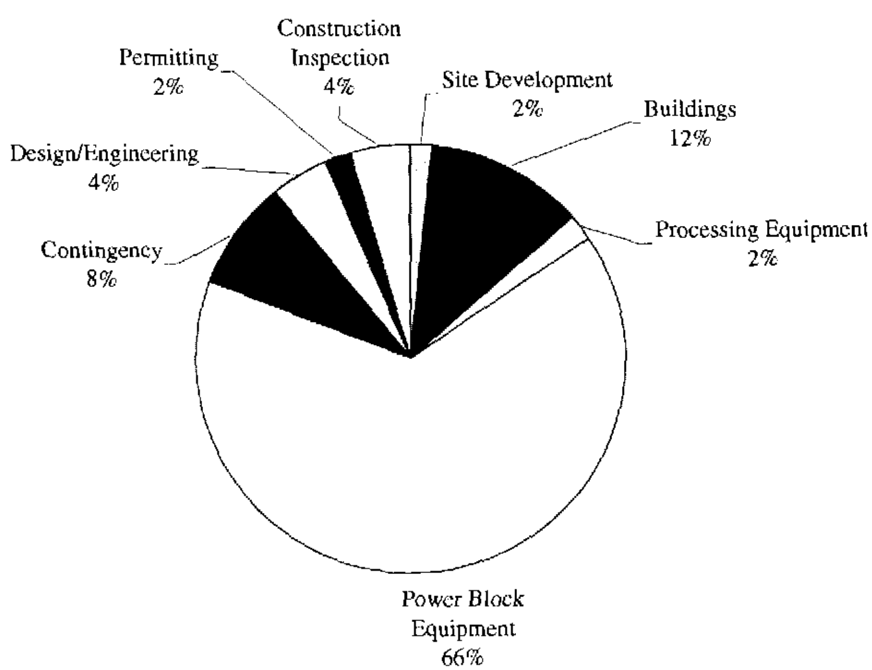
Key variables included waste-to-energy technology, emission control equipment costs, and land. Equipment requirements to meet applicable emission control regulations can also have a significant impact on capital costs. For alternatives that might be located on land that Plzenská teplárenská does not own, land cost was assumed to consist of the land plus whatever costs are necessary to develop the site to make it suitable for the waste-to-energy plant. These improvements include flood control measures, utilities (water, sewer, storm drainage, natural gas, electricity), and access roads. To an extent, it is reasonable to expect Plzenská teplárenská would pay for roads and other infrastructure required to accommodate the project; however, such sympathy could lead to abuses if civil authorities use the project as an excuse to pay for long overdue improvements that would normally be the responsibility of the civil authority. Therefore, this analysis included only site related infrastructure costs within the site boundary. The project capital expenses are summarized in Table VII-1, and the distribution of the construction cost is presented in Figure VII-1. Detail backup for site-specific plant developments is shown in Appendix B.

TABLE VII-1
PROJECT CAPITAL EXPENSE SUMMARY
Expressed in 2003 Kč ($)

Site	Tonne/yr	Mass-Burn		RDF	
		Million Kč	Million $	Million Kč	Million $
Central Plant	100,000	1,630	54.3	1,820	60.8
	50,000	1,110	36.9	1,410	46.9
Roudna	100,000	1,880	62.6	1,910	63.5
	50,000	1,300	43.4	1,510	50.3
Plzenská Energetiká	100,000	1,770	59.1	1,890	62.9
	50,000	1,210	40.4	1,460	48.7
Bory	The Bory site is not suitable for a waste-to-energy facility.				

Note: Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.

FIGURE VII-1
CONSTRUCTION COST CATEGORIES



Financing

Financing variables included debt interest rate and term, debt/equity ratio. The following values were used in the screening analysis:

- Interest rate: 5%
- Term: 12 years; no payments during the first two years of construction; 10 years to final payment
- Equity investment: 25% of total project cost

Revenues

Tipping fees will be the primary source of revenue for the waste-to-energy facility. Since Plzenská teplárenská's district heating load is projected to remain constant and they can meet the load now with existing equipment, the waste-to-energy project would offer no value towards fixed costs. That is, the construction of the waste-to-energy project would not allow Plzenská teplárenská to avoid or defer adding boiler capacity. With this perspective, the waste-to-energy project will allow Plzenská teplárenská to avoid only variable costs such as fuel, which in this case is brown coal. Variable costs and current district heating prices are shown in Table VII-2 below. (Later when we examine the Base Case in greater detail, we will discuss Plzenská teplárenská's rationale for challenging the assumption that heat should be valued at only the avoided variable cost.)

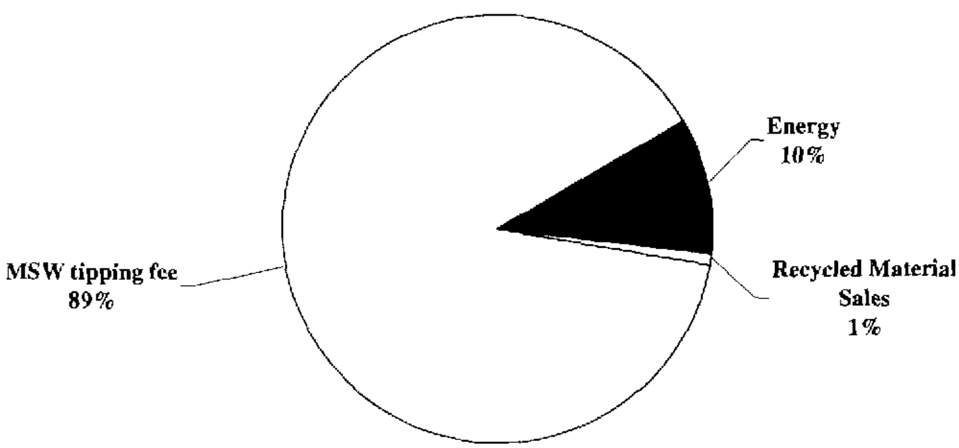
TABLE VII-2
PLZENSKÁ TEPLÁRENSKÁ VARIABLE COSTS AND DISTRICT HEATING RATES

Costs	**Kč**	**Kč per GJ**	**$US per MMBtu**
Variable	230,814	56.31 Kč	$1.98
Heat purchased	64,620	15.76 Kč	$0.55
Fixed	346,832	84.61 Kč	$2.98
Total	642,266	156.69 Kč	$5.51
Prices (without VAT)			
Residential		159 Kč	$5.59
Note: Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.			

Source: Plzenská teplárenská

Furthermore, from the high-pressure, 13.4 MPa (1,944 psig) boilers, Plzenská teplárenská currently generates about 106 kWh net/GJ (112 kWh net/MMBtu) of export heat, but from the 4.8 MPa (700 psig) waste-to-energy boilers Plzenská teplárenská will only generate 67.8 kWh/GJ (71.5 kWh net/MMBtu). This means that for each unit of district heat (GJ or MMBtu) that is supplied by the waste-to-energy facility, Plzenská teplárenská will save 56.3 Kč per GJ ($1.98 per MMBtu) in variable costs (coal primarily) but lose the revenue from 38.2 kWh/GJ (40.5 kWh/MMBtu) in net electric generation. The amount of lost revenue (lost opportunity to sell at the higher cogeneration rate) is the sell rate minus the variable cost to produce the electricity (mostly coal cost). On average Plzenská teplárenská's variable cost to produce cogenerated electricity is 266 Kč/MWh ($0.0089/kWh). Thus subtracting the variable cost of 266 Kč/MWh ($0.0089/kWh) from the selling rate of 901 Kč/MWh ($.030/kWh) yields lost revenue of 635 Kč/MWh ($0.021/kWh). The sources of revenue are presented in Figure VII-2.

FIGURE VII-2
SOURCES OF REVENUE



Operating Costs

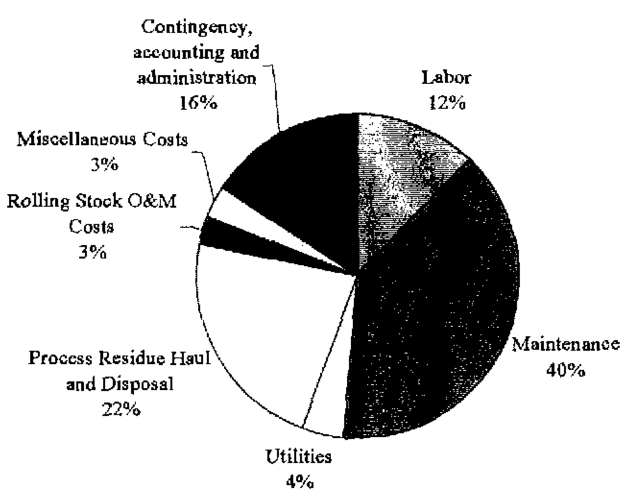
Operating cost variables included items such as labor, maintenance, fuel, absorbent, electricity, makeup water, chemicals, and emission fees. The annual operating costs are summarized in Table VII-3, and the distribution of costs is presented in Figure VII-3. Detail backup for site-specific plant developments is shown in Appendix B.

TABLE VII-3
ANNUAL OPERATING COST SUMMARY
Expressed in 2003 Kč ($)

Site	Tonne/yr	Mass-Burn		RDF	
		Million Kč/yr	Million $/yr	Million Kč/yr	Million $/yr
Central	100 000	119	3.98	149	4.97
Plant	50,000	80	2.68	102	3.41
Roudna	100,000	128	4.26	143	4.78
	50,000	87	2.89	99	3.29
Plzenská	100,000	127	4.24	143	4.78
Energetiká	50,000	86	2.87	93	3.11
Bory	The Bory site is not suitable for a waste-to-energy facility.				

Note: Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.

FIGURE VII-3
OPERATIONS AND MAINTENANCE COST CATEGORIES



Technology Comparison

Using the inputs and methodology discussed above, and basing the analysis on processing 100,000 tonnes/yr at the Central Plant, the economic performances of the two technologies were calculated and the results are shown in Table VII-4 below. From this analysis we observe that the Mass Burn technology is less expensive than RDF technology—about 14% less.

TABLE VII-4
ECONOMIC ASSESSMENT OF TECHNOLOGIES
Expressed in 2003 Kč ($)

		100,000 tonnes/yr		
		Mass Burn	**RDF**	**Variance (RDF – MB)**
Capital Expense	Kč mil	1,630	1,820	190
	$ mil	54.3	60.8	6.5
Annual Operating expense	Kč mil	119	149	30
	$ mil	3.98	4.96	0.98
Tipping fee	Kč /tonne	**2,670**	**3,130**	460
	$/tonne	88.9	104	15.5
Breakeven years	Yrs	12.4	12.2	
After tax rate of return	Pct	11.1	11.6	

Note: Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.

Capacity Comparison

The economics associated with building a larger facility—"economies of scale"—were evaluated by comparing the cost of the 100,000 tonne/year facility cost with the cost of the 50,000 tonne/yr facility. Although cutting the plant size in half (from 100,000 tonne/year to 50,000 tonne/year) greatly reduces the capital cost, the reduction in physical space will not be quite so dramatic. While it is true the traffic flow will be less for the smaller plant, the space required for the trucks to maneuver, unload, and exit the site will stay somewhat similar. Naturally, variable costs such as ash disposal, electricity usage, and reagent consumption will decrease proportionally with the amount of waste processed, and since maintenance material expenses tend to be proportional to the capital investment, they too will decrease with the smaller sized plant. However since either size plant would be operated 24 hours/day, seven days per week, there would be little if any savings in labor cost.

Basing the analysis on the Central Plant site and the more cost effective Mass Burn technology discussed immediately above, the economic performances of the two sizes of plants were calculated and the results are shown in Table VII-5 below. The analysis shows that although the smaller facility is less expensive to build, the unit revenue requirement (Kč/tonne, $/tonne) is higher; in fact much higher—almost 40%. Clearly the larger more cost effective project should be pursued.

TABLE VII-5
ECONOMIC ASSESSMENT OF FACILITY SIZE
Expressed in 2003 Kč ($)

		Mass Burn Facility Located at Central Plant		
		100,000 tonnes/yr	50,000 tonnes/yr	Variance (50k – 100k)
Capital Expense	Kč mil	1,630	1,110	(520)
	$ mil	54.3	36.9	(17.4)
Annual Operating expense	Kč mil	119	80	(39)
	$ mil	3.98	2.68	(1.30)
Tipping fee	Kč /tonne	**2,670**	**3,700**	1,030
	$/tonne	88.9	123	35
Breakeven years	Yrs	12.2	12.4	
After tax rate of return	Pct	11.5	11.1	
Note: Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.				

<u>Site Comparison</u>

The economics associated with constructing a waste-to-energy facility at the various sites discussed before were analyzed based on using the larger sized facility, and using the Mass Burn technology. The economic performances were calculated and the results are shown in Table VII-6 below. From the results, we observe the Central Plant Mass Burn facility is the least costly site to build on.

TABLE VII-6
ECONOMIC ASSESSMENT OF ALTERNATIVE SITES
Expressed in 2003 Kč ($)

		100,000 tonnes/yr, mass-burn			
		Central Plant	Roudna	Plzenská Energetiká	Bory
Capital Expense	Kč mil	1,630	1,880	1,770	Not Assessed
	$ mil	54.3	62.6	59.1	
Annual Operating expense	Kč mil	119	128	127	
	$ mil	3.98	4.26	4.24	
Tipping fee	Kč/tonne	**2,670**	**3,170**	**3,020**	
	$/tonne	88.9	105.6	100.7	
Breakeven years	Yrs	12.2	12.2	12.2	
After tax rate of return	Pct	11.5	11.9	11.6	
Note: Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.					

Base Case Defined

Based on the screening analysis, the most economical alternative would be 100,000 tonne per year Mass Burn located at the Central Plant. This alternative became the Base Case for further sensitivity analyses. (However for reference the comparable financial performance of the 50,000 tonne per year project also is shown.) At the request of Plzenská teplárenská, the final economic evaluation was structured a little differently than the screening analysis. In the final analysis it was assumed that no operating fund would be created and that negative income would be allowed—at least for evaluating the project financial performance. Also the loan repayment term was reduced to 10 years instead of 12, and the discount rate was set to 5% instead of 13+ %.

Key assumptions to Base Case

A complete listing of assumptions can be found on the Input and Results summary sheet of the pro forma printout presented in Appendix D. Key assumptions included:

Mass burn capacity	100,000 tonnes/year
Economic study period:	20 years
First year of commercial operation	2010
Tax rate	24%
Inflation rate	3% per year
Tipping fee escalation rate	3%; same as inflation
All other escalation rates	3%; same as inflation
Equity	25%
Discount rate	5%
Loan	75%
Loan interest rate	5%; same as discount rate
Loan term	10 years; no payments during the first two years of construction; 8 years to final payment

Base Case Results

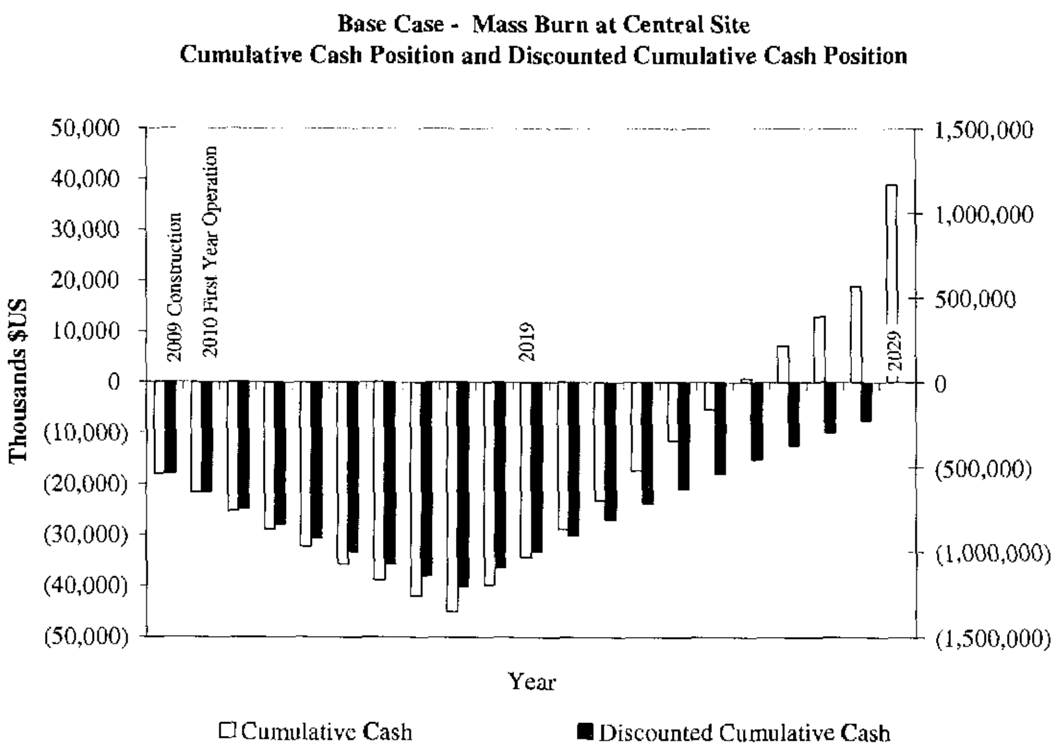
Compared to the screening analysis, the results of the final Base Case shows a much lower tipping fee. This is primarily due to reducing the rate of return from near 13% to 5%. In the screening analysis the breakeven period was about 12 years, but with a lower rate of return assumed in the final analysis, the breakeven period extended to about 15 years. The Base Case results are listed in Table VII-7 below and the cumulative cash flow/ discounted cash flow is shown in Figure VII-4.

TABLE VII-7
BASE CASE RESULTS
Expressed in 2003 Kč ($)

		100,000 tonnes/yr	50,000 tonnes/yr (for reference)
Tipping fee	Kč /tonne	**2,119**	3,011
	$/tonne	70.6	100
Breakeven years	Yrs	15.9	15.9
After tax rate of return	Pct	5.0%	5.0%

Note: Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.

FIGURE VII-4



Note: 2010 is assumed to be the first year of operation. Discounting is back to 2009. Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.

Other Sensitivities

Other sensitivities were performed to examine how key variables might affect the financial performance as represented by the tipping fee. Since the heating value we deduced from the waste information provided to us seemed rather low, the first sensitivity was to increase the thermal production by 10%. (However, if we assumed a much higher thermal production number or fuel heating value, we also would have to assume a higher capital cost—within limits, the combustor is essentially a GJ-machine.) The analysis demonstrates the financial performance is rather insensitive to thermal production. The 10% increase in thermal output reduced the tipping fee by only 1.2%.

The second sensitivity was to increase the price at which district heat is sold. During discussions with Plzenská teplárenská they noted that since the project might not be completed until 2010, it might be reasonable to place a higher value on the project's heat output. By 2010, it was reasoned, additional heat capacity might be needed, and thus the waste-to-energy project could receive capacity value in addition to avoided variable costs (coal primarily). It was Plzenská teplárenská's opinion that heat could be valued at 110 Kč /GJ ($3.87 /MMBtu). The assumption of a near 90% increase in heat revenue had the expected outcome of significantly reducing the tipping fee—almost 14%. Both sensitivities and the Base Case are summarized in Table VII-8 below.

TABLE VII-8
OTHER SENSITIVITIES

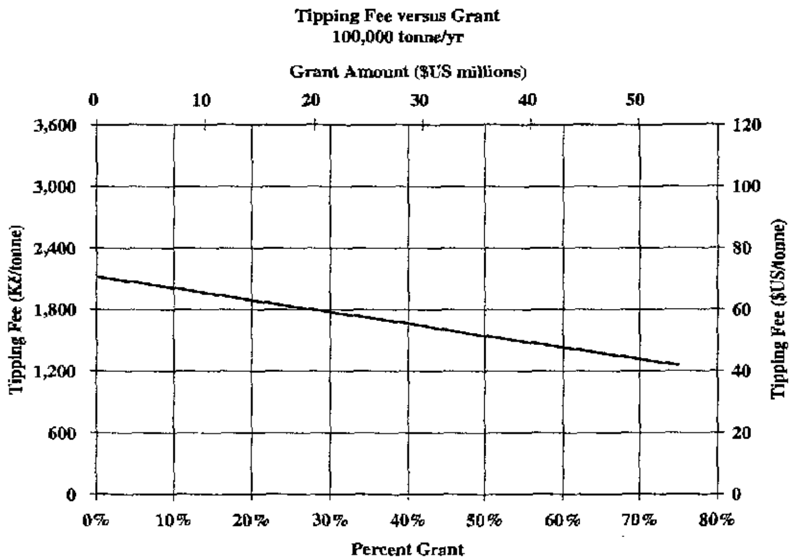
	Units	Base Case	Higher Heat Production	Higher District Heat Sales Price
Heat exported	GJ/yr	552,581	607,839 10% higher	552,581
	MMBtu/yr	523,745	576,120 10% higher	523,745
District heat price	Kč /GJ	58	58	110 89.7% higher
	$/MMBtu	2.04	2.04	3.87 89.7% higher
Tipping fee	Kč /tonne	**2,119**	**2,094**	**1,831**
	$/tonne	70.6	69.8	61.0
Variance	Kč /tonne	Base	(25)	(288)
	$/tonne	Base	(0.8)	(9.6)
	Percent	Base	-1.2%	-13.6%

Note: Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.

Capital Expense

Plzenská teplárenská also noted that an unsubsidized project tipping fee might be too high to be accepted in the community, and wanted to know what impact grants might have on the project. Naturally, if the project does not have to support a large capital expense burden, the tipping fee can be reduced; and this relationship is shown below in Figure VII-5 (for the 100,000 tonne/yr size) and in Figure VII-6 (for the 50,000 tonne/yr size).

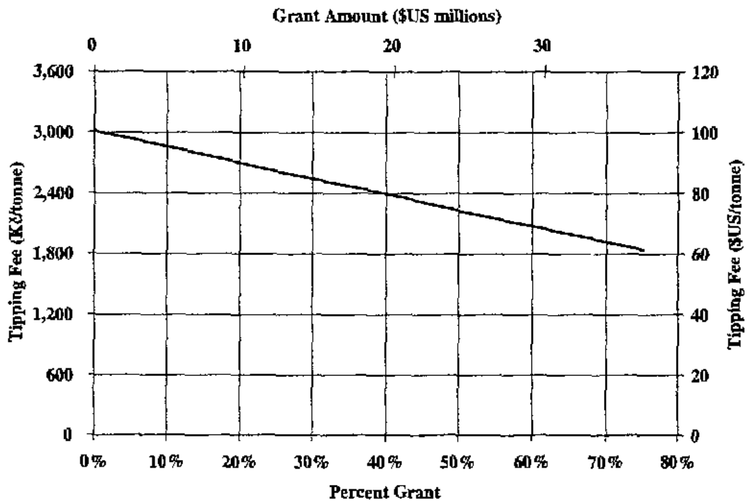
FIGURE VII-5



Total capital cost (2009): 2,150 million Kč ($71.6 million). Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.

FIGURE VII-6

Tipping Fee versus Grant
50,000 tonne/yr



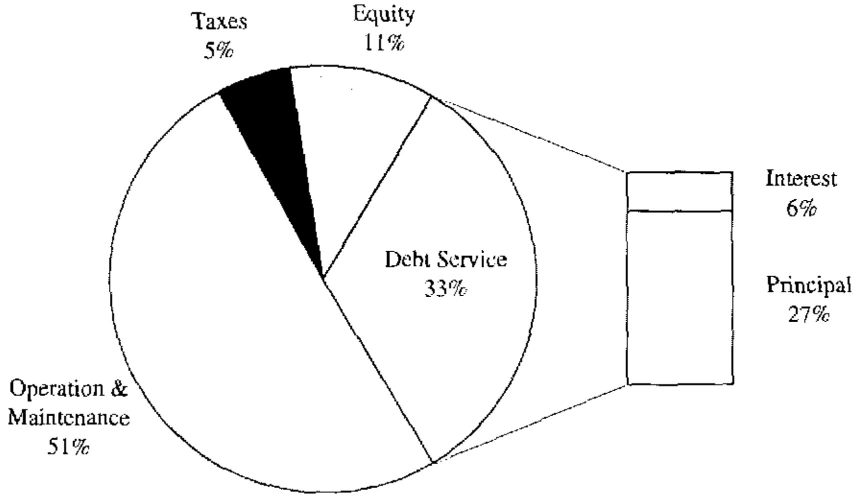
Total capital cost (2009): 1,460 million Kč ($48.7 million). Depiction of numbers follows the U.S. convention—thousands are separated by a comma, and a period is used as a decimal indicator.

Summary

1. The technology comparison showed that Mass Burn was less expensive than RDF—about 14%.
2. The capacity comparison showed that although the smaller facility required less capital to build, the unit revenue requirement (Kč/tonne, $/tonne) was higher; in fact much higher—almost 40%. Clearly the larger more cost effective project should be pursued if at all possible.
3. The site comparison showed the Central plant site was more economical than either of the other two, Roudna and Plzenská energetiká. The Bory site is space-constrained and is not suitable for WTE development.
4. Reducing the rate of return from near 13% to 5% reduced the tipping fee from 2,670 Kč /tonne ($88.9/tonne) to about 2,119 Kč /tonne ($70.6 /tonne), but the breakeven point increased from 12 years to about 16 years.
5. The project financial performance was rather insensitive to thermal production. A 10% increase in heat production only reduced the tipping fee by 1.2%
6. If the value of thermal energy were increased from 58 Kč /GJ (the avoided variable cost) to 110 Kč/GJ, the tipping fee decreased from 2,119 Kč /tonne ($70.6 /tonne) to 1,831 Kč /tonne ($61/tonne).
7. The tipping fee could be reduced if grants or other subsidies were available to reduce the debt burden.

8. Over the 20-year study period, the bulk of the tipping fees will go to pay for operating and maintenance expenses, debt retirement, equity, and taxes. Figure VII-7 below shows the distribution of how the revenues are used.

Figure VII-7
Uses of Revenue



VIII. CONCLUSIONS

Plzenská teplárenská is in a good position to venture into the waste incineration business. They have a reasonably sound financial position; they are experienced with operating complex combustion equipment; and they have a proven reliability track record. Waste incineration provides the Plzen area with an alternative to landfilling which will meet the objectives of the European Community at large using proven technologies. District heating is by its nature seasonal, and revenues from waste incineration would help even out the cash flow. Additionally, the factors that affect waste generating entities should be different than the factors that affect district heating customers. Even if a commercial heating customer goes out of business, the flow of community waste will not change much.

Adequate waste is available in the Plzen area to provide fuel to a waste-to-energy facility of up to 100,000 tonnes/year throughput, and there is adequate space at the Central Plant site to build and operate such a plant. A waste-to-energy facility can be built to which meets or exceeds Czech Republic and European Union environmental requirements. Depending on the financial assumptions, the revenue requirement (tipping fee) could range as shown below.

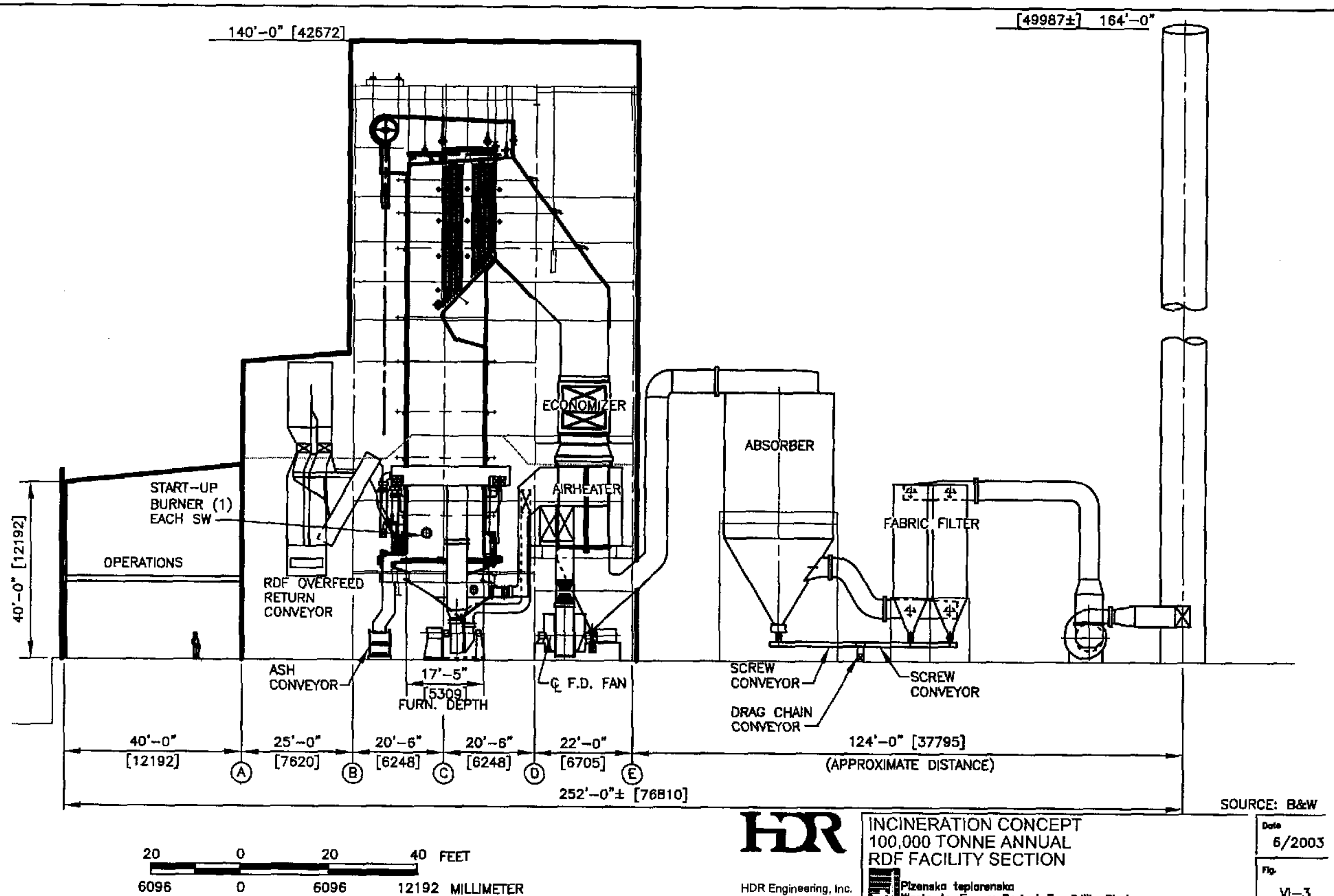
2,670 Kč /tonne ($88.9/tonne)	Similar to Base Case but with near 13% rate of return
2,119 Kč /tonne ($70.6/tonne)	**Base Case** (includes 5% rate of return)
2,094 Kč /tonne ($69.8/tonne)	Base Case with 10% higher heat output
1,831 Kč /tonne ($61/tonne)	Base Case with higher heat sale price (value)

APPENDIX A – SITE CONCEPT MAPS

HDR

HDR Engineering, Inc.

Selected Facility Sites Site Area Plan WTE Feasibility Study Plzenska teplarenska Waste-to-Energy Project Feasibility Study	Date 6/2003 Fig. VI–1



SOURCE: B&W

HDR

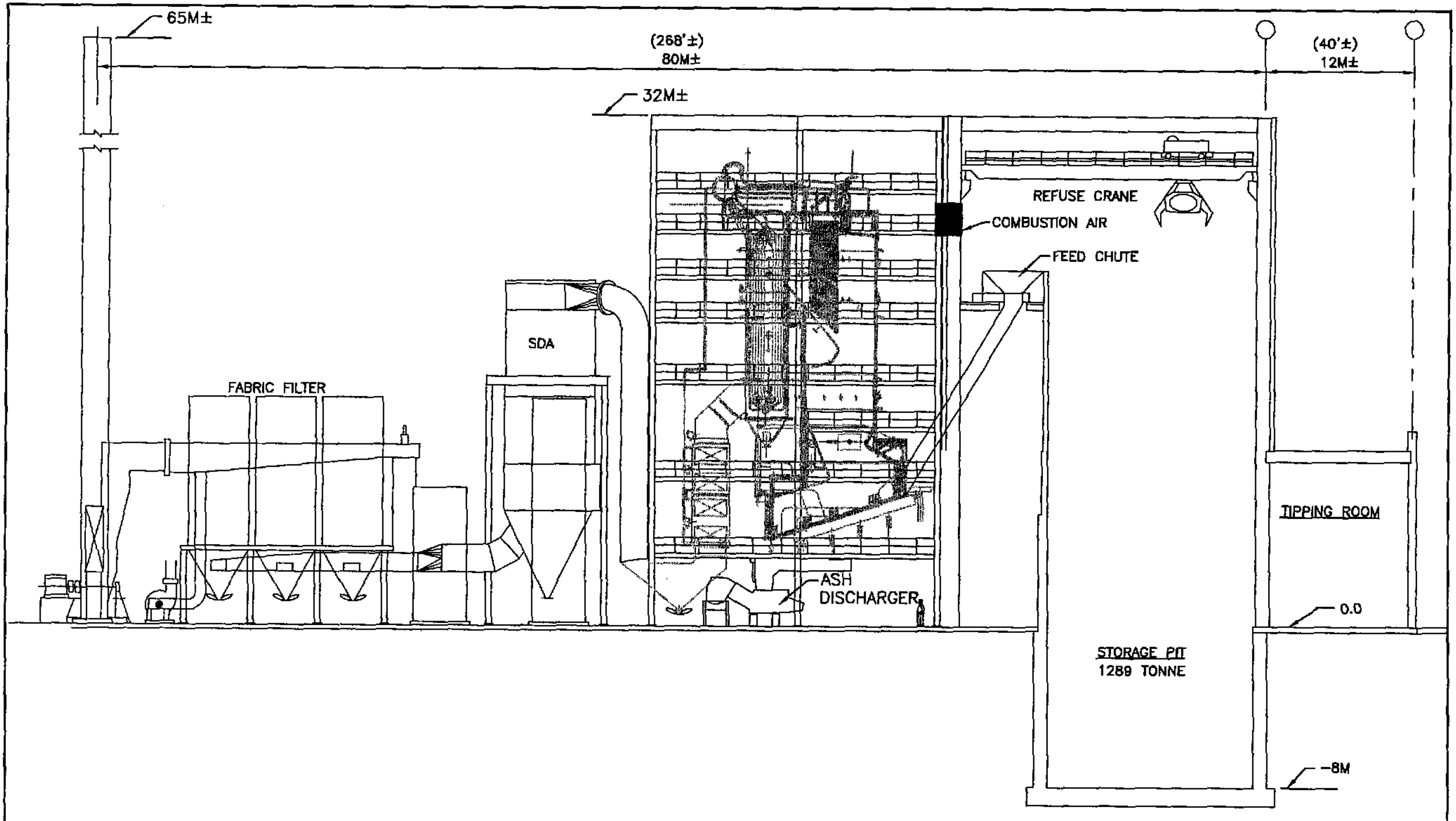
HDR Engineering, Inc.

INCINERATION CONCEPT
100,000 TONNE ANNUAL
RDF FACILITY SECTION

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-3



HDR

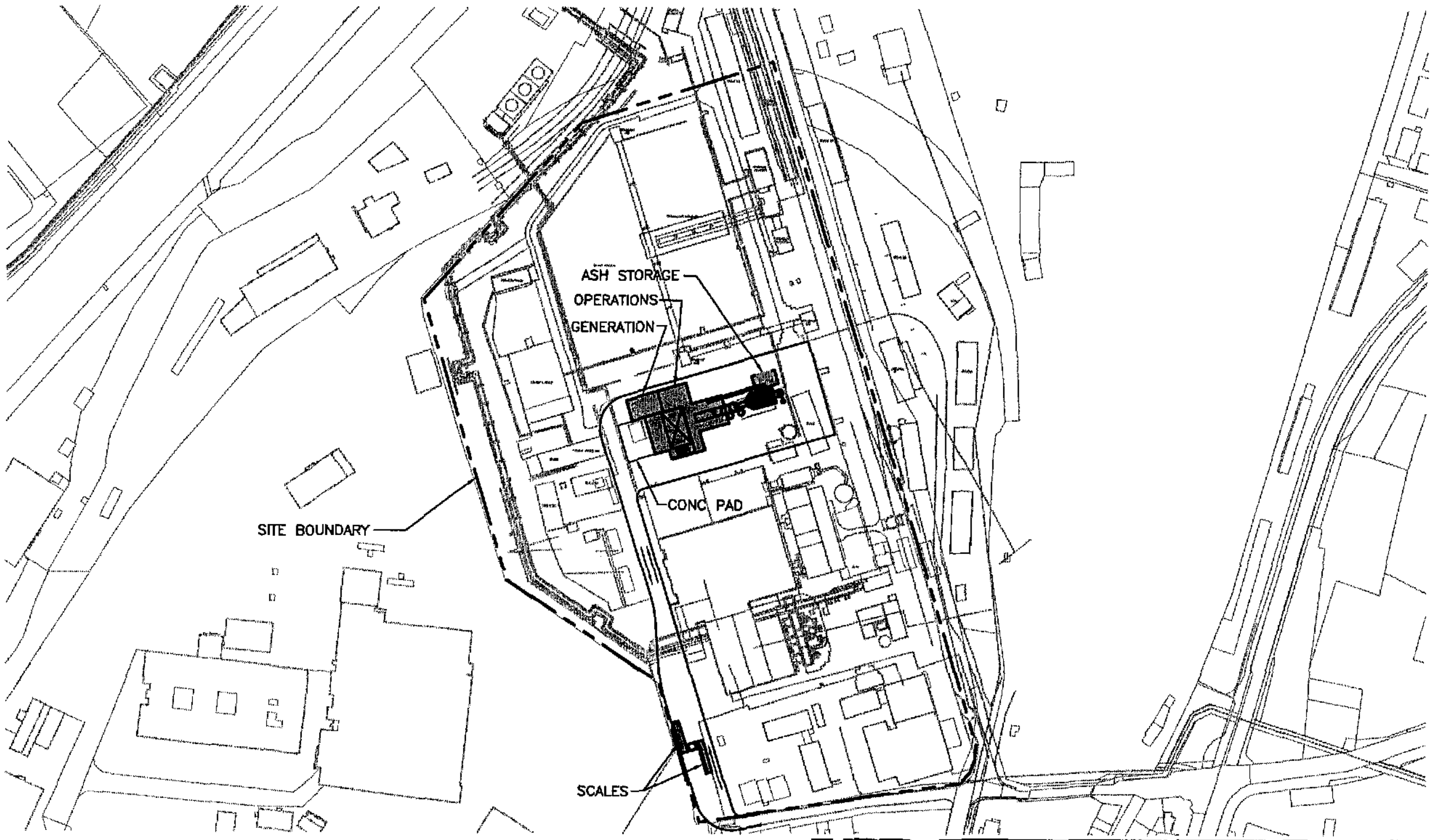
HDR Engineering, Inc.

INCINERATION CONCEPT
100,000 TONNE ANNUAL
MASS BURN SECTION

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-5



HDR

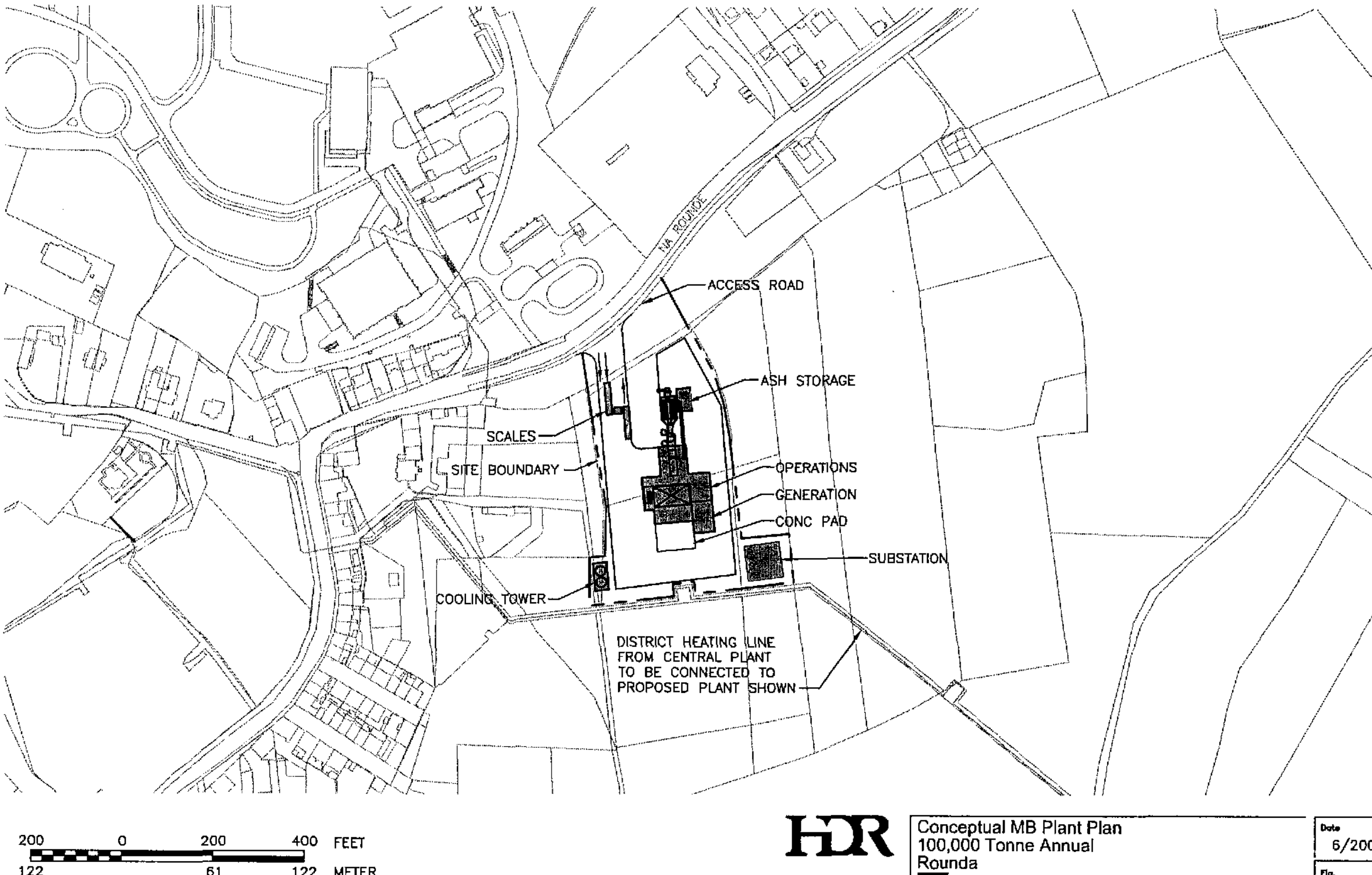
HDR Engineering, Inc.

Conceptual MB Plant Plan
100,000 Tonne Annual
Central Plant

Plzensko teplarenska
Waste-to-Energy Project Feasibility Study

Date
6/2003

Fig.
VI-8



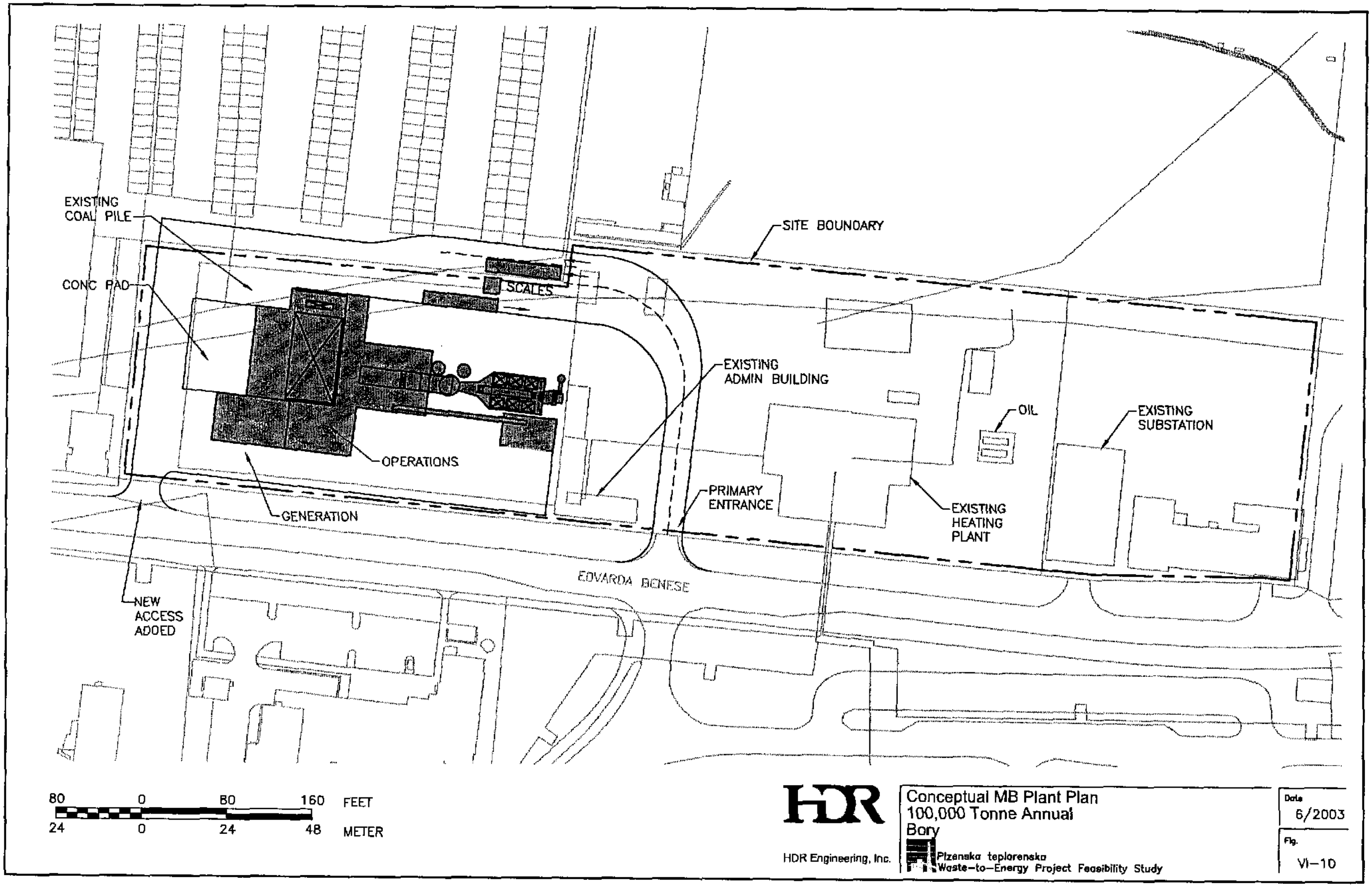
HDR Engineering, Inc.

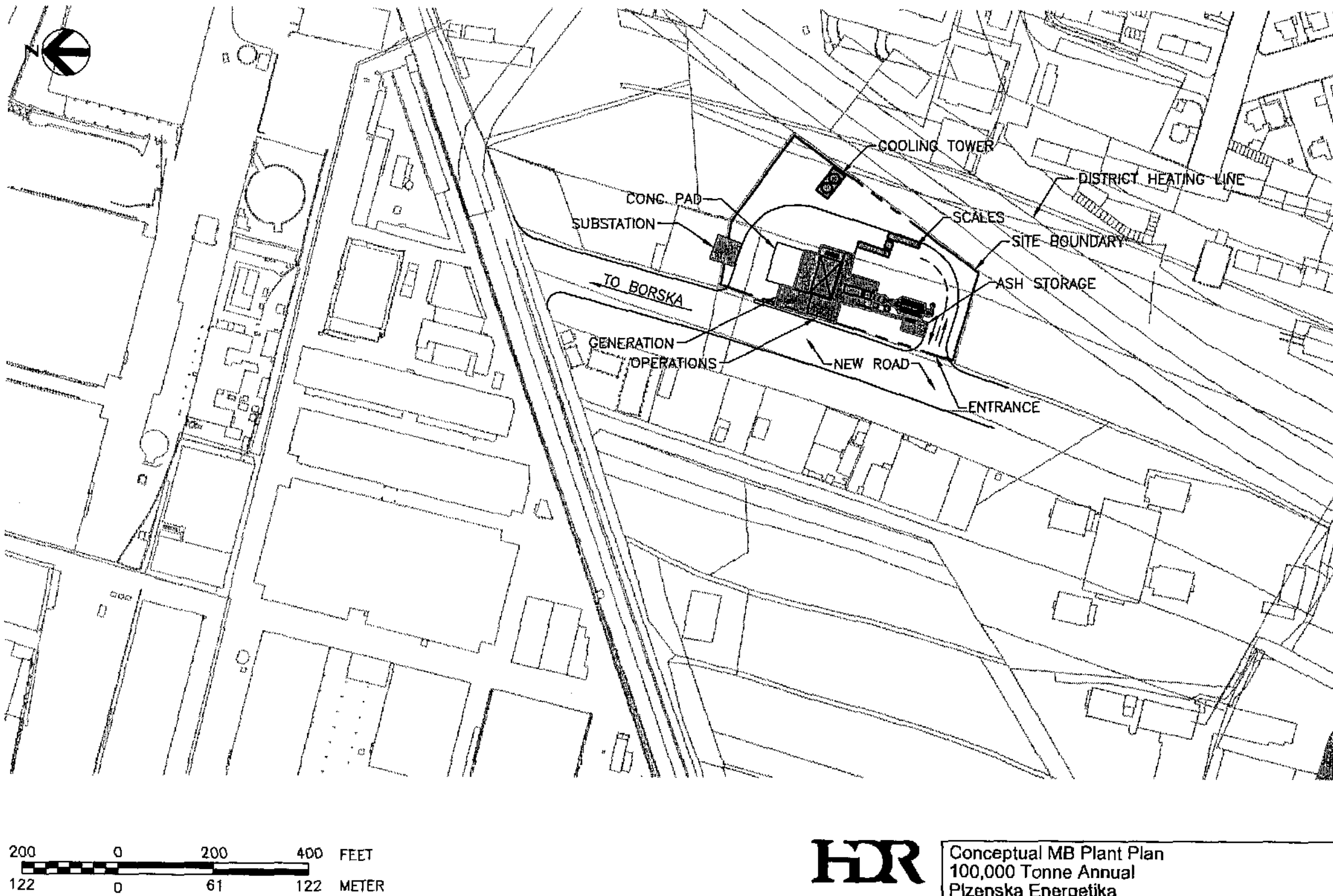
Conceptual MB Plant Plan
100,000 Tonne Annual
Rounda

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI–9


EXISTING COAL PILE
CONC PAD
SCALES
SITE BOUNDARY
EXISTING ADMIN BUILDING
OIL
EXISTING SUBSTATION
OPERATIONS
GENERATION
PRIMARY ENTRANCE
EXISTING HEATING PLANT
EDVARDA BENESE
NEW ACCESS ADDED
80 0 80 160 FEET
24 0 24 48 METER
HDR
HDR Engineering, Inc.
Conceptual MB Plant Plan
100,000 Tonne Annual
Bory
Plzenska teplarenska
Waste-to-Energy Project Feasibility Study
Date
6/2003
Fig.
VI-10



HDR

HDR Engineering, Inc.

Conceptual MB Plant Plan
100,000 Tonne Annual
Plzenska Energetika

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-11

NOTE: WASTE IS WEIGHED AT REMOTE SITE. RDF CAN BE DELIVERED BY CONVEYOR OR TRUCK FROM ROUNDA SITE.

HDR

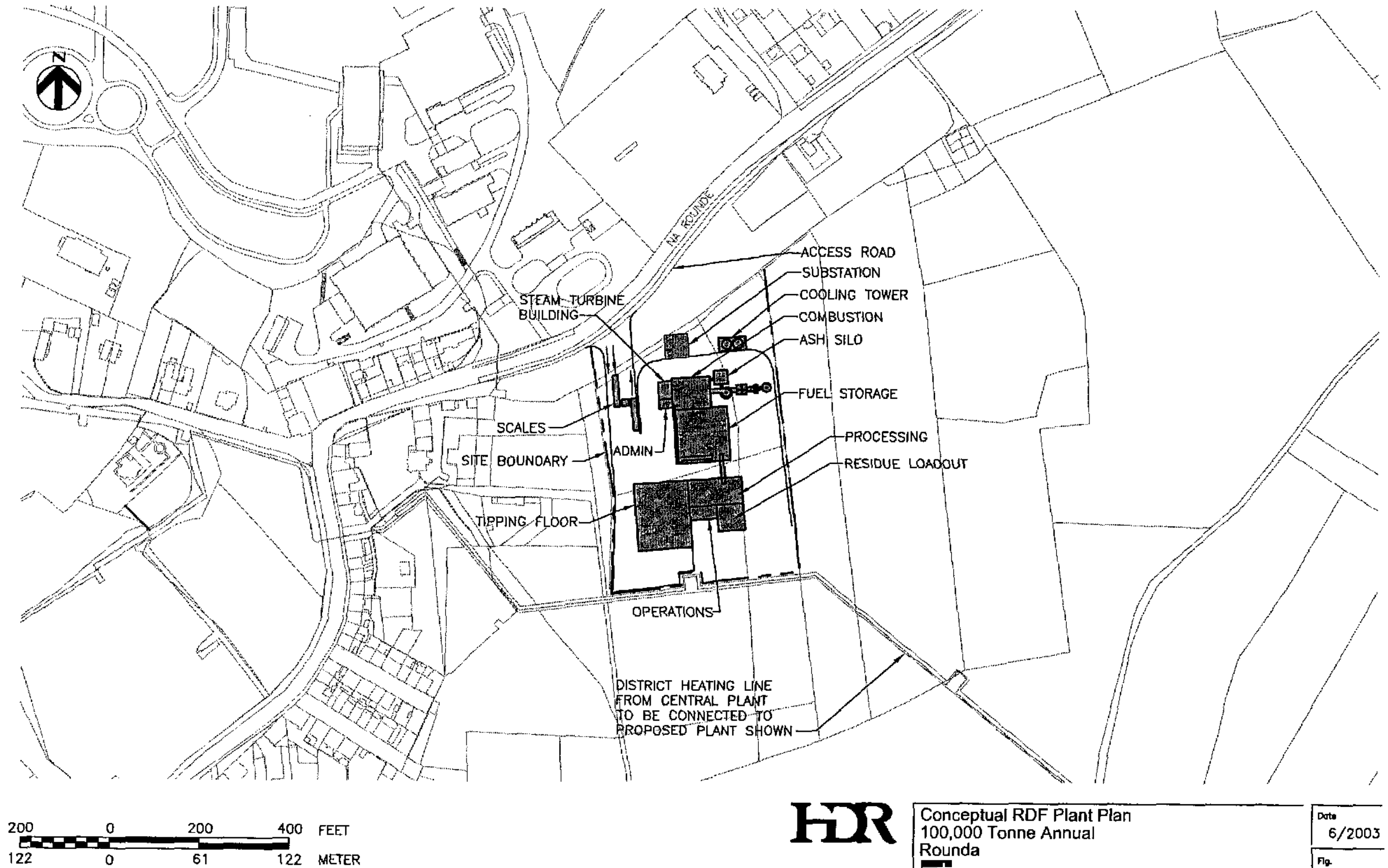
HDR Engineering, Inc.

Conceptual RDF Plant Plan
100,000 Tonne Annual
Central Plant

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-12



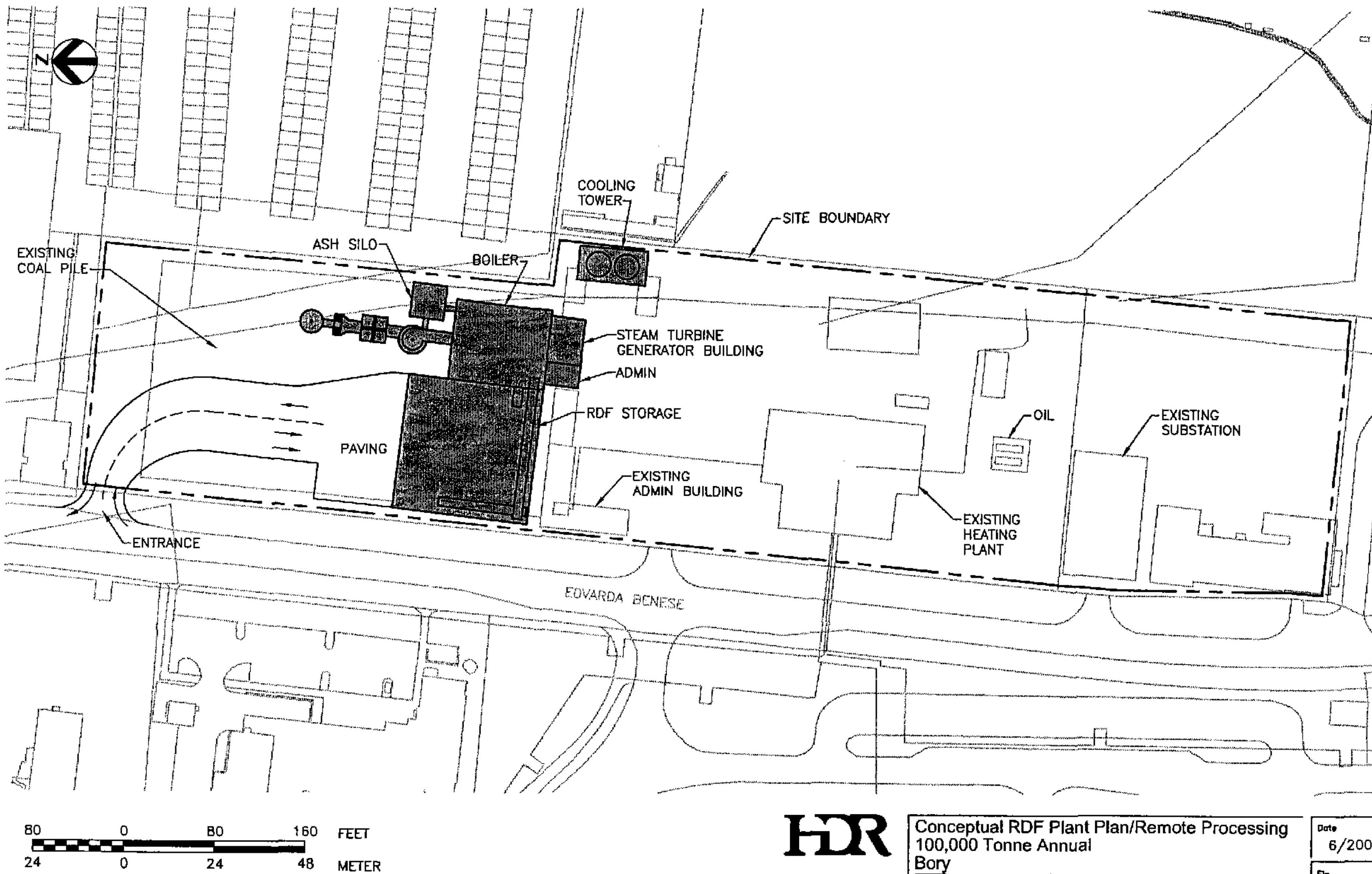
HDR
HDR Engineering, Inc.

Conceptual RDF Plant Plan
100,000 Tonne Annual
Rounda

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-13



NOTE: WASTE IS WEIGHED AT OTHER SITES AND TRUCKED IN.

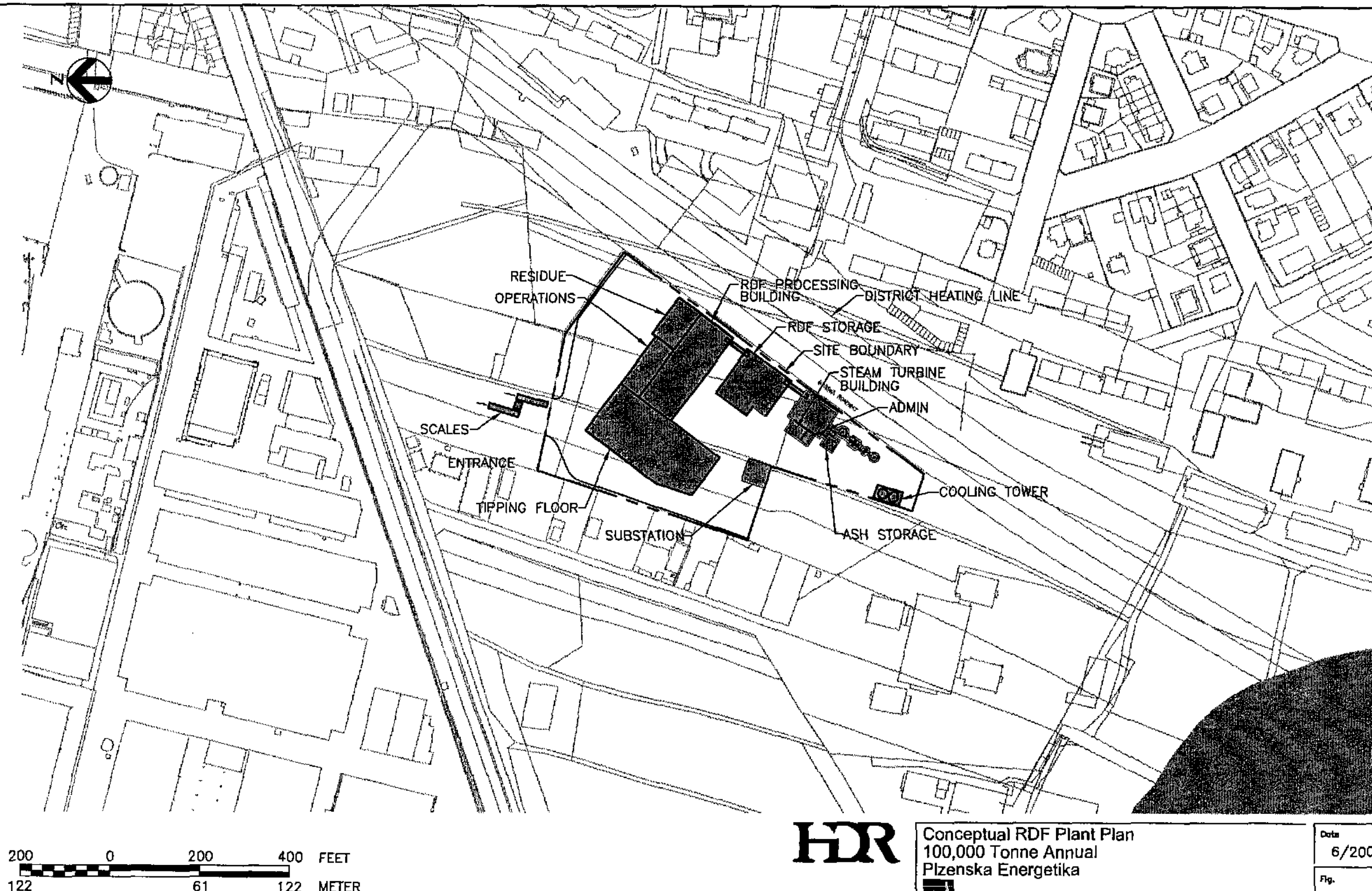
HDR Engineering, Inc.

Conceptual RDF Plant Plan/Remote Processing
100,000 Tonne Annual
Bory

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-14



HDR

HDR Engineering, Inc.

Conceptual RDF Plant Plan
100,000 Tonne Annual
Plzenska Energetika

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI–15

APPENDIX B – ESTIMATED COSTS

Project:	[illegible] Feasibility Study
Technology:	Mass Burn Facility-Central Plant
Date:	[illegible]
Estimate Basis:	Conceptual Layout-100,000 Annual Tonnage
Cost:	2003$
Location:	[illegible]

BASE CASE-APPENDIX B1
COST SUMMARY
MASS BURN FACILITY-CENTRAL PLANT
Conceptual Layout (100,000 Annual tonnage)

	USD		USD
Estimated Range of Total Capital Costs	48,874,000	to	59,735,000
Estimated Range of Annual Amortized Capital Cost	4,978,000	to	6,084,000
Estiimated Range of Annual Operations & Maint. Costs	3,920,300	to	4,312,000
Estimated Range of Annual Costs	8,898,300	to	10,396,000

YEAR 2003 ANNUAL TONNAGE	100,000	Tonnes	
COST PER Metric Ton (Tonne)- (Before Revenues) (2003$)	$89	to	$104

Note: Annual Operations Cost does not include marketing & transfer of recovered materials,

BASE CASE-APPENDIX B1
MASS BURN FACILITY-CENTRAL PLANT
CAPITAL COST SUMMARY [(1)]
Conceptual Layout (100,000 Annual tonnage)

			Estimated Costs'
I. SITE AQUISITION			$0
II. SITE DEVELOPMENT			$ 840,000
III. SCALE HOUSE AND SCALES			$156,000
IV. BUILDINGS			$6,455,700
V. PROCESSING EQUIPMENT			$566,000
VI. MOBILE EQUIPMENT			$420,000
VII. POWER BLOCK EQUIPMENT			$35,523,000
	SUBTOTAL CONSTRUCTION AND EQUIPMENT		$43,960,700
	CONTINGENCY	10%	$4,396,000
	DESIGN/ENGINEERING	5%	$2,418,000
	PERMITTING (Estimated)	2.3%	$1,112,000
	CONSTRUCTION INSPECTION	5%	$2,418,000
	TOTAL CAPITAL COST (FACILITY IMPLEMENTATION)		$54,304,700

NOTES:

(1) All costs rounded to 1000's

(2) All costs in 2003 $.

[illegible]

I. SITE AQUISITION

Item	Quantity	Units	Unit Price	Item Cost	Total
Property Purchase	0	Sq. Meter	$20	0	
Subtotal I					0

II. SITE DEVELOPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Site Preparation Conversion= 0.3048					$ 433,000
Excavation -foundations(1)	13,200	Cu. Meters	$22	$290,400	
General Earthwork (2)	8,100	Cu. Meters	$12	$97,200	
Earth Fill Material	0	Cu. Meters	$22	$0	
Slope Stabilization	0	Cu. Meters	$40	$0	
Finishing Grassing & Grading	0	Sq. meters	$22	$0	
Relocation of Circ Water Piping	244	Meter	$135	$32,900	
Demolition (Warehouse Buildings)	1,041	Cu. Meters	$12	$12,500	
Site Improvements					$ 190,000
Approach /Roadways Concrete (3)	1,254	Sq. Meter	$60	$75,200	
Asphalt Roadways & Parking	400	Sq. Meter	$65	$26,000	
Retaining Walls	153	Cu. Meters	$450	$68,800	
Site Drainage (Established)	1	L.S.	$20,000	$20,000	
Fencing(4)	0	m	$48	$0	
Landscaping (Minimal)	0	L.S.	$15,000	$0	
Site Utilities(5)					$ 216,800
Fire Protection	183	m	$135	$24,700	
Water Supply	183	m	$135	$24,700	
Well Field	0	LS	$50,000	$0	
Sewer System	183	m	$150	$27,400	
Electrical(6)	1	L.S.	$140,000	$140,000	
Subtotal II					$ 839,800

Notes:

(1) Based on estimated building square footages. Demolition calculated separately

(2) General Earthwork includes moving soil, backfill, embankment, loadout, excav.

(3) Roadway unit price includes curbs, gutters, etc.

(4) Assumes perimeter fencing at 6' (1829 mm)(w/ barbed wire) with gates and litter fencing around maneuvering area of 15' (4572 mm)height.

(5) Utilities unit price includes excavation, bedding material, piping installed, backfill, etc.

(6) Electrical includes facility service transformer

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

III. SCALE HOUSE AND SCALES

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Building (1)	37	sm	$538	$19,914	
Concrete Slabwork(2)	11	Cu. Meters	$262	$3,000	
Concrete Footings	8	Cu. Meters	$523	$4,000	
Interior Treatments(3)	37	sm	$538	$19,914	
Motor Truck Scales & Foundations	2	LS	$60,000	$120,000	
Mechanical(4)	37	sm	$108	$3,983	
Electrical(5)	37	sm	$129	$4,779	
Subtotal III					$155,676

Notes:

(1) No additional facilities for waste delivery truck drivers or admintration activities areas, are included.

(2) Assumes stable soil with good load bearing capacity. Slab floor is 6"(152 mm) reinforced concrete.

(3) Includes tile, painting, window covers and funiture

(4) *Building mechanical includes drains, plumbing, air handling, fire protection, etc.*

(5) Electrical includes lighting, power, and communications.

IV. BUILDINGS

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Buildings - Preengineered	557	sm	$ 810	$451,500	
Ash Concrete Push Walls(3)	100	Cu. Meters	$ 523	$52,300	
Metal Buildings - Engineered	49,000	Cu. Meters	$ 100	$4,900,000	
Concrete Pit (3)	3,200	Cu. Meters	$ 290	$928,000	
Overhead Doors	6	ea	$ 10,000	$60,000	
Admin. Area (Control Room)	74	sm	$ 860	$63,900	
Subtotal IV					$6,455,700

Notes:

(1) Metal bldg. includes structural steel, column free bldg. (long span), 30 ft. (9144 mm)clear height, roofing, mechanical and electrical.

(2) Assumes stable soil with good load bearing capacity. Slab floor is 10" (254 mm) reinforced concrete on grade;
12" (305 mm)on structural slabs

(3) 4 ft (1219 mm)thick wall with 10 ft (3038 mm) thick mat

[illegible]

V. PROCESSING EQUIPMENT

Item	Quantity	Type	Units	Unit Price	Item Cost	Total
Overhead Cranes (1)	2	2.5 Cu. Meter Grapple	Each	$ 283,000	$ 566,000	
Subtotal V						$566,000

Notes:

(1) Crane quotes from Kone Cranes

VI. MOBILE EQUIPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Ash Trucks and Trailers	2	Each	$125,000	$250,000	
Loader	1	Each	$150,000	$150,000	
Pick-up/Utility Truck	1	Each	$20,000	$20,000	
Subtotal VI					$420,000

Notes:

(1) Loader used for ash loading and general maintenance activities

[illegible]

VII. POWER BLOCK EQUIPMENT

Item	Quantity	Unit	Unit Price	Item Cost	Total
Mass Burn Boiler-delivered(1)	1	LS	$21,656,000	$21,656,000	
SNCR (NOx Control)	1	LS	$156,000	$156,000	
Continuous Emissions Monitoring (4)	1	LS	$219,450	$219,450	
Bottom Ash Handling	1	LS	$449,000	$449,000	
Flyash Handling/Conditioning	1	LS	$426,000	$426,000	
Aux Cooling Water System (2)	0.5	LS	$66,000	$33,000	
Additional Cooling Towers	0	LS	$143,000	$0	
Condensate System	0.6	LS	$228,000	$136,800	
Chem Feed (2)	1	LS	$124,000	$62,000	
Circulating Water System	1	LS	$85,000	$85,000	
Waste Water System	1	LS	$65,000	$65,000	
Water Treatment (2) (Upgrade only)	1	LS	$45,000	$45,000	
Fire Protection	0.5	LS	$193,000	$96,500	
Feedwater System	1	LS	$175,000	$175,000	
Compressed Air System	1	LS	$49,000	$49,000	
Service Water System	1	LS	$47,000	$47,000	
Stack (Erected) (65 m)	1	LS	$350,000	$350,000	
Heat Exchangers	1	LS	$65,000	$65,000	
Steam Piping	1	LS	$125,000	$125,000	
Steam Turbine (3)	1	LS	$1,400,000	$1,400,000	
Substation & Electrical System (2)	0.2	LS	$2,928,000	$439,200	
Equipment Subtotal					$26,079,950
Boiler Erection (Labor)	1	LS	$6,496,800	$6,496,800	
Steam Turbine Installation (3)	1	LS	$98,000	$98,000	
Mechanical Systems Installation (Labor)	1	LS	$1,614,000	$1,614,000	
Electrical Installation (Labor)	1	LS	$1,024,800	$1,024,800	
Installation Subtotal					$9,233,600
Shop Tools & Equip.	1	Allowance	$50,000	$50,000	
Office Furnishings	0.2	Allowance	$40,000	$9,200	
Spare Parts	1	Allowance	$150,000	$150,000	
Miscellaneous Items					$209,200
Subtotal VII					$35,522,750

Notes:

(1) Based on equipment quote from Babcock and Wilcox

(2) Assumes that all or a portion of these systems are provided at the existing Central Plant

(3) Based on equipment qoute and installation estimate from Skoda and Dresser Rand

(4) Based on Quote from OPSIS

Subtotal I through VII	$43,959,926

$/tonne/day capacity at 322 tpd $136,386

[illegible]

BASE CASE-APPENDIX B1
MASS BURN FACILITY-CENTRAL PLANT
OPERATIONS AND MAINTENANCE COST SUMMARY [(1)]
Conceptual Layout (100,000 Annual tonnage)

			Estimated Costs[(2)]
I.	LABOR		$ 491,000
II.	FACILITY MAINTENANCE		$ 1,556,000
III.	UTILITIES		$ 162,000
IV.	PROCESS RESIDUE HAUL & DISPOSAL		$ 894,000
V.	ROLLING STOCK O&M COSTS		$ 109,300
VI.	MISCELLANEOUS COSTS		$ 138,000
	SUBTOTAL OPERATION & MAINTENANCE		$ 3,350,300
	CONTINGENCY	10%	$ 335,000
	ACCOUNTING, SUPPLIES, MISC.	5%	$ 184,000
	ADMINISTRATION	3%	$ 111,000
	TOTAL ANNUAL OPERATION & MAINTENANCE COST		$ 3,980,300
VIII.	MINUS (Estimated - see proforma)	MATERIAL SALES REVENUES[(3)]	$ (60,000)
	NET ANNUAL OPERATION & MAINTENANCE COST		$ 3,920,300
		Cost / Tonne	$ 39.20

NOTES:

(1) All costs rounded to 1000's

(2) All costs in 2003 $.

(3) Does not include energy revenues

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

I. LABOR

Job Classification	Personnel(1)	$/hr	hrs/yr (6)	OT Hrs	Annual Cost	% OT	Total
Facility Manager (2)	1	$20.00	2,016	-	$40,321	0%	
Operating Engineer (3)	0.5	$14.55	2,016	-	$14,667	0%	14,616
Shift Supervisor (3)	5	$12.61	2,016	-	$127,111	0%	
Administrative / Clerical (4)	0.5	$4.67	2,016	208	$5,189	10%	5,138
Scale Attendant (4)	2	$4.90	2,016	208	$21,796	10%	
Lead Equipment Operator (4)	4	$7.47	2,016	312	$69,531	15%	
Equipment Operators (4)	5	$4.90	2,016	312	$57,037	15%	
Mechanic (4)	1	$7.23	2,016	208	$16,087	10%	
Elect / Electronics Specialist (4)	2	$7.47	2,016	208	$33,212	10%	
Welders (4)	1	$7.00	2,016	208	$15,568	10%	
Helper (4)	2	$5.83	2,016	208	$25,947	10%	
Residue Disposal Drivers (4)	2	$5.13	2,016	208	$22,833	10%	
Spotters/Laborers (4)	4	$4.67	2,016	208	$41,515	10%	
Subtotal	30						$491,000

Notes:

(1) Based on a 24-hour, seven day per week operation.
(2) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick [illegible]
(3) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick [illegible]
(4) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick [illegible]
(5) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick [illegible]
and overtime pay is at 1.5 times straight time
(6) Assumes standard Czech working hours

II. FACILITY MAINTENANCE

Item	% of Capital Value	Quantity	Unit	Unit Price	Annual Cost	Total
Site Maintenance (1)	1.5%	1	L.S.	$ 6,102	$6,102	
Building Repair & Replacement (2	3.3%	1	L.S.	$ 218,000	$218,000	
Equipment Maintenance (3)	2.0%	1	L.S.	$ 532,919	$532,919	
Equipment Replacement (3)	3.0%	1	L.S.	$ 799,379	$799,379	
Subtotal						$ 1,556,000

Notes:

(1) Site maintenance is estimated as % capital construction cost for site improvements and site utilities.
(2) Building repair base on a 30 year depreciation of the original capital cost with escalation.
(3) Estimated annual fund amount for Maintenance and replacements. Based on Est. 20 year facility life.

[illegible]

III. UTILITIES

Item	Quantity	Unit	Unit Price	Annual Cost	Total
Electricity Purchase (1)	500	MWH/yr	$ 30.04	$ 15,020	
Natural Gas (2)	236,298	m3	$ 0.20	$ 47,623	
Telephone (Mobile/Fixed) (3)	22	Phones	$ 360	$ 7,920	
Water	13,205	m3	$ 0.33	$ 4,313	
Sewer (4)	3,301	m3	$ 0.33	$ 1,078	
Lime Reagent	1,001	Tonne/yr	$ 76.20	$ 76,270	
Ammonia Reagent	375	Tonne/yr	$ 20.00	$ 7,507	
Carbon Reagent	44	Tonne/yr	$ 50.00	$ 2,177	
Subtotal					$ 161,908

Notes:

(1) Electricity purchase accounts for energy use during downtimes only; in-house power provided by the system otherwise.

(2) Gas used for start-up and shutdown only to maintain "good combustion control"

(3) Based on mobile phones for entire staff except drivers, helpers and laborers.

(4) Sewer use based on 25% of water use; evaporation and an ash quench account for rest.

IV. PROCESS RESIDUE HAUL & DISPOSAL

Item	Cost /Load(1)	Quantity	Unit	Unit Price	Annual Cost	Total
Process Residue Haul	$ 43	1,257	Tonne	$ 2.15	$ 2,703	
Ash Haul	$ 43	31,678	Tonne	$ 2.15	$ 68,107	
Landfill Disposal Fees		32,935	Tonne	$ 25.00	$ 823,368	
Subtotal						$ 894,178

Notes:

(1) Cost assumes truck operating costs per 20-tonne load (lubrication & maint.)

V. ROLLING STOCK O&M COSTS

Fuel	Weeks	Unit Rate	Units	Unit Price	Annual Cost	Total
Loader	52	1,325	l/wk	$0.85	$58,600	
Pick-up Truck	52	114	l/wk	$0.85	$5,000	
Maintenance	**# Vehicles**	**Quantity**	**Units**	**Unit Price**	**Annual Cost**	**Total**
Loader	1	1	L.S.	$8,250	$8,300	
Pick-up Truck	1	19,200	Km/Yr	$0.13	$2,400	
General O&M		1	L.S.	$35,000	$35,000	
Subtotal						$109,300

Notes:

(1) Based on Owning and Operating Cost Methodology in the Caterpillar Performance Handbook.

[illegible]

VI. MISCELLANEOUS COSTS

Item	Usage (1)	Quantity	Unit	Unit Price	Annual Cost	Total
Property Insurance (2)	1	0.3%			$130,600	
Flood Insurance (2)	0	1.2%			$0	
Property Taxes (3)	1	2,601	m^2	$0.78	$2,000	
Pollution Fees (4)		1	L.S.	$ 5,075	$ 5,075	
Subtotal						$ 137,675

Notes:

(1) Multiplier used to adjust costs for various potential sites. Zero means expense not applicable to this site.

(2) Based on % of capital construction costs.

(3) *Based on area of developed property area.*

(4) Based on analysis in report on Environmental Considerations and assuming 7446 combustion hours per at unit capacity.

Subtotal I through VI	$3,350,060

VII. MATERIAL SALES REVENUES(3)

Material	Units	Unit	Unit Value	Annual Revenues	Total
Net Electric Generation	33,118,106	MWh		$0	Addressed in Pro Forma
Net Steam Generation	250,267,506	Tonne		$0	Addressed in Pro Forma
Aluminum	-	Tonne	$800	$0	No recovery provided
Ferrous Metals (from ash residue)	2,400	Tonne	$25	$60,000	
Subtotal VIII	2,400	Tonne Recycled			$60,000

	Base Labor Rates		
Labor Rate Assumptions	Model Value	US $	CZK (1)
	$/Hour	$/Hour (2)	Kc/Hr
Facility Manager	$ 13.33	$ 13.33	400.00
Operating Engineer	$ 10.00	$ 10.00	300.00
Shift Supervisor	$ 8.67	$ 8.67	260.00
Administrative/Clerical	$ 3.33	$ 3.33	100.00
Scale Attendant	$ 3.50	$ 3.50	105.00
Lead Equipment Operator	$ 5.33	$ 5.33	160.00
Equipment Operators	$ 3.50	$ 3.50	105.00
Picking Crew	$ 3.33	$ 3.33	100.00
Mechanic	$ 5.17	$ 5.17	155.00
Electrician/Electronics Specialist	$ 5.33	$ 5.33	160.00
Welders	$ 5.00	$ 5.00	150.00
Helpers	$ 4.17	$ 4.17	125.00
Residue Disposal Drivers	$ 3.67	$ 3.67	110.00
Spotters/Laborers	$ 3.33	$ 3.33	100.00

(1) Kc/Hr rates are rates as provided by PT

Project:	[illegible] Feasibility Study
Technology:	[illegible] Central Plant
Estimate Basis:	[illegible] Annual tonnage)
Costs:	[illegible]
Location:	Plzeň, Czech Republic

Conversion factor = 3.785412

Domestic	Assumptions	Gallons/Yr	Liters/Year
Average People/Day	7		
Lpd/person	95		
Lpd	676		
days/week	7		
weeks/year	52		
Lpy		65,000	246,052

			Liters/Year	Estimated Annual Cost
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Spray [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

			Liters/Year
Total Water Usage		3,488,302	13,204,659
Evaporation/Ash Quench	75%	2,616,226	9,903,494
Total Sewer Usage		872,075	3,301,165

Reagent Usage Estimates

	Qty/Ton (lb/ton)	Kg/Tonne	Annual Usage (tonne)	Estimated Annual Cost
Lime (limestone)	20	10.0	1,001	$76,270
Ammonia	7.5	3.8	375	$7,825
Carbon	0.87	0.4	44	$2,269

Energy Generation Assumptions

	Gross Gen [illegible]	In House Power [illegible]	Net Gen/Tonne	Net Annual Generation	
Steam Production (Kg)	2834	[illegible]	2503	250,287,508	Tonne
Electricity Production (kWh)	375	[illegible]	331.2	33,118,106	kWh

Assumes backpressure turbine 7.0 Kg/KW-hr 35,380 Kg/hr 0% Margin

Energy Consumption Assumptions

Item	mmBtu/Ton	MMBtu	ft³/yr	m³/yr
Natural Gas (mmBTU)	0.0757	8,344	8,344,411	236,314
	MJ/Tonne	GJ		m^3/yr
Natural Gas (MJ)	88.03	8,803		236,298

Item	Qty/Tonne	hp	load factor	kw	hrs/year	kwh/yr
Power Purchase Req. (kWh/Tonne	5.0					500,000
Total Purchase						500,000

MSW Quanitites and Characteristics

Waste Quantity (Annual metric ton-Tonne)	100,000	Tonne		
Daily Delivery (5 Days per week)	451	Tonne/Day		
Capacity Factor	85%			
Throughput Capacity (7 Days per week)	322	Tonne/Day		
Annual Throughput	100,000	Tonne		
MSW HHV (B&W)	10.1	MJ/Kg		
Boiler Efficiency (B&W)	71%			
Fuel Feed Rate (B&W)	13,430	Kg/hr	322	tonne/day
Gross Steam Production (B&W)	35,380	Kg/hr	2634	Kg(steam)/tonne waste

MSW Storage Calculations

Pit Storage	4	Days		
Pit Storage	1,289	tonne		
MSW Density	267	Kg/Cu Meter		
MSW Pit Capacity	4,829	Cu. Meter		
Pit Area	400	sm	8	m deep plus 50% of vol. up to charging level
Pit length	30	meter	14	meter wide

Residue Disposal

	Percent Of Input				
				0	Truckloads/Day5
Reject Residue Disposal	1.5%	5	tpd5	4	Truckloads/Day7
Ash Disposal	27%	87.0	tpd7	5.0	Truckloads/Day
Truck Payload (Tons)		20	tons/truck	10	HRs/day
Assumes disposal of rejects and ash residue		59	HRS/week	2	Round Trip Haul

Basic Conceptual Layout Dimensions

		Length	Span	Area	Height	Number of Levels
Conversion Factor	M to Ft	3.28084				
Exterior Maneuvering	Feet	120.0	60.0	7,200		
	Meters	36.6	18.3	669		
MSW Tipping Floor	Feet	120.0	35.0	4,200	40.0	1.0
	Meters	36.6	10.7	390	12.2	
Boiler Bldg	Feet	60.0	85.0	5,100	135.0	1.0
	Meters	18.3	25.9	474	41.1	
Turbine Building	Feet	60.0	45.0	2,700	15.0	2.0
	Meters	18.3	13.7	251	4.6	
Maintenance/Storage (on site)	Feet	0.0	0.0	-	15.0	1.0
	Meters	0.0	0.0	-		
Admin/ Control Room	Feet	60.0	45.0	2,700	15.0	2.0
	Meters	18.3	13.7	251	4.6	
Refuse Storage Bldg (Pit)	Feet	120.0	60.0	7,200	115.0	1.0
	Meters	36.6	18.3	669	35.1	
Ash Storage Bldg	Feet	50.0	30.0	1,500	30.0	1.0
	Meters	15.2	9.1	139	9.1	
Site Development	Feet	350.0	80.0	28,000		
	Meters	106.7	24.4	2,601		
		Total Bldg Floor Area		**23,400**	S.F	
				2,174	S.M	

Demolition Estimate

		Length	Span	Area	Height	Volume
Conversion Factor	M to Ft	3.28084	3.28084	10.7639111	3.28084	Cy/m3
Warehouse #1	Feet	40	20	800.0	16	474
	Meters	12.2	6.1	74.3	4.9	362
Warehouse #2	Feet	40	18	720.0	16	427
	Meters	12.2	5.5	66.9	4.9	326
Warehouse #3	Feet	37	21	777.0	16	460
	Meters	11.3	6.4	72.2	4.9	352
Condensate Piping Relocation	Feet	400			12	
	Meters	122			3.7	

[illegible]

Alternate C-RDF Central Plant Incineration - Appendix B2
COST SUMMARY
RDF INCINERATION & REMOTE PROCESSING FACILITY
Conceptual Layout (100,000 Annual Tonnage)

Estimated Range of Total Capital cost	$48,656,000	to	$66,903,000
Estimated Range of Annual Amortized Cost	$4,956,000	to	$6,814,000
Estimated Range of Annual Operations and Maint. Costs	$4,064,000	to	$4,967,000
Estimated Range of Annual Costs	$9,020,000	to	$11,781,000
YEAR 2003 Annual Process Tonnage	100,000		70%
RDF Annual Tonne	70,000		
Estimated Cost per Processed Tonne	$90	to	$118

Note: Annual Operations Cost does not include marketing & shipping of recovered materials,

[illegible]	[illegible]
[illegible]	RDF Incineration & Remote Processing Facility
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Alternate C-RDF Central Plant Incineration - Appendix B2
RDF INCINERATION & REMOTE PROCESSING FACILITY
CAPITAL COST SUMMARY [(1)]
Conceptual Layout (100,000 Annual Tonnage)

			Estimated Costs[(2)]
I.	SITE AQUISITION		$ 342,000
II.	SITE DEVELOPMENT		$ 2,487,100
III.	SCALE HOUSE AND SCALES		$ 155,741
IV.	BUILDINGS		$ 9,574,200
V.	PROCESSING EQUIPMENT		$ 6,654,000
VI.	MOBILE EQUIPMENT		$ 625,000
VII.	POWER BLOCK EQUIPMENT		$ 29,397,450
	SUBTOTAL CONSTRUCTION AND EQUIPMENT		$ 49,235,491
	CONTINGENCY	10%	$ 4,923,500
	DESIGN/ENGINEERING	5%	$ 2,707,900
	PERMITTING	2.3%	$ 1,245,700
	CONSTRUCTION INSPECTIOI	5%	$ 2,707,900
	TOTAL CAPITAL COST (FACILITY IMPLEMENTATION)		$ 60,820,491

NOTES:
(1) All costs rounded to 1000's
(2) All costs in 2003 $.

I. SITE AQUISITION

Item	Quantity	Units	Unit Price (4)	Item Cost	Total
	11,400	SM	$ 30.00	$ 342,000	
Subtotal I					$ 342,000

II. SITE DEVELOPMENT

Item		Quantity	Units	Unit Price (4)	Item Cost	Total
Site Preparation (2 sites assumed)						$ 1,363,600
Excavation -foundations(1)		800	CuM	$22	$18,000	
Added for Combustion Facility		3,902	CuM	$12	$47,000	
General Earthwork (2)		6,100	CuM	$22	$134,000	
Earth Fill Material(7)		46,233	CuM	$22	$1,017,000	
Slope Stabilization (7)		3,642	CuM	$40	$146,000	
Added for Combustion Facility		0	CuM	$40	$0	
Finishing Grassing & Grading		0	Sq Meter	$22	$0	
Demolition (Warehouse Buildings)		103	CuM	$16	$1,600	
Site Improvements						$ 683,500
Approach /Roadways Concrete (3)		80	sm	$60	$5,000	
Asphalt Roadways & Parking		8,100	sm	$65	$526,500	
Retaining Walls		153	CuM	$450	$69,000	
Site Drainage		1	L.S.	$40,000	$40,000	
Fencing(4)		580	m	$48	$28,000	
Landscaping (Minimal)		1	L.S.	$15,000	$15,000	
Site Utilities(5)	Number of Sites					$ 440,000
Fire Protection	2	215	m	$135	$58,000	
Water Supply	2	215	m	$135	$58,000	
Well Field	1	0	LS	$50,000	$0	
Sewer System	2	215	m	$150	$64,000	
Electrical(6)		1	L.S.	$260,000	$260,000	
Subtotal II						$ 2,487,100

Notes:

(1) Based on estimated building Area (sm). Demolition calculated separately.

(2) General Earthwork includes moving soil, backfill, embankment, loadout tunnel excav, etc.

(3) Roadway unit price includes curbs, gutters, etc.

(4) Assumes perimeter fencing at 6' (1829 mm)(w/ barbed wire) with gates and litter fencing around maneuvering area of 15' (4877 mm) heig

(5) Utilities unit price includes excavation, bedding material, piping installed, backfill, etc.

(6) Electrical includes high voltage service transformer, exterior lingtinig

(7) Estimate raising the Roudna site approximately 3 M.

III. SCALE HOUSE AND SCALES

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Building	37	SM	$538	$19,906	
Concrete Slabwork(2)	11	CuM	$262	$2,882	
Concrete Footings	8	CuM	$523	$4,184	
Interior Treatments(3)	37	SM	$538	$19,906	
Motor Truck Scales & Foundations	2	LS	$60,000	$120,000	
Mechanical(4)	37	SM	$108	$3,996	
Electrical(5)	37	SM	$129	$4,773	
Subtotal III					$155,741

Notes:

(1) No additional facilities for waste delivery truck drivers or admintration activities areas, are included.

(2) Assumes stable soil with good load bearing capacity. Slab floor is 6"(152 mm) reinforced concrete.

(3) Includes tile, painting, window covers and funiture

(4) Building mechanical includes drains, plumbing, air handling, fire protection, etc.

(5) Electrical includes lighting, power, communications, etc.

IV. BUILDINGS

Item	Quantity	Units		Unit Price	Item Cost	Total
RDF Processing						$ 6,271,900
Metal Buildings -Shell (1)	5,100	SM	$	538	$2,744,900	
Loadout Canopy	500	SM	$	262	$131,000	
Concrete Slabwork(2)	1,500	CuM	$	262	$393,000	
Concrete Footings/Foundation	2,600	CuM	$	523	$1,360,000	
Concrete Push Walls(3)	500	CuM	$	400	$200,000	
Overhead Doors	10	ea	$	10,000	$100,000	
Mechanical(4)	5,434	SM	$	65	$351,000	
Fire Protection (5)	5,434	SM	$	20	$108,000	
Fire Protection Beneath Equipment	500	SM	$	22	$11,000	
Electrical(6)	5,875	SM	$	86	$506,000	
Admin. / Maint. Area	682	SM	$	538	$367,000	
Combustion Facility						$3,302,300
Metal Buildings - Shell (Ash)	140	SM	$	810	$113,400	
Ash Concrete Push Walls(3)	170	CuM	$	400	$68,000	
Metal Buildings - Engineered (Boiler)	28,500	CuM	$	100	$2,850,000	
RDF Metal Buildings (Storage)	334	SM	$	810	$270,900	
Subtotal IV						$ 9,574,200

Notes:

(1) *Metal bldg. includes structural steel, column free bldg. (long span), 30 ft. (9144 mm)clear height, & 20 yr roofing warranty.*

(2) Assumes stable soil with good load bearing capacity. Slab floor is 10" (254 mm) reinforced concrete on grade;12" (305 mm)on structural ε

(3) 15' (4877 mm) concrete waste containment walls along three sides of tipping area

(4) *Building mechanical includes drains, plumbing, air handling, etc.*

(5) Assumes adequate water pressure and water supply available.

(6) Electrical includes lighting, power, communications, etc.

V. PROCESSING EQUIPMENT

Item	Quantity	Type & Size	Units	Unit Price	Item Cost	Total
Processing Equipment						
Primary Trommel	1		Ea			
Secondary Tromme	1		Ea			
Primary Shredder	1		Ea			
Manetic Separators	2		Ea			
Conveyors	1		Ea			
Sorting Platform	1		Ea			
Mics. Structural	1		LS			
Electrical Equip.	1		LS			
Dust Collection	1		LS			
Subtotal Processing Equipment (1)					$3,400,000	
RDF Conveyor to Central Plant		1,300	m	$3,500.00	Use Truck Transport	
RDF Conveyor		10	m	$11,900.00	$119,000	
RDF Retrieval System		1	LS	$340,000	$340,000	
RDF Feed System Subtotal						
Electrical Service	1		LS	$100,000	$100,000	
Freight	1		LS	$200,000	$200,000	
Total Equipment Cost - Furnished and Delivered						$4,159,000
Equipment Installation (Local Costs)						$2,495,000
Subtotal V						$6,654,000

Notes:

(1) Base on Quote from The Heil Company

(2) Assumes RDF must transport approximately 4 Km from Roudna to the Central Plant via truck. Possible 1300 M via conveyor

VI. MOBILE EQUIPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Front End - Loader Rubber Tire	2	ea	$150,000	$300,000	
Utility Tractor and Sweeper	1	ea	$55,000	$55,000	
Ash Trucks & Trailers	2	ea	$125,000	$250,000	
Pick-up/Utility Truck	1	ea	$20,000	$20,000	
Subtotal VI					$625,000

Notes:

(1) Facility operating hours per year based on number of shifts 4,160 hrs 2 Shifts

VII. POWER BLOCK EQUIPMENT

Item	Quantity	Unit	Unit Price	Item Cost	Total
RDF Fired Boiler (1)	1	LS	$16,893,000	$16,893,000	
SNCR (NOx Control)	1	LS	$135,000	$135,000	
Continuous Emissions Monitoring (2)	1	LS	$219,450	$219,450	
Bottom Ash Handling	1	LS	$280,000	$280,000	
Flyash Handling/Conditioning	1	LS	$621,339	$621,000	
Aux Cooling Water System (3)	0.50	LS	$66,000	$33,000	
Additional Cooling Towers	0	Cell	$143,000	$0	
Condensate System	0.60	LS	$228,000	$136,800	
Chem Feed	1	LS	$110,092	$55,000	
Circulating Water System	1	LS	$173,432	$173,400	
Waste Water System	1	LS	$204,393	$204,400	
Water Treatment (3) (upgrade only)	0.30	LS	$198,981	$59,700	
Fire Protection	0.50	LS	$171,658	$85,800	
Feedwater System	1	LS	$155,512	$155,500	
Compressed Air System	1	LS	$43,735	$44,000	
Service Water System	1	LS	$41,340	$41,000	
Stack (Erected) (65 m erected)	1	LS	$350,000	$350,000	
Heat Exchangers	0	LS	$65,000	$0	
Steam Piping	1	LS	$125,000	$125,000	
Steam Turbine (4)	1	LS	$1,250,000	$1,250,000	
Substation & Electrical System (3)	0.30	LS	$2,928,000	$878,400	
Equipment Subtotal					$21,740,450
Boiler Erection (Labor)	1	LS	$5,067,900	$5,068,000	
Steam Turbine Installation (4)	0.08	LS	$875,000	$70,000	
Mechanical Installation (Labor)	1	LS	$1,690,993	$1,183,700	
Electrical Installation (Labor)	1	LS	$1,045,296	$1,045,300	
Installation Subtotal					$7,367,000
Shop Tools & Equip.	1	Allowance	$100,000	$100,000	
Office Furnishings	1.00	Allowance	$40,000	$40,000	
Spare Parts	1	Allowance	$150,000	$150,000	
Miscellaneous Items					$290,000
Subtotal VII					**$29,397,450**

Notes:

(1) Based on equipment quote from Babcock and Wilcox

(2) Based on equipment quote from Opsis plus 10 percent for installation, calibration and training assistance.

(3) Assumes that all or a portion of these systems are provided at the existing Central Plant, only

(4) Based on equipment qoute and installation estimate from Skoda and Dresser Rand

Subtotal I through VII	**$49,235,491**

$/tonne/day capacity at 322 tpd $152,753

[illegible]

Alternate C-RDF Central Plant Incineration - Appendix B2
RDF INCINERATION & REMOTE PROCESSING FACILITY
OPERATIONS AND MAINTENANCE COST SUMMARY (1)
Conceptual Layout (100,000 Annual Tonnage)

				Estimated Costs(2)
I. LABOR			$	765,500
II. FACILITY MAINTENANCE			$	1,678,000
III. UTILITIES			$	199,000
IV. RDF Deliver & Residue Haul & Disposal			$	1,187,000
V. ROLLING STOCK O&M COSTS			$	194,000
VI. MISCELLANEOUS COSTS			$	155,000
SUBTOTAL OPERATION & MAINTENANCE			$	4,179,000
CONTINGENCY	10%		$	418,000
ACCOUNTING, SUPPLIES, MISC.	5%		$	230,000
ADMINISTRATION AND PROFIT	3%		$	138,000
TOTAL ANNUAL OPERATION & MAINTENANCE COST			$	4,965,000
VIII. MINUS MATERIAL SALES REVENUES			$	(450,000)
NET ANNUAL OPERATION & MAINTENANCE COST			$	4,515,000
OPERATION & MAINTENANCE COST RANGE	$4,064,000	to		$4,967,000
	Cost / Tonne		$	45.15

NOTES:

(1) All costs rounded to 1000's

(2) All costs in 2003 $.

(3) Does not include energy revenues

I. LABOR

Job Classification	Personnel(1)	$/hr(2)	hrs/yr	OT Hrs	Annual Cost	% OT	Total
Facility Manager (2)	1	$20.00	2,016	0	$40,320	0%	
Operating Engineer (3)	2	$14.55	2,016	0	$58,666	0%	
Administrative/Clerical (4)	1.5	$4.67	2,016	208	$16,296	10%	
Scale Attendant (4)	2	$4.90	2,016	208	$22,814	10%	
RDF Haulers	4	$4.67	2,016	208	$43,456	10%	
Processing Plant	24	People 2 Operation shift/ 1 Maintenance shift					
Equipment Operators (4)	4	$7.47	2,016	208	$69,530	10%	
Equipment Operators (4)	4	$4.90	2,016	208	$45,629	10%	
Picking Crew (4)	8	$4.67	2,016	208	$86,912	10%	
Mechanic (4)	1	$7.23	2,016	208	$16,839	10%	
Electrician/Electronics Specialist (	1	$7.47	2,016	208	$17,382	10%	
Welders (4)	1	$7.47	2,016	208	$17,382	10%	
Helper (4)	2	$5.83	2,016	208	$27,160	10%	
Residue Disposal Drivers (4)	1	$5.13	2,016	208	$11,950	10%	
Spotters/Laborers (4)	2	$4.67	2,016	208	$21,728	10%	
Boiler Plant	18	People 24 hours-7 days per week					
Lead Equipment Operator (4)	4	$7.47	2,016	312	$74,189	15%	
Equipment Operators (4)	5	$4.90	2,080	312	$62,426	15%	
Mechanic (4)	2	$7.23	2,080	208	$34,604	10%	
Electrician/Electronics Specialist (	1	$7.47	2,080	208	$17,860	10%	
Welders (4)	1	$7.47	2,080	208	$17,860	10%	
Helper (4)	2	$5.83	2,080	208	$27,907	10%	
Ash Disposal Driver (4)	1	$5.13	2,080	208	$12,279	10%	
Laborer (4)	2	$4.67	2,080	208	$22,325	10%	
Subtotal	53						$765,500

Notes:

(1) Point in Time Staffing for year 2003.

(2) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick l 50%

(3) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick l 45.5%

(4) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick l 40%

(5) Assumes standard Czech working hours

(6) Overtime pay is at 1.5 times regular rate

II. FACILITY MAINTENANCE

Item	% of Capital Value	Quantity	Unit	Unit Price	Annual Cost	Total
RDF Processing						
Site Maintenance(Both sites) (1)	1.5%	1	Lump	$ 37,307	$37,307	
Building Repair & Replacement (2	3.3%	1	Lump	$ 212,112	$212,112	
Equipment Maintenance (3)	2.0%	1	Lump	$ 83,180	$83,180	
Shredder Maintenance (4)	5.0%	1	Lump	$ 25,000	$25,000	
Equipment Replacement (5)	3.0%	1	Lump	$ 124,770	$124,770	
Combustion Facility						
Building Repair & Replacement (2	3.3%	1	Lump	$ 108,976	$108,976	
Equipment Maintenance (3)	2.0%	1	Lump	$ 434,809	$434,809	
Equipment Replacement (5)	3.0%	1	Lump	$ 652,214	$652,214	
Subtotal						$1,678,000

Notes:

(1) Site maintenance is estimated as % capital construction cost for site improvements and site utilities.

(2) Buidling repair base on a 30 year depreciation of the original capital cost with escalation.

(3) Equipment maintenance (annual needs) and replacement (periodic needs) estimated based on assumed 20 life.

(4) Shredder maintenance is based on empirical data from shredder operations, which involves frequent hammer rebuilds or replacement

(5) Equipment maintenance (annual needs) and replacement (periodic needs) estimated based on assumed 20 life. This is a set aside fund

III. UTILITIES

Item	Quantity	Unit	Unit Price	Annual Cost	Total
Electricity	2,896	MWH/yr	$ 30.04	$ 86,989	
Natural Gas	165,409	m^3/yr	$ 0.20	$ 33,082	
Telephone (Mobile/Fixed)	40	Phones	$ 360	$ 14,400	
Water	11,414	m3/yr	$ 0.33	$ 3,767	
Sewer	2,455	m3/yr	$ 0.33	$ 810	
Lime	701	Tonne	$ 76.20	$ 53,389	
Ammonia	263	Tonne	$ 20.00	$ 5,255	
Carbon	30	Tonne	$ 50.00	$ 1,505	
Subtotal					$ 199,196

Notes:

(1) Electricity purchase includes process plant and combustion energy use during downtimes only; inhouse power provided by the system otherwi

(2) Gas used for start-up and shutdown only to maintain "good combustion control"

(3) Based on mobile phones for entire staff except drivers, helpers and laborers.

(4) Sewer use based on 25% of water use; evaporation and ash quench account for rest.

IV. RDF Deliver & Residue Haul & Disposal

Item	Cost /Load(1)	Quantity	Unit	Unit Price	Annual Cost	Total
RDF Haul to Central Plant	$ 43	70,000	Tonne	$ 2.15	$ 150,500	
Process Residue Haul	$ 43	27,500	Tonne	$ 2.15	$ 59,125	
Ash Haul	$ 43	10,677	Tonne	$ 2.15	$ 22,955	
Land fill disposal fees		38,177	Tonne	$ 25.00	$ 954,414	
Subtotal						$ 1,186,993

Notes:

(1) Cost assumes truck operating costs per 22-tonne load

V. ROLLING STOCK O&M COSTS

Fuel	Useage	Unit Rate	Units	Unit Price	Annual Cost	Total
Front End Loader (1)	8,320	11	L/hour	$0.85	$80,300	
Articulated Crane	52	95	L/wk(est.)	$0.85	$4,200	
Pick-up Truck	52	114	L/wk	$0.85	$5,000	
Maintenance	**# Vehicles**	**Quantity**	**Units**	**Unit Price**	**Annual Cost**	**Total**
Front End Loader(1)	2	1	L.S.	$28,700	$57,400	
Articulated Crane	1	1	L.S.	$10,000	$10,000	
Pick-up Truck	1	19,200	Km/Yr	$0.13	$2,500	
General O&M		1	L.S.	$35,000	$35,000	
Subtotal						$194,400

Notes:

(1) Based on Owning and Operating Cost Methodology in the Catepillar Performance Handbook.

VI. MISCELLANEOUS COSTS

Item	Useage (1)	Quantity	Unit	Unit Price	Annual Cost	Total
Property Insurance (2)	1	0.3%			$145,800	
Flood Insurance (2)	0	1.2%			$0	
Property Taxes (3)	1	7,086	m^2	$0.78	$5,500	
Pollution Fees (4)		1	L.S.	$ 3,529	$ 3,529	
Subtotal						$ 154,829

Notes:

(1) Multiplier used to adjust costs for various potential sites. Zero means expense not appicalbe to this site.

(2) Based on % of capital construction costs.

(3) Based on area of developed property.

(4) Based on analysis in report on Environmental Considerations and assuming 7446 combustion hours per at unit capacity.

Subtotal I through VI	$4,178,918

VII. MATERIAL SALES REVENUES

Material	2003 Tons/Yr	Unit	Unit Value	Annual Revenues	Total
Net Electric Generation	30,598	Mwh		$0	Addressed in Pro Forma
Net Steam Generation	330,321,579	Tonne		$0	Addressed in Pro Forma
Aluminum	400	Tonne	$800	$320,000	
Ferrous Metals (pre-combustion)	2,600	Tonne	$50	$130,000	
Subtotal VIII	3,000	Tonne Recycled			$450,000

Labor Rate Assumptions	Model Value $/Hour	US $ $/Hour (2)	CZK (1) K/Hr
Facility Manager	$ 13.33	$ 13.33	400.00
Operating Engineer	$ 10.00	$ 10.00	300.00
Shift Supervisor	$ 8.67	$ 8.67	260.00
Administrative/Clerical	$ 3.33	$ 3.33	100.00
Scale Attendant	$ 3.50	$ 3.50	105.00
Lead Equipment Operator	$ 5.33	$ 5.33	160.00
Equipment Operators	$ 3.50	$ 3.50	105.00
Picking Crew	$ 3.33	$ 3.33	100.00
Mechanic	$ 5.17	$ 5.17	155.00
Electrician/Electronics Specialist	$ 5.33	$ 5.33	160.00
Welders	$ 5.00	$ 5.00	150.00
Helpers	$ 4.17	$ 4.17	125.00
Residue Disposal Drivers	$ 3.67	$ 3.67	110.00
Spotters/Laborers	$ 3.33	$ 3.33	100.00

(1) Kc/Hr rates are rates as provided by PT

(2) Conversion @ 30 Kc per USD

Water Usage

	Assumption	Gallons	Liters
	Conversion factor =		3.785412
Domestic	**Assumption**	**Gallons**	**Liters**
Average People/Day	13		
Usage/Person/Day		25	95
Per day		313	1183
days/week		7	7
weeks/year		52	52
Per Year		113,750	430,591
MakeWater/Blowdown	4%	2,443,328	9,249,004
Spray Dryer(Kg/hr Water/tpd Fl	0.95	428,128	1,601,712
washdown		35,100	132,868
Total Water Usage		3,015,306	11,414,175
Evaporation/Ash Quench	80%	2,366,745	8,959,104
Total Sewer Usage		648,561	2,455,071

Reagent Usage

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lime	20	10.0	701	[illegible]
Ammonia	7.5	3.8	263	$5,478
Carbon	0.87	0.4	30	$1,569

Energy Generation Assumptions

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Steam Production (Kg)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Electricity Production (kWh)	[illegible]	[illegible]	[illegible]	[illegible]	Kwh

Assumes backpressure turbine	7	Kg/KW-hr	32,688	Kg/hr	0% Margin

Energy Consumption Assumptions

Item				
Natural Gas (mmBTU)	0.0707	35.31467	5,841	165,410

	MJ/Tonne	GJ	m^3/yr
Natural Gas (MJ)	88.03	6,162	165,409

Processing Equipment	Qty	hp	load factor	kw	hrs/year	28.32 kwh/yr
C-1	1	10	90%	6.7	4576	30,682
C-2	1	10	90%	6.7	4576	30,682
C-3	1	5	90%	3.4	4576	15,341
C-4	1	5	90%	3.4	4576	15,341
C-5	1	5	90%	3.4	4576	15,341
C-6	1	5	90%	3.4	4576	15,341
C-7	1	5	90%	3.4	4576	15,341
C-8	1	5	90%	3.4	4576	15,341
C-9	1	5	90%	3.4	4576	15,341
C-10	1	5	90%	3.4	4576	15,341
C-11	1	5	90%	3.4	4576	15,341
C-12	1	5	90%	3.4	4576	15,341
C-13	1	5	90%	3.4	4576	15,341
C-14	1	5	90%	3.4	4576	15,341
C-15	1	5	90%	3.4	4576	15,341
C-16	1	5	90%	3.4	4576	15,341
C-17	1	5	90%	3.4	4576	15,341
C-18	1	5	90%	3.4	4576	15,341
C-19	1	5	90%	3.4	4576	15,341
T-1	1	40	90%	26.8	4576	122,728
T-2	1	40	90%	26.8	4576	122,728
S-1	1	400	90%	268.2	4576	1,227,283
Dust Collection	1	40	90%	26.8	4576	122,728
Miscellaneous	1	30	90%	20.1	4576	92,046
Total Equipment				**439.2**		**2,009,676**
Item	**Qty**	**hp**	**load factor**	**kw**	**hrs/year**	**kwh/yr**
Ventilating Equipment/ Heating Equipment	12	3	80%	21.5	4576	98,183
Power Block Purchase(kWh/T)	5					350,000
		SFT	**W/SF**	**kw**	**hrs/year**	**kwh/yr**
Lighting (3W/SF + 10%)		29,000	3.00	95.7	4576	437,923
Total Kw Hours / year						**2,895,782**

RDF Quantities and Characteristics

Waste Quantity		100,000	Tonne		
Daily Delivery (7 days per week)		274	Tonne		
Capacity Factor		85%			
Daily Delivery (5 days per week)		385	Tonne		
Annual Throughput		100,000	Tonne		
RDF Production		70%			
RDF Quantity(5 day week production)		269	Tonne	Aluminum Recovery	0.40%
RDF Quantity (annual)		70,000	Tonne	Ferrous Recovery	2.60%
RDF HHV (B&W)		11.9	MJ/Kg		
Boiler Efficiency (B&W)		72%			
Fuel Feed Rate (B&W)		9,401	Kg/Hr at	226 tonne/day	
Gross Steam Production (B&W)		32,688	Kg/Hr	3477 Kg(steam)/tonne	

Residue Disposal

Co-firing Rate (% RDF)		100%	RDF	5 Truckloads/Day5
Reject Disposal	27.5%	106	tpd5	1 Truckloads/Day7
Ash Disposal (cofiring)	13%	29.3	tpd7	7.0 Truckloads/Day
Truck Payload (Tons)		20	tonne/truck	14 HRs/day
		73	HRS/week	2 Round Trip Haul

Basic Conceptual Layout Dimensions

MSW Tipping floor storage (Minimum)

Daily Delivery	385	Tonne	
Floor Storage	4	days	
Floor Storage	1538	Tonne	
MSW Density	208	Kg/Cu.M	
Floor Storage	7,387	Cu.M	
Floor Storage	2,200	SM	(15 ft (4.6 m) deep plus 35% for maneuvering)

RDF Storage Calculations

RDF Floor Storage	4	Days	
RDF Floor Storage	1077	tonne	
RDF Density	192	Kg/Cu.M	
RDF Floor Storage	5602	Cu.M	
RDF Floor Storage	1600	SM	(15 ft (4.6 m) deep plus 25% for maneuvering)
RDF Conveyor Length	20	m	Between Processing Building and RDF Storage
Power Plant RDF Input	226	tpd7	

Waste Storage		Length	Span	Area	Height	Floor Elevation
RDF Storage bldg length	Feet	120	111	13,320	30	
	Meters	37	34	1600	9	
Tipping building length	Feet	120	147	17,640	30	
	Meters	37	45	2200	9	

Processing Area		Length	Span	Area	Height	Floor Elevation
	M to Ft	3.28084	3.28084	10.76391111	3.28084	3.28084
Exterior Maneuvering	Feet	120.0	45.0	5,400.0		
	Meters	36.6	13.7	501.7		
MSW Tipping Floor	Feet	120.0	150.0	18,000.0	19.7	16.4
	Meters	36.6	45.7	1,672.3	6	5
Processing Area	Feet	170.6	68.9	11,754.2	36.1	0.0
	Meters	52	21	1,092.0	11	0
Shredder Enclosure	Feet	39.4	26.2	1,033.3	32.8	0.0
	Meters	12	8	96.0	10	0
Maintenance/Storage	Feet	101.7	36.1	3,670.5	16.4	0.0
	Meters	31	11	341.0	5	0
Admin/ Control Room	Feet	101.7	36.1	3,670.5	16.4	19.7
	Meters	31	11	341.0	5	6
Loadout Canopy	Feet	68.9	68.9	4,746.9	19.7	0.0
	Meters	21	21	441.0	6	0
		Total Bldg Floor Area		42,875		
		Improved area		4,485		

[illegible]						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Meters	21.3	25.9	553	42.7	
Turbine Building	Feet	70.0	45.0	3,150	20.0	1.0
	Meters	21.3	13.7	293	6.1	1.0
Maintenance/Storage	Feet	60.0	45.0	2,700	20.0	1.0
	Meters	18.3	13.7	251	6.1	
Admin/ Control Room	Feet	60.0	45.0	2,700	20.0	1.0
	Meters	18.3	13.7	251	6.1	
Refuse Storage Bldg	Feet	80.0	45.0	3,600	30.0	1.0
	Meters	24.4	13.7	334	9.1	
Ash Storage Bldg	Feet	50.0	30.0	1,500	30.0	1.0
	Meters	15.2	9.1	139	9.1	
Site Development	Feet	350.0	80.0	28,000		
	Meters	106.7	24.4	2,601		
		Total Bldg Floor Area		19,600		
				[illegible]		

Demolition Estimate

[illegible]						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Meters	12.2	6.1	74.3	4.9	36
Warehouse #2 (1)	Feet	40	18	720.0	16	42
	Meters	12.2	5.5	66.9	4.9	32
Warehouse #3 (1)	Feet	37	21	777.0	16	45
	Meters	11.3	6.4	72.2	4.9	35

Notes:

(1) Warehouse demolition at the central Plant location only

	1984 SPSA COST ($000)	2002 SPSA Escalated	SPSA Only 1 Process line	Plem Adj. Factor # of TPH
Adjustment Factors				
Escalation Factor		1.78		
Tons Per Hour Infeed	100	100	100	30
Number of Lines	3	3	1	1
Process Bldg SF	111,000	111,000	37,095	37,095
Site Development				
Over Excavation	$ 1,248	$ 2,221	$ 922	$ 922
Backfill	$ 891	$ 1,586	$ 659	$ 659
Roads, Parking and Walkways	$ 1,036	$ 1,844	$ 766	$ 766
Storm Sewer	$ 17	$ 30	$ 13	$ 13
Sanitary Sewer	$ 180	$ 320	$ 133	$ 133
Water Supply	$ 100	$ 178	$ 74	$ 74
Fencing	$ 52	$ 93	$ 38	$ 38
Landscaping	$ 59	$ 105	$ 44	$ 44
Retaining Walls	$ 22	$ 39	$ 16	$ 16
Site Lighting	$ 85	$ 151	$ 63	$ 63
	$ 3,690	$ 6,568	$ 2,727	$ 2,727
Buildings				
Process Plant	$ 12,677	$ 22,565	$ 9,389	$ 9,389
Scales & Scale House		$ 375	$ 375	$ 375
	$ 12,677	$ 22,940	$ 9,764	$ 9,764
Process Equipment Installed				
Conveyors	$ 4,673	$ 8,318	$ 3,454	$ 1,318
Primary Trommel	$ 2,250	$ 4,005	$ 1,663	$ 635
Secondary Trommel	$ 1,350	$ 2,403	$ 998	$ 381
Shredder	$ 1,318	$ 2,346	$ 974	$ 372
Magnets	$ 520	$ 926	$ 384	$ 147
Instrumentation & Controls	$ 500	$ 890	$ 370	$ 141
Electrical	$ 2,140	$ 3,809	$ 1,582	$ 1,582
Mechanical	$ 1,441	$ 2,565	$ 1,065	$ 1,065
Fire Protection	$ 99	$ 176	$ 73	$ 73
	$ 14,291	$ 25,438	$ 10,563	$ 5,713
Miscellaneous				
Shop Tools and equipment	$ 150	$ 267	$ 111	$ 111
Mobile Equipment				$ 625
Office Furnishings	$ 30	$ 53	$ 22	$ 22
Spare Parts	$ 540	$ 961	$ 399	$ 152
	$ 720	$ 1,282	$ 532	$ 910

VI. MISCELLANEOUS COSTS

Item	Useage (1)	Quantity	Unit	Unit Price	Annual Cost	Total
Property Insurance (2)	1	0.3%			$116,400	
Flood Insurance (2)	0	1.2%			$0	
Property Taxes (3)	1	7,086	m^2	$0.78	$5,500	
Pollution Fees (4)		1	L.S.	$ 3,529	$ 3,529	
Subtotal						$ 125,429

Notes:

(1) Multiplier used to adjust costs for various potential sites. Zero means expense not appicalbe to this site.

(2) Based on % of capital construction costs.

(3) Based on area of developed property.

(4) Based on analysis in report on Environmental Considerations and assuming 7446 combustion hours per at unit capacity.

Subtotal I through VI	$2,237,329

VII. MATERIAL SALES REVENUES

Material	2003 Tons/Yr	Unit	Unit Value	Annual Revenues	Total
Net Electric Generation	11,899	Mwh		$0	Addressed in Pro Forma
Net Steam Generation	165,160,790	Tonne		$0	Addressed in Pro Forma
Aluminum	200	Tonne	$800	$160,000	
Ferrous Metals (pre-combustion)	1,300	Tonne	$50	$65,000	
Subtotal VIII	1,500	Tonne Recycled			$225,000

Labor Rate Assumptions	Model Value $/Hour	US $ $/Hour	CZK K/Hr
Facility Manager	$ 13.33	$ 13.33	400.00
Operating Engineer	$ 10.00	$ 10.00	300.00
Shift Supervisor	$ 8.67	$ 8.67	260.00
Administrative/Clerical	$ 3.33	$ 3.33	100.00
Scale Attendant	$ 3.50	$ 3.50	105.00
Lead Equipment Operator	$ 5.33	$ 5.33	160.00
Equipment Operators	$ 3.50	$ 3.50	105.00
Picking Crew	$ 3.33	$ 3.33	100.00
Mechanic	$ 5.17	$ 5.17	155.00
Electrician/Electronics Specialist	$ 5.33	$ 5.33	160.00
Welders	$ 5.00	$ 5.00	150.00
Helpers	$ 4.17	$ 4.17	125.00
Residue Disposal Drivers	$ 3.67	$ 3.67	110.00
Spotters/Laborers	$ 3.33	$ 3.33	100.00

(1) Kc/Hr rates are rates as provided by PT

(2) Conversion @ 30 Kc per USD

Water Usage

	Conversion factor =		3.785412
Domestic	**Assumption**	**Gallons**	**Liters**
Average People/Day	0		
Usage/Person/Day		25	95
Per day		12	45
days/week		7	7
weeks/year		52	52
Per Year		4,333	16,403
MakeWater/Blowdown	4%	1,221,664	4,624,502
Spray Dryer(Kg/hr Water/tpd Fu	0.95	211,564	800,856
washdown		35,100	132,868
Total Water Usage		1,472,661	5,574,630
Evaporation/Ash Quench	80%	1,176,396	4,453,142
Total Sewer Usage		296,266	1,121,487

Reagent Usage

	[illegible]	Kg/Tonne	Annual Usage (tonne)	Estimated Annual Cost
Lime	20	10.0	350	[illegible]
Ammonia	7.5	3.8	131	$2,739
Carbon	0.87	0.45	16	$821

Energy Generation Assumptions

	Gross Generation per Tonne	In-House Power per Tonne	Net Generation per Tonne	Net Annual Generation	
Steam Production (Kg)	3477	174	3303	[illegible]	Tonne
Electricity Production (kWh)	[illegible]	45	[illegible]	[illegible]	KWh

Assumes backpressure turbine	9	Kg/KW-hr	16,344	Kg/hr	0%	Margin

Energy Consumption Assumptions

Item	mmBtu/Ton	cubic feet/ meter	MMBTU	m³/yr
Natural Gas (mmBTU)	0.0757	35.31467	2,921	82,705
	MJ/Tonne		**GJ**	**m³/yr**
Natural Gas (MJ)	88.03		3,081	82,704

						28.32
Processing Equipment	**Qty**	**hp**	**load factor**	**kw**	**hrs/year**	**kwh/yr**
C-1	1	10	90%	6.7	2288	15,341
C-2	1	10	90%	6.7	2288	15,341
C-3	1	5	90%	3.4	2288	7,671
C-4	1	5	90%	3.4	2288	7,671
C-5	1	5	90%	3.4	2288	7,671
C-6	1	5	90%	3.4	2288	7,671
C-7	1	5	90%	3.4	2288	7,671
C-8	1	5	90%	3.4	2288	7,671
C-9	1	5	90%	3.4	2288	7,671
C-10	1	5	90%	3.4	2288	7,671
C-11	1	5	90%	3.4	2288	7,671
C-12	1	5	90%	3.4	2288	7,671
C-13	1	5	90%	3.4	2288	7,671
C-14	1	5	90%	3.4	2288	7,671
C-15	1	5	90%	3.4	2288	7,671
C-16	1	5	90%	3.4	2288	7,671
C-17	1	5	90%	3.4	2288	7,671
C-18	1	5	90%	3.4	2288	7,671
C-19	1	5	90%	3.4	2288	7,671
T-1	1	40	90%	26.8	2288	61,364
T-2	1	40	90%	26.8	2288	61,364
S-1	1	400	90%	268.2	2288	613,642
Dust Collection	1	40	90%	26.8	2288	61,364
Miscellaneous	1	30	90%	20.1	2288	46,023
Total Equipment				**439.2**		**1,004,838**
Item	**Qty**	**hp**	**load factor**	**kw**	**hrs/year**	**kwh/yr**
Ventilating Equipment/ Heating Equipment	12	3	80%	21.5	2288	49,091
Power Block Purchase(kWh/T)	5					175,000
		SFT	**W/SF**	**kw**	**hrs/year**	**kwh/yr**
Lighting (3W/SF + 10%)		29,000	3.00	95.7	2288	218,962
Total						**1,447,891**

Basic Assumptions

RDF Quanitites and Characteristics

Waste Quantity	50,000	Tonne		
Daily Delivery (7 days per week)	137	Tonne		
Capacity Factor	85%			
Daily Delivery (5 days per week)	192	Tonne		
Annual Throughput	50,000	Tonne		
RDF Production	70%			
RDF Quantity(5 day week production)	135	Tonne	Aluminum Recovery	0.40%
RDF Quantity (annual)	35,000	Tonne	Ferrous Recovery	2.60%
RDF HHV (B&W)	11.9	MJ/Kg		
Boiler Efficiency (B&W)	70%			
Fuel Feed Rate (B&W)	4,701	Kg/Hr at	113	tonne/day
Gross Steam Production (B&W)	16,344	Kg/Hr	3,477	Kg(steam)/tonne

Residue Disposal

Co-firing Rate (% RDF)		100%	RDF	3	Truckloads/Day5
Residue Disposal	27.5%	53	tpd5	1	Truckloads/Day7
Ash Disposal (cofiring)	13%	14.7	tpd7	3.0	Truckloads/Day
Truck Payload (Tons)		20	tonne/truck	6	HRs/day
		31	HRS/week	3	Round Trip Hrs

Basic Conceptual Layout Dimensions

MSW Tipping floor storage (Minimum)

Daily Delivery	192	Tonne	
Floor Storage	4	days	
Floor Storage	769	Tonne	
MSW Density	208	Kg/Cu.M	
Floor Storage	3,694	Cu.M	
Floor Storage	1,100	SM	(15 ft (4.6 m) deep plus 25% for maneuvering)

RDF Storage Calculations

RDF Floor Storage	4	Days	
RDF Floor Storage	538	tonne	
RDF Density	192	Kg/Cu.M	
RDF Floor Storage	2801	Cu.M	
RDF Floor Storage	800	SM	(15 ft (4.6 m) deep plus 25% for maneuvering)
RDF Conveyor Length	20	m	Between Processing Building and RDF Storage
Power Plant RDF Input	113	tpd7	

Waste Storage		Length	Span	Area	Height	Floor Elevation
RDF Storage bldg length	Feet	120	111	13,320	30	
	Meters	37	34	800	9	
Tipping building length	Feet	120	147	17,640	30	
	Meters	37	45	1100	9	

Basic Assumptions

Processing Area		Length	Span	Area	Height	Floor Elevation
	M to Ft	3.28084	3.28084	10.76391111	3.28084	3.28084
Exterior Maneuvering	Feet	120.0	45.0	5,400.0		
	Meters	36.6	13.7	501.7		
MSW Tipping Floor	Feet	120.0	150.0	18,000.0	19.7	16.4
	Meters	36.6	45.7	1,672.3	6	5
Processing Area	Feet	170.6	68.9	11,754.2	36.1	0.0
	Meters	52	21	1,092.0	11	0
Shredder Enclosure	Feet	39.4	26.2	1,033.3	32.8	0.0
	Meters	12	8	96.0	10	0
Maintenance/Storage	Feet	101.7	36.1	3,670.5	16.4	0.0
	Meters	31	11	341.0	5	0
Admin/ Control Room	Feet	101.7	36.1	3,670.5	16.4	19.7
	Meters	31	11	341.0	5	6
Loadout Canopy	Feet	68.9	68.9	4,746.9	19.7	0.0
	Meters	21	21	441.0	6	0
		Total Bldg Floor Area		42,875		
		Improved area		4,485		

Basic Assumptions

Combustion Facility		Length	Span	Area	Height	Floor Elevation
	M to Ft	3.28084	3.28084	10.76391111	3.28084	3.28084
Boiler Bldg	Feet	60.0	85.0	5,100	140.0	1.0
	Meters	18.3	25.9	474	42.7	
Turbine Building	Feet	70.0	45.0	3,150	20.0	1.0
	Meters	21.3	13.7	293	6.1	1.0
Maintenance/Storage	Feet	48.0	36.0	1,728	20.0	1.0
	Meters	14.6	11.0	161	6.1	
Admin/ Control Room	Feet	48.0	36.0	1,728	20.0	1.0
	Meters	14.6	11.0	161	6.1	
Refuse Storage Bldg	Feet	80.0	45.0	3,600	30.0	1.0
	Meters	24.4	13.7	334	9.1	
Ash Storage Bldg	Feet	30.0	30.0	900	30.0	1.0
	Meters	9.1	9.1	84	9.1	
Site Development	Feet	350.0	80.0	28,000		
	Meters	106.7	24.4	2,601		
		Total Bldg Floor Area		16,206		
				[illegible]		

Demolition Estimate

		Length	Span	Area	Height	Volume
Conversion Factor	M to Ft	3.28084	3.28084	10.76391111	3.28084	Cy to m3
Warehouse #1 (1)	Feet	40	20	800.0	16	474
	Meters	12.2	6.1	74.3	4.9	-
Warehouse #2 (1)	Feet	40	18	720.0	16	427
	Meters	12.2	5.5	66.9	4.9	-
Warehouse #3 (1)	Feet	37	21	777.0	16	460
	Meters	11.3	6.4	72.2	4.9	-

__Notes:__

(1) Warehouse demolition at the central Plant location only

	1984 SPSA COST ($000)	2002 SPSA Escalated	SPSA Only 1 Process line	Plzen Adj. Factor # of TPH
Adjustment Factors				
Escalation Factor		1.78		
Tons Per Hour Infeed	100	100	100	30
Number of Lines	3	3	1	1
Process Bldg SF	111,000	111,000	37,095	37,095
Site Development				
Over Excavation	$ 1,248	$ 2,221	$ 922	$ 922
Backfill	$ 891	$ 1,586	$ 659	$ 659
Roads, Parking and Walkways	$ 1,036	$ 1,844	$ 766	$ 766
Storm Sewer	$ 17	$ 30	$ 13	$ 13
Sanitary Sewer	$ 180	$ 320	$ 133	$ 133
Water Supply	$ 100	$ 178	$ 74	$ 74
Fencing	$ 52	$ 93	$ 38	$ 38
Landscaping	$ 59	$ 105	$ 44	$ 44
Retaining Walls	$ 22	$ 39	$ 16	$ 16
Site Lighting	$ 85	$ 151	$ 63	$ 63
	$ 3,690	$ 6,568	$ 2,727	$ 2,727
Buildings				
Process Plant	$ 12,677	$ 22,565	$ 9,389	$ 9,389
Scales & Scale House		$ 375	$ 375	$ 375
	$ 12,677	$ 22,940	$ 9,764	$ 9,764
Process Equipment Installed				
Conveyors	$ 4,673	$ 8,318	$ 3,454	$ 1,318
Primary Trommel	$ 2,250	$ 4,005	$ 1,663	$ 635
Secondary Trommel	$ 1,350	$ 2,403	$ 998	$ 381
Shredder	$ 1,318	$ 2,346	$ 974	$ 372
Magnets	$ 520	$ 926	$ 384	$ 147
Instrumentation & Controls	$ 500	$ 890	$ 370	$ 141
Electrical	$ 2,140	$ 3,809	$ 1,582	$ 1,582
Mechanical	$ 1,441	$ 2,565	$ 1,065	$ 1,065
Fire Protection	$ 99	$ 176	$ 73	$ 73
	$ 14,291	$ 25,438	$ 10,563	$ 5,713
Miscellaneous				
Shop Tools and equipment	$ 150	$ 267	$ 111	$ 111
Mobile Equipment				$ 625
Office Furnishings	$ 30	$ 53	$ 22	$ 22
Spare Parts	$ 540	$ 961	$ 399	$ 152
	$ 720	$ 1,282	$ 532	$ 910

RDF Conveyor & Storage				**Length Adj.**	**Dia. Adj.**
RDF conveyor		$ 2,461	$ 4,381	$ 37	$ 32
RDF retrieval system					$ 340
Storage Building					$ 271
					$ 643
Subtotal		$ 31,378	$ 56,228	$ 23,587	$ 19,759
Contingency	10%	$ 3,138	$ 5,623	$ 2,359	$ 1,976
Total RDF Plant		**$ 34,516**	**$ 61,851**	**$ 25,945**	**$ 21,735**

Project:	Plezenska teplarenska WTE Feasibility Study
Technology:	RDF Incineration & Processing Facility- Roudna
Date:	08/11/03
Estimate Basis:	Conceptual Layout (50,000 Annual Tonnage)
Costs:	2003$
Location:	Plzen, Czech Republic

RDF Alternate B - Appendix B12
COST SUMMARY
RDF INCINERATION & PROCESSING FACILITY- ROUDNA
Conceptual Layout (50,000 Annual Tonnage)

Estimated Range of Total Capital cost	$40,233,000	to	$55,321,000
Estimated Range of Estimated Range of Total Capital Costs	$4,098,000	to	$5,635,000
Estimated Range of Estimated Range of Annual Amortized Capital C	$2,760,000	to	$3,374,000
Estiimated Range of Annual Operations & Maint	$6,858,000	to	$9,009,000
Estimated Range of Annual Costs	50,000		70%
RDF Annual Tonne	35,000		
Estimated Cost per Processed Tonne	$137	to	$180

Note: Annual Operations Cost does not include marketing & shipping of recovered materials,

Project:	Plezenska teplarenska WTE Feasibility Study
Technology:	RDF Incineration & Processing Facility- Roudna
Date:	08/11/03
Estimate Basis:	Conceptual Layout (50,000 Annual Tonnage)
Costs:	2003$
Location:	Plzen, Czech Republic

RDF Alternate B - Appendix B12
RDF INCINERATION & PROCESSING FACILITY- ROUDNA
CAPITAL COST SUMMARY [1]
Conceptual Layout (50,000 Annual Tonnage)

			Estimated Costs[2]
I.	SITE AQUISITION		$ 774,510
II.	SITE DEVELOPMENT		$ 4,269,400
III.	SCALE HOUSE AND SCALES		$ 155,741
IV.	BUILDINGS		$ 6,163,600
V.	PROCESSING EQUIPMENT		$ 8,130,000
VI.	MOBILE EQUIPMENT		$ 685,000
VII.	POWER BLOCK EQUIPMENT		$ 20,533,800
	SUBTOTAL CONSTRUCTION AND EQUIPMENT		$ 40,712,051
	CONTINGENCY	10%	$ 4,071,200
	DESIGN/ENGINEERING	5%	$ 2,239,200
	PERMITTING	2.3%	$ 1,030,000
	CONSTRUCTION INSPECTION	5%	$ 2,239,200
	TOTAL CAPITAL COST (FACILITY IMPLEMENTATION)		$ 50,291,651

NOTES:

(1) *All costs rounded to 1000's*

(2) All costs in 2003 $.

I. SITE AQUISITION

Item	Quantity	Units	Unit Price (4)	Item Cost	Total
	25,817	SM	$ 30.00	$774,510.00	
Subtotal I					$ 774,510.00

II. SITE DEVELOPMENT

Item		Quantity	Units	Unit Price (4)	Item Cost	Total
Site Preparation (1 site assumed)						$ 3,052,000
Excavation -foundations(1)		500	CuM	$22	$11,000	
Added for Combustion Facility		47	CuM	$12	$1,000	
General Earthwork (2)		46,300	CuM	$22	$1,019,000	
Earth Fill Material(7)		81,400	CuM	$22	$1,791,000	
Slope Stabilization (7)		2,700	CuM	$40	$108,000	
Added for Combustion Facility		3,011	CuM	$40	$120,000	
Finishing Grassing & Grading		1	Ha	$1,500	$2,000	
Demolition (Warehouse Buildings)		0	CuM	$12	$0	
Site Improvements						$ 809,800
Approach /Roadways Concrete (3)		1,487	sm	$60	$89,000	
Asphalt Roadways & Parking		8,566	sm	$65	$556,800	
Retaining Walls		153	CuM	$450	$69,000	
Site Drainage		1	L.S.	$40,000	$40,000	
Fencing(4)		840	m	$48	$40,000	
Landscaping (Minimal)		1	L.S.	$15,000	$15,000	
Site Utilities(5)	Number of Sites					$ 407,600
Fire Protection	1	350	m	$135	$47,300	
Water Supply	1	350	m	$135	$47,300	
Well Field	1	0	LS	$50,000	$0	
Sewer System	1	350	m	$150	$53,000	
Electrical(6)		1	L.S.	$260,000	$260,000	
Subtotal II						$ 4,269,400

Notes:

(1) Based on estimated building size (SM). Demolition calculated separately.
(2) General Earthwork includes moving soil, backfill, embankment, loadout tunnel excav, etc.
(3) Roadway unit price includes curbs, gutters, etc.
(4) Assumes perimeter fencing at 6' (1829 mm)(w/ barbed wire) with gates and litter fencing around maneuvering area of 15' (4877 mm) height, except at Cer
(5) Utilities unit price includes excavation, bedding material, piping installed, backfill, etc.
(6) Electrical includes high voltage service transformer, exterior lingtinig
(7) Estimate raising the site approximately 3 M.

III. SCALE HOUSE AND SCALES

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Building	37	SM	$538	$19,906	
Concrete Slabwork(2)	11	CuM	$262	$2,882	
Concrete Footings	8	CuM	$523	$4,184	
Interior Treatments(3)	37	SM	$538	$19,906	
Motor Truck Scales & Foundations	2	LS	$60,000	$120,000	
Mechanical(4)	37	SM	$108	$3,996	
Electrical(5)	37	SM	$129	$4,773	
Subtotal III					$155,741

Notes:

(1) No additional facilities for waste delivery truck drivers or admintration activities areas, are included.
(2) Assumes stable soil with good load bearing capacity. Slab floor is 6"(152 mm) reinforced concrete.
(3) Includes tile, painting, window covers and funiture
(4) Building mechanical includes drains, plumbing, air handling, fire protection, etc.
(5) Electrical includes lighting, power, communications, etc.

IV. BUILDINGS

Item	Quantity	Units		Unit Price	Item Cost	Total
RDF Processing						$ 5,079,900
Metal Buildings -Shell (1)	4,300	SM	$	538	$2,314,300	
Loadout Canopy	500	SM	$	262	$131,000	
Concrete Slabwork(2)	1,200	CuM	$	262	$314,400	
Concrete Footings/Foundation	800	CuM	$	523	$418,000	
Concrete Push Walls(3)	200	CuM	$	400	$80,000	
Overhead Doors	10	ea	$	10,000	$100,000	
Mechanical(4)	4,634	SM	$	65	$299,000	
Fire Protection (5)	4,634	SM	$	19.91	$92,000	
Fire Protection Beneath Equipment	500	SM	$	22	$11,000	
Electrical(6)	5,100	SM	$	86	$439,200	
Admin. / Maint. Area	682	SM	$	1,292	$881,000	
Combustion Facility						$1,083,700
Metal Buildings - Shell (Ash)	90	SM	$	807	$72,700	
Ash Concrete Push Walls(3)	140	CuM	$	400	$56,000	
Metal Buildings - Engineered (Boiler)	24,000	CuM	$	32	$775,000	
RDF Metal Buildings (Storage)	334	SM	$	538	$180,000	
Subtotal IV						$ 6,163,600

Notes:

(1) Metal bldg. includes structural steel, column free bldg. (long span), 30 ft. (9144 mm)clear height, & 20 yr roofing warranty.
(2) Assumes stable soil with good load bearing capacity. Slab floor is 10" (254 mm) reinforced concrete on grade;12" (305 mm)on structural slabs
(3) 15' (4877 mm) concrete waste containment walls along three sides of tipping area
(4) Building mechanical includes drains, plumbing, air handling, etc.
(5) Assumes adequate water pressure and water supply available.
(6) Electrical includes lighting, power, communications, etc.

V. PROCESSING EQUIPMENT

Item	Quantity	Type & Size	Units	Unit Price	Item Cost	Total
Processing Equipment						
Primary Trommel	1		Ea			
Secondary Tromme	1		Ea			
Primary Shredder	1		Ea			
Manetic Separators	2		Ea			
Conveyors	1		Ea			
Sorting Platform	1		Ea			
Mics. Structural	1		LS			
Electrical Equip.	1		LS			
Dust Collection	1		LS			
Subtotal Processing Equipment (1)					$3,400,000	
RDF Conveyor		20	m	$11,971.64	$239,000	
RDF Retrieval System		1	LS	$340,000	$340,000	
RDF Feed System Subtotal						
Electrical Service	1		LS	$100,000	$100,000	
Freight	1		LS	$200,000	$200,000	
Total Equipment Cost - Furnished and Delivered						$4,279,000
Equipment Installation (Local Costs)						$3,851,000
Subtotal V						$8,130,000

Notes:

(1) Base on Quote from The Heil Company
~~(2) Assumes RDF must transport approximately 4 Km from Roudna to the Central Plant via truck. Possible 1300 M via conveyor~~

VI. MOBILE EQUIPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Front End - Loader Rubber Tire	2	ea	$180,000	$360,000	
Utility Tractor and Sweeper	1	ea	$55,000	$55,000	
Ash Trucks & Trailers	2	ea	$125,000	$250,000	
Pick-up/Utility Truck	1	ea	$20,000	$20,000	
Subtotal VI					$685,000

Notes:

(1) Facility operating hours per year based on number of shifts 4,160 hrs 2 Shifts

VII. POWER BLOCK EQUIPMENT

Item	Quantity	Unit	Unit Price	Item Cost	Total
RDF Fired Boiler (1)	1	LS	$10,500,000	$10,500,000	
SNCR (NOx Control)	1	LS	$133,000	$133,000	
Continuous Emissions Monitoring (2)	1	LS	$220,000	$220,000	
Bottom Ash Handling	1	LS	$155,335	$89,000	
Flyash Handling/Conditioning	1	LS	$621,339	$357,000	
Aux Cooling Water System (3)	1	LS	$58,727	$33,700	
Additional Cooling Towers	1	Cell	$143,000	$143,000	
Condensate System	1	LS	$202,352	$116,200	
Chem Feed	1	LS	$110,092	$63,200	
Circulating Water System	1	LS	$173,432	$99,600	
Waste Water System	1	LS	$204,393	$117,400	
Water Treatment (3)	1	LS	$198,981	$114,300	
Fire Protection	1	LS	$171,658	$98,600	
Feedwater System	1	LS	$155,512	$89,300	
Compressed Air System	1	LS	$43,735	$25,000	
Service Water System	1	LS	$41,340	$24,000	
Stack (Erected)	1	LS	$350,000	$201,000	
Heat Exchangers	2	LS	$65,000	$130,000	
Steam Piping	1	LS	$125,000	$71,800	
Steam Turbine (4)	1	LS	$300,000	$300,000	
Substation & Electrical System (3)	1	LS	$2,928,000	$1,681,700	
Equipment Subtotal					$14,607,800
Boiler Erection (Labor)	1	LS	$3,150,000	$3,150,000	
Steam Turbine Installation (4)	0.5	LS	$180,000	$90,000	
Mechanical Installation (Labor)	1	LS	$1,247,959	$1,248,000	
Electrical Installation (Labor)	1	LS	$1,098,000	$1,098,000	
Installation Subtotal					$5,586,000
Shop Tools & Equip.	1	Allowance	$100,000	$100,000	
Office Furnishings	1	Allowance	$40,000	$40,000	
Spare Parts	1	Allowance	$200,000	$200,000	
Miscellaneous Items					$340,000
Subtotal VII					$20,533,800

Notes:

(1) Based on equipment quote from Babcock and Wilcox

(2) Based on equipment quote from Opsis plus 10 percent for installation, calibration and training assistance.

(3) Assumes that all or a portion of these systems are provided at the existing Central Plant, only

(4) Based on equipment qoute and installation estimate from Skoda and Dresser Rand

Subtotal I through VII	$40,712,051

$/tonne/day capacity at 137 tpd $297,198

Project:	Plezenska teplarenska WTE Feasibility Study
Technology:	RDF Incineration & Processing Facility- Roudna
Date:	08/11/03
Estimate Basis:	Conceptual Layout (50,000 Annual Tonnage)
Costs:	2003$
Location:	Plzen, Czech Republic

RDF Alternate B - Appendix B12
RDF INCINERATION & PROCESSING FACILITY- ROUDNA
OPERATIONS AND MAINTENANCE COST SUMMARY (1)
Conceptual Layout (50,000 Annual Tonnage)

				Estimated Costs(2)
I.	LABOR			$ 572,700
II.	FACILITY MAINTENANCE			$ 1,242,000
III.	UTILITIES			$ 99,000
IV.	PROCESS RESIDUE HAUL & DISPOSAL			$ 535,000
V.	ROLLING STOCK O&M COSTS			$ 194,000
VI.	MISCELLANEOUS COSTS			$ 129,000
	SUBTOTAL OPERATION & MAINTENANCE			$ 2,772,000
	CONTINGENCY	10%		$ 277,000
	ACCOUNTING, SUPPLIES, MISC.	5%		$ 152,000
	ADMINISTRATION AND PROFIT	3%		$ 91,000
	TOTAL ANNUAL OPERATION & MAINTENANCE COST			$ 3,292,000
VIII.	MINUS	MATERIAL SALES REVENUES		$ (225,000)
	NET ANNUAL OPERATION & MAINTENANCE COST			$ 3,067,000
	OPERATION & MAINTENANCE COST RANGE		*$2,760,000* to	*$3,374,000*
			Cost / Tonne	$ 61.34

NOTES:

(1) All costs rounded to 1000's

(2) All costs in 2003 $.

(3) Does not include energy revenues

I. LABOR

Job Classification	Personnel(1)	$/hr	hrs/yr	OT Hrs	Annual Cost	% OT	Total
Facility Manager (2)	1	$20.00	2,016	0	$40,320	0%	
Operating Engineer (3)	1	$14.55	2,016	0	$29,333	0%	
Administrative/Clerical (4)	1	$4.67	2,016	208	$10,864	10%	
Scale Attendant (4)	2	$4.90	2,016	208	$22,814	10%	
RDF Haulers	0	$4.67	2,016	208	$0	10%	
Processing Plant 15	People	1-Operation shift/ 1 Maintenance shift					
Equipment Operators (4)	2	$7.47	2,016	208	$34,765	10%	
Equipment Operators (4)	2	$4.90	2,016	208	$22,814	10%	
Picking Crew (4)	4	$4.67	2,016	208	$43,456	10%	
Mechanic (4)	1	$7.23	2,016	208	$16,839	10%	
Electrician/Electronics Specialist (	1	$7.47	2,016	208	$17,382	10%	
Welders (4)	1	$7.47	2,016	208	$17,382	10%	
Helper (4)	1	$5.83	2,016	208	$13,580	10%	
Residue Disposal Drivers (4)	1	$5.13	2,016	208	$11,950	10%	
Spotters/Laborers (4)	2	$4.67	2,016	208	$21,728	10%	
Boiler Plant 18	People	24 hours 7 days per week					
Lead Equipment Operator (4)	4	$7.47	2,016	312	$74,189	15%	
Equipment Operators (4)	5	$4.90	2,080	312	$62,426	15%	
Mechanic (4)	2	$7.23	2,080	208	$34,604	10%	
Electrician/Electronics Specialist (	1	$7.47	2,080	208	$17,860	10%	
Welders (4)	1	$7.47	2,080	208	$17,860	10%	
Helper (4)	2	$5.83	2,080	208	$27,907	10%	
Ash Disposal Driver (4)	1	$5.13	2,080	208	$12,279	10%	
Laborer (4)	2	$4.67	2,080	208	$22,325	10%	
Subtotal	38						$572,700

Notes:

(1) Point in Time Staffing for year 2003.

(2) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick [illegible]

(3) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick [illegible]

(4) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, vacation/sick [illegible]

(5) Assumes standard Czech working hours

(6) Overtime pay is at 1.5 times regular rate

II. FACILITY MAINTENANCE

Item	% of Capital Value	Quantity	Unit	Unit Price	Annual Cost	Total
RDF Processing						
Site Maintenance(site) (1)	1.5%	1	Lump	$ 64,041	$64,041	
Building Repair & Replacement (2	3.3%	1	Lump	$ 172,776	$172,776	
Equipment Maintenance (3)	2.0%	1	Lump	$ 85,580	$85,580	
Shredder Maintenance (4)	5.0%	1	Lump	$ 25,000	$25,000	
Equipment Replacement (5)	3.0%	1	Lump	$ 128,370	$128,370	
Combustion Facility						
Building Repair & Replacement (2	3.3%	1	Lump	$ 35,762	$35,762	
Equipment Maintenance (3)	2.0%	1	Lump	$ 292,156	$292,156	
Equipment Replacement (5)	3.0%	1	Lump	$ 438,234	$438,234	
Subtotal						$1,242,000

Notes:

(1) Site maintenance is estimated as % capital construction cost for site improvements and site utilities.

(2) Buidling repair base on a 30 year depreciation of the original capital cost with escalation.

(3) Equipment maintenance (annual needs) and replacement (periodic needs) estimated based on assumed 20 life.

(4) Shredder maintenance is based on empirical data from shredder operations, which involves frequent hammer rebuilds or replacement

(5) Equipment maintenance (annual needs) and replacement (periodic needs) estimated based on assumed 20 life. This is a fund set aside.

III. UTILITIES

Item	Quantity	Unit	Unit Price	Annual Cost	Total
Electricity	1,448	MWH/yr	$ 35.7905	$ 51,821	
Natural Gas	82,704	m^3/yr	$ 0.202	$ 16,668	
Telephone (Mobile/Fixed)	-5	Phones	$ 360	$ (1,800)	
Water	5,575	CuM/Yr	$ 0.340	$ 1,895	
Sewer	1,121	CuM/Yr	$ 0.340	$ 381	
Lime	350	Tonne	$ 76.20	$ 26,694	
Ammonia	131	Tonne	$ 20.00	$ 2,627	
Carbon	16	Tonne	$ 50.00	$ 788	
Subtotal					$ 99,075

Notes:

(1) Electricity purchase includes process plant and combustion energy use during downtimes only; inhouse power provided by the system otherwise

(2) Gas used for start-up and shutdown only to maintain "good combustion control"

(3) Based on mobile phones for entire staff except drivers, helpers and laborers.

(4) Sewer use based on 25% of water use; evaporation and ash quench account for rest.

IV. PROCESS RESIDUE HAUL & DISPOSAL

Item	Cost /Load(1)	Quantity	Unit	Unit Price	Annual Cost	Total
RDF Haul to Central Plant	$ 43	-	Tonne	$ 2.15	$ -	
Process Residue Haul	$ 43	13,750	Tonne	$ 2.15	$ 29,563	
Ash Haul	$ 43	5,338	Tonne	$ 2.15	$ 11,477	
Landfill Disposal Fees		19,088	Tonne	$ 25.90	$ 494,386	
Subtotal						$ 535,426

Notes:

(1) Cost assumes truck operating costs per 20-ton load

V. ROLLING STOCK O&M COSTS

Fuel	Useage	Unit Rate	Units	Unit Price	Annual Cost	Total
Front End Loader (1)	8,320	11	L/hour	$0.85	$80,300	
Articulated Crane	52	95	L/wk(est.)	$0.85	$4,200	
Pick-up Truck	52	114	L/wk	$0.85	$5,000	
Maintenance	**# Vehicles**	**Quantity**	**Units**	**Unit Price**	**Annual Cost**	**Total**
Front End Loader(1)	2	1	L.S.	$28,700	$57,400	
Articulated Crane	1	1	L.S.	$10,000	$10,000	
Pick-up Truck	1	19,200	Km/Yr	$0.13	$2,500	
General O&M		1	L.S.	$35,000	$35,000	
Subtotal						$194,400

Notes:

(1) Based on Owning and Operating Cost Methodology in the Catepillar Performance Handbook.

VI. MISCELLANEOUS COSTS

Item	Useage (1)	Quantity	Unit	Unit Price	Annual Cost	Total
Property Insurance (2)	1	0.3%			$120,100	
Flood Insurance (2)	0	1.2%			$0	
Property Taxes (3)	1	7,086	m^2	$0.78	$5,500	
Pollution Fees (4)		1	L.S.	$ 3,529	$ 3,529	
Subtotal						$ 129,129

Notes:

(1) Multiplier used to adjust costs for various potential sites. Zero means expense not appicalbe to this site.

(2) Based on % of capital construction costs.

(3) Based on area of developed property.

(4) Based on analysis in report on Environmental Considerations and assuming 7446 combustion hours per at unit capacity.

Subtotal I through VI	$2,200,029

VII. MATERIAL SALES REVENUES

Material	2003 Tons/Yr	Unit	Unit Value	Annual Revenues	Total
Net Electric Generation	11,899	Mwh		$0	Addressed in Pro Forma
Net Steam Generation	165,160,790	Tonne		$0	Addressed in Pro Forma
Aluminum	200	Tonne	$800	$160,000	
Ferrous Metals (pre-combustion)	1,300	Tonne	$50	$65,000	
Subtotal VIII	1,500	Tonne Recycled			$225,000

Labor Rate Assumptions	Model Value $/Hour	US $ $/Hour	CZK K/Hr
Facility Manager	$ 13.33	$ 13.33	400.00
Operating Engineer	$ 10.00	$ 10.00	300.00
Shift Supervisor	$ 8.67	$ 8.67	260.00
Administrative/Clerical	$ 3.33	$ 3.33	100.00
Scale Attendant	$ 3.50	$ 3.50	105.00
Lead Equipment Operator	$ 5.33	$ 5.33	160.00
Equipment Operators	$ 3.50	$ 3.50	105.00
Picking Crew	$ 3.33	$ 3.33	100.00
Mechanic	$ 5.17	$ 5.17	155.00
Electrician/Electronics Specialist	$ 5.33	$ 5.33	160.00
Welders	$ 5.00	$ 5.00	150.00
Helpers	$ 4.17	$ 4.17	125.00
Residue Disposal Drivers	$ 3.67	$ 3.67	110.00
Spotters/Laborers	$ 3.33	$ 3.33	100.00

(1) Kc/Hr rates are rates as provided by PT

(2) Conversion @ 30 Kc per USD

Water Usage

	Assumptions	Gallons	Liters
	Conversion factor =		3.785412
Domestic			
Average People/Day	0		
Usage/Person/Day		25	95
Per day		12	45
days/week		7	7
weeks/year		52	52
Per Year		4,333	16,403
MakeWater/Blowdown	4%	1,221,664	4,624,502
Spray Dryer(Kg/hr Water/tpd Fu	0.95	211,564	800,856
washdown		35,100	132,868
Total Water Usage		1,472,661	5,574,630
Evaporation/Ash Quench	80%	1,176,396	4,453,142
Total Sewer Usage		296,266	1,121,487

Reagent Usage

	Lb/Ton [illegible]	Kg/Tonne	Annual Usage (Tonne)	Estimated Annual Cost
Lime	20	10.0	350	$26,594
Ammonia	7.5	3.8	131	$2,739
Carbon	0.87	0.45	16	$821

Energy Generation Assumptions

	Gross Generation per Tonne	In House Power per Tonne	Net Generation per Tonne	Net Annual Generation	
Steam Production (Kg)	2477	174	2303	155,150,799	Tonne
Electricity Production (kWh)	286	46	240	11,898,304	KWh

Assumes backpressure turbine	9	Kg/KW-hr	16,344	Kg/hr	0%	Margin

Energy Consumption Assumptions

Item	mmBtu/Ton	cubic feet/ meter	MMBTU		m^3/yr
Natural Gas (mmBTU)	0.0757	35.31467	2,921		82,705
	MJ/Tonne		GJ		m^3/yr
Natural Gas (MJ)	88.03		3,081		82,704

Processing Equipment	Qty	hp	load factor	kw	hrs/year	28.32 kwh/yr
C-1	1	10	90%	6.7	2288	15,341
C-2	1	10	90%	6.7	2288	15,341
C-3	1	5	90%	3.4	2288	7,671
C-4	1	5	90%	3.4	2288	7,671
C-5	1	5	90%	3.4	2288	7,671
C-6	1	5	90%	3.4	2288	7,671
C-7	1	5	90%	3.4	2288	7,671
C-8	1	5	90%	3.4	2288	7,671
C-9	1	5	90%	3.4	2288	7,671
C-10	1	5	90%	3.4	2288	7,671
C-11	1	5	90%	3.4	2288	7,671
C-12	1	5	90%	3.4	2288	7,671
C-13	1	5	90%	3.4	2288	7,671
C-14	1	5	90%	3.4	2288	7,671
C-15	1	5	90%	3.4	2288	7,671
C-16	1	5	90%	3.4	2288	7,671
C-17	1	5	90%	3.4	2288	7,671
C-18	1	5	90%	3.4	2288	7,671
C-19	1	5	90%	3.4	2288	7,671
T-1	1	40	90%	26.8	2288	61,364
T-2	1	40	90%	26.8	2288	61,364
S-1	1	400	90%	268.2	2288	613,642
Dust Collection	1	40	90%	26.8	2288	61,364
Miscellaneous	1	30	90%	20.1	2288	46,023
Total Equipment				**439.2**		**1,004,838**
Item	**Qty**	**hp**	**load factor**	**kw**	**hrs/year**	**kwh/yr**
Ventilating Equipment/ Heating Equipment	12	3	80%	21.5	2288	49,091
Power Block Purchase(kWh/T)	5					175,000
		SFT	W/SF	kw	hrs/year	kwh/yr
Lighting (3W/SF + 10%)		29,000	3.00	95.7	2288	218,962
Total						**1,447,891**

Basic Assumptions

RDF Quanitites and Characteristics					
Waste Quantity		50,000	Tonne		
Daily Delivery (7 days per week)		137	Tonne		
Capacity Factor		85%			
Daily Delivery (5 days per week)		192	Tonne		
Annual Throughput		50,000	Tonne		
RDF Production		70%			
RDF Quantity(5 day week production)		135	Tonne	Aluminum Recovery	0.40%
RDF Quantity (annual)		35,000	Tonne	Ferrous Recovery	2.60%
RDF HHV (B&W)		11.9	MJ/Kg		
Boiler Efficiency (B&W)		70%			
Fuel Feed Rate (B&W)		4,701	Kg/Hr at	113 tonne/day	
Gross Steam Production (B&W)		16,344	Kg/Hr	3,477 Kg(steam)/tonne	
Residue Disposal					
Co-firing Rate (% RDF)		100%	RDF	3 Truckloads/Day5	
Residue Disposal	27.5%	53	tpd5	1 Truckloads/Day7	
Ash Disposal (cofiring)	13%	14.7	tpd7	3.0 Truckloads/Day	
Truck Payload (Tons)		20	tonne/truck	6 HRs/day	
		31	HRS/week	2 Round Trip Haul	

Basic Conceptual Layout Dimensions

MSW Tipping floor storage (Minimum)

Daily Delivery	192	Tonne	
Floor Storage	4	days	
Floor Storage	769	Tonne	
MSW Density	208	Kg/Cu.M	
Floor Storage	3,694	Cu.M	
Floor Storage	1,100	SM	(15 ft (4.6 m) deep plus 35% for maneuvering)

RDF Storage Calculations

RDF Floor Storage	4	Days	
RDF Floor Storage	538	tonne	
RDF Density	192	Kg/Cu.M	
RDF Floor Storage	2801	Cu.M	
RDF Floor Storage	800	SM	(15 ft (4.6 m) deep plus 25% for maneuvering)
RDF Conveyor Length	20	m	Between Processing Building and RDF Storage
Power Plant RDF Input	113	tpd7	

Waste Storage		Length	Span	Area	Height	Floor Elevation
RDF Storage bldg length	Feet	120	111	13,320	30	
	Meters	37	34	800	9	
Tipping building length	Feet	120	147	17,640	30	
	Meters	37	45	1100	9	

Basic Assumptions

Processing Area		Length	Span	Area	Height	Floor Elevation
	M to Ft	3.28084	3.28084	10.76391111	3.28084	3.28084
Exterior Maneuvering	Feet	120.0	45.0	5,400.0		
	Meters	36.6	13.7	501.7		
MSW Tipping Floor	Feet	120.0	150.0	18,000.0	19.7	16.4
	Meters	36.6	45.7	1,672.3	6	5
Processing Area	Feet	170.6	68.9	11,754.2	36.1	0.0
	Meters	52	21	1,092.0	11	0
Shredder Enclosure	Feet	39.4	26.2	1,033.3	32.8	0.0
	Meters	12	8	96.0	10	0
Maintenance/Storage	Feet	101.7	36.1	3,670.5	16.4	0.0
	Meters	31	11	341.0	5	0
Admin/ Control Room	Feet	101.7	36.1	3,670.5	16.4	19.7
	Meters	31	11	341.0	5	6
Loadout Canopy	Feet	68.9	68.9	4,746.9	19.7	0.0
	Meters	21	21	441.0	6	0
		Total Bldg Floor Area		42,875		
		Improved area		4,484.9		

Basic Assumptions

Combustion Facility		Length	Span	Area	Height	Floor Elevation
	M to Ft	3.28084	3.28084	10.76391	3.28084	3.28084
Boiler Bldg	Feet	60.0	85.0	5,100	140.0	1.0
	Meters	18.3	25.9	474	42.7	
Turbine Building	Feet	70.0	45.0	3,150	20.0	1.0
	Meters	21.3	13.7	293	6.1	1.0
Maintenance/Storage	Feet	48.0	36.0	1,728	20.0	1.0
	Meters	14.6	11.0	161	6.1	
Admin/ Control Room	Feet	48.0	36.0	1,728	20.0	1.0
	Meters	14.6	11.0	161	6.1	
Refuse Storage Bldg	Feet	80.0	45.0	3,600	30.0	1.0
	Meters	24.4	13.7	334	9.1	
Ash Storage Bldg	Feet	30.0	30.0	900	30.0	1.0
	Meters	9.1	9.1	84	9.1	
Site Development	Feet	350.0	80.0	28,000		
	Meters	106.7	24.4	2,601		
		Total Bldg Floor Area		[illegible]		

Demolition Estimate

		Length	Span	Area	Height	Volume
Conversion Factor	M to Ft	3.28084	3.28084	10.76391	3.28084	Cy of m3
Warehouse #1 (1)	Feet	40	20	800.0	16	474
	Meters	12.2	6.1	74.3	0.0	-
Warehouse #2 (1)	Feet	40	18	720.0	16	427
	Meters	12.2	5.5	66.9	0.0	-
Warehouse #3 (1)	Feet	37	21	777.0	16	460
	Meters	11.3	6.4	72.2	0.0	-

Notes:

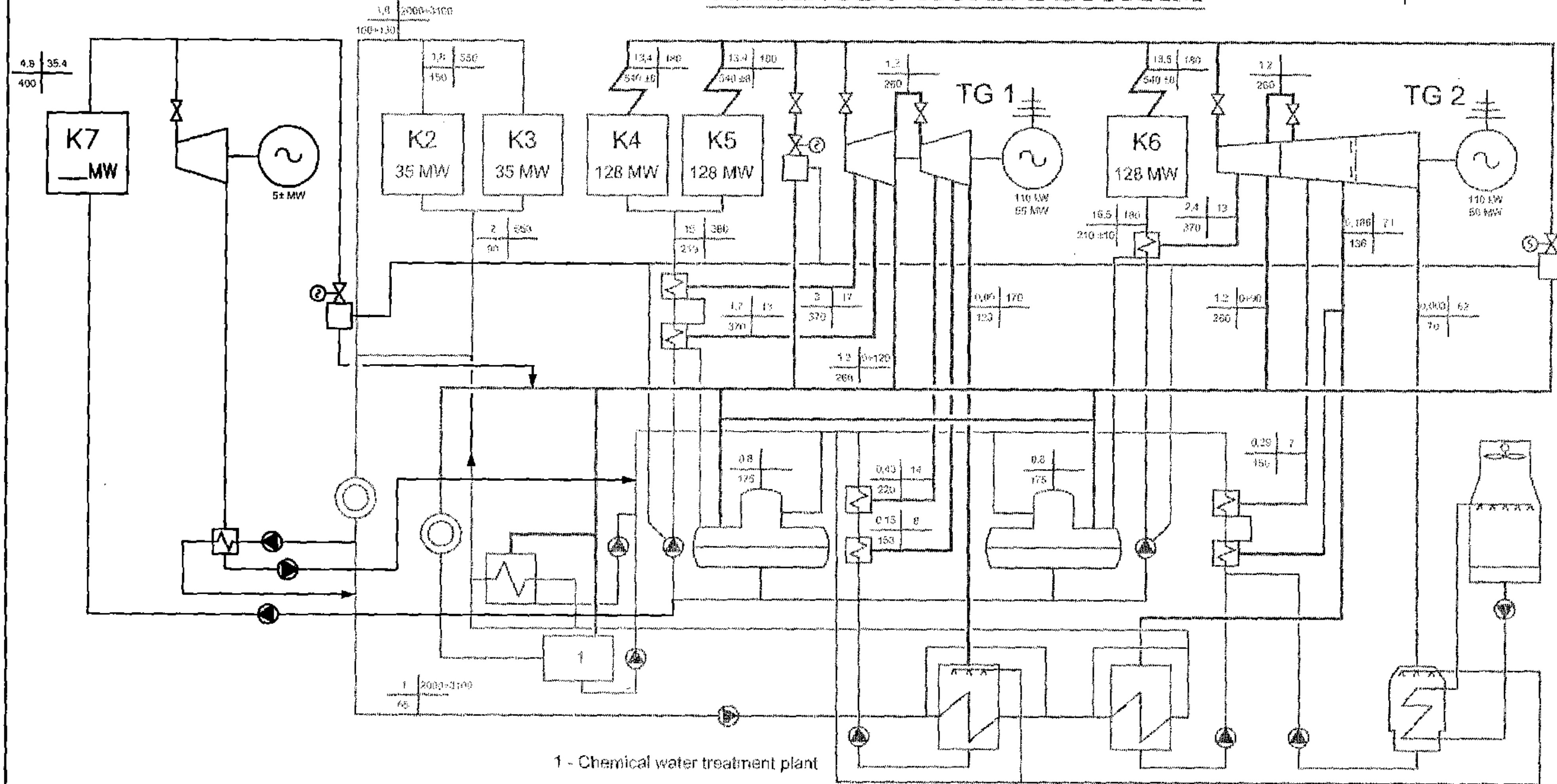
(1) Warehouse demolition at the central Plant location only

	1984 SPSA COST ($000)	2002 SPSA Escalated	SPSA Only 1 Process line	Plzen Adj. Factor # of TPH
Adjustment Factors				
Escalation Factor		1.78		
Tons Per Hour Infeed	100	100	100	30
Number of Lines	3	3	1	1
Process Bldg SF	111,000	111,000	37,095	37,095
Site Development				
Over Excavation	$ 1,248	$ 2,221	$ 922	$ 922
Backfill	$ 891	$ 1,586	$ 659	$ 659
Roads, Parking and Walkways	$ 1,036	$ 1,844	$ 766	$ 766
Storm Sewer	$ 17	$ 30	$ 13	$ 13
Sanitary Sewer	$ 180	$ 320	$ 133	$ 133
Water Supply	$ 100	$ 178	$ 74	$ 74
Fencing	$ 52	$ 93	$ 38	$ 38
Landscaping	$ 59	$ 105	$ 44	$ 44
Retaining Walls	$ 22	$ 39	$ 16	$ 16
Site Lighting	$ 85	$ 151	$ 63	$ 63
	$ 3,690	$ 6,568	$ 2,727	$ 2,727
Buildings				
Process Plant	$ 12,677	$ 22,565	$ 9,389	$ 9,389
Scales & Scale House		$ 375	$ 375	$ 375
	$ 12,677	$ 22,940	$ 9,764	$ 9,764
Process Equipment Installed				
Conveyors	$ 4,673	$ 8,318	$ 3,454	$ 1,318
Primary Trommel	$ 2,250	$ 4,005	$ 1,663	$ 635
Secondary Trommel	$ 1,350	$ 2,403	$ 998	$ 381
Shredder	$ 1,318	$ 2,346	$ 974	$ 372
Magnets	$ 520	$ 926	$ 384	$ 147
Instrumentation & Controls	$ 500	$ 890	$ 370	$ 141
Electrical	$ 2,140	$ 3,809	$ 1,582	$ 1,582
Mechanical	$ 1,441	$ 2,565	$ 1,065	$ 1,065
Fire Protection	$ 99	$ 176	$ 73	$ 73
	$ 14,291	$ 25,438	$ 10,563	$ 5,713
Miscellaneous				
Shop Tools and equipment	$ 150	$ 267	$ 111	$ 111
Mobile Equipment				$ 685
Office Furnishings	$ 30	$ 53	$ 22	$ 22
Spare Parts	$ 540	$ 961	$ 399	$ 152
	$ 720	$ 1,282	$ 532	$ 970

RDF Conveyor & Storage				Length Adj.	Dia. Adj.
RDF conveyor		$ 2,461	$ 4,381	$ 73	$ 65
RDF retrieval system					$ 340
Storage Building					$ 180
					$ 585
Subtotal		$ 31,378	$ 56,228	$ 23,587	$ 19,760
Contingency	10%	$ 3,138	$ 5,623	$ 2,359	$ 1,976
Total RDF Plant		**$ 34,516**	**$ 61,851**	**$ 25,945**	**$ 21,736**

APPENDIX C – SYSTEMS DIAGRAMS

TECHNOLOGICAL DIAGRAM



1 - Chemical water treatment plant

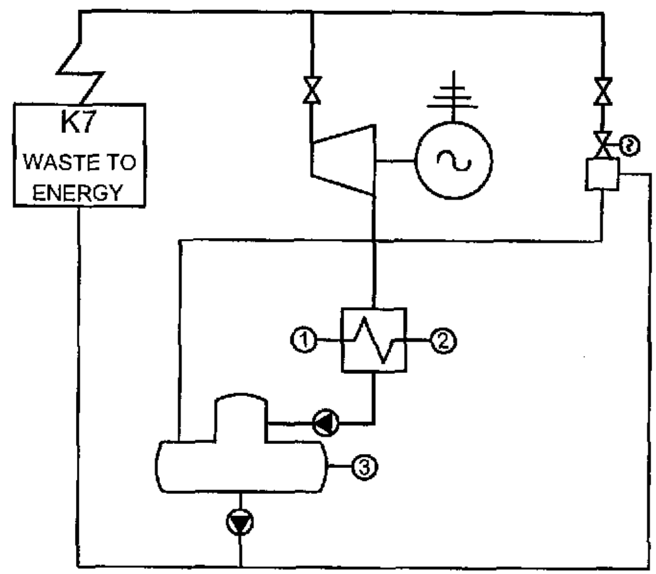
HDR

HDR Engineering, Inc.

Concept for Turbine Generator
100,000 Tonne Annual
Central Plant Location

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date	6/2003
Fig.	VI–2



① HOT WATER RETURN FROM DISTRICT HEATING SYSTEM
② HOT WATER TO HEATING SYSTEM
③ DEMINERALIZED WATER FROM INCINERATION PLANT

HDR

HDR Engineering, Inc.

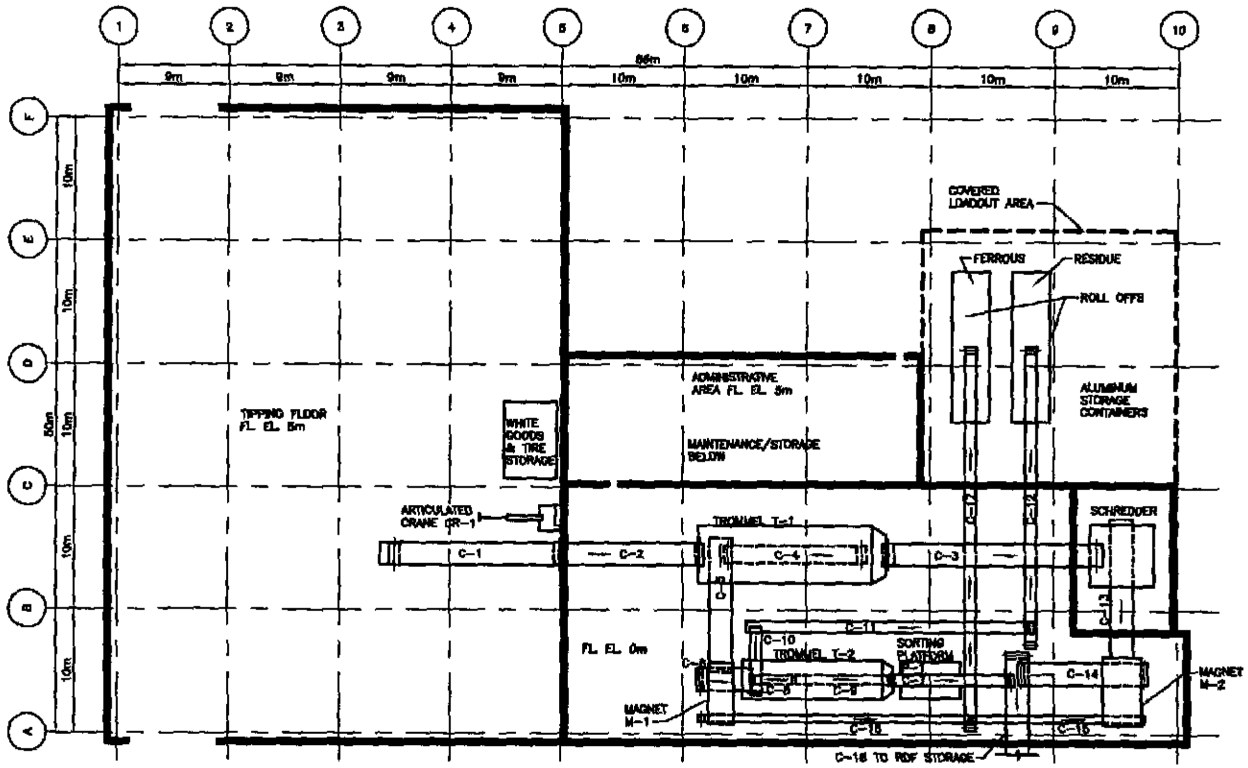
Concept for Turbine Generator
100,000 Tonne Annual
Plant Remote From Central Plant

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI–4

Process Equipment List			
Number	Description	Type	Waste Density (Lbs/Cf)
C-1	In-Feed Conveyor	Apron	12
C-2	Trommel T-1 Feed Conveyor	Apron	12
C-3	Shredder Feed Conveyor	Apron	8
C-4	Trommel T-1 Unders Conveyor	Belt	15
C-5	Unders Transfer Conveyor	Belt	15
C-6	Trommel T-2 Feed Conveyor	Belt	15
C-7	Trommel T-2 Overs Conveyor	Belt	12
C-8	Trommel T-2 Fines Conveyor	Belt	40
C-9	Trommel T-2 Unders Conveyor	Belt	4
C-10	Rejects Transfer Conveyor	Belt	40
C-11	Rejects Transfer Conveyor	Belt	40
C-12	Rejects Loadout Conveyor	Belt	40
C-13	Shredder Loadout Conveyor	Vibrating Pan	4
C-14	Transfer Conveyor	Belt	4
C-15	Shredder Ferrous Conveyor	Belt	20
C-16	Ferrous Transfer Conveyor	Belt	20
C-17	Ferrous loadout Conveyor	Belt	20
C-18	RDF Transfer Conveyor	Belt	4
M-1	Magnet	Overhead Belt	
M-2	Magnet	Overhead Belt	
P-1	Aluminum Sorting Station	Platform	
S-1	Shredder	Hammermill	
T-1	Primary Trommel	1-Stage	
T-2	Secondary Trommel	2-Stage	



HDR

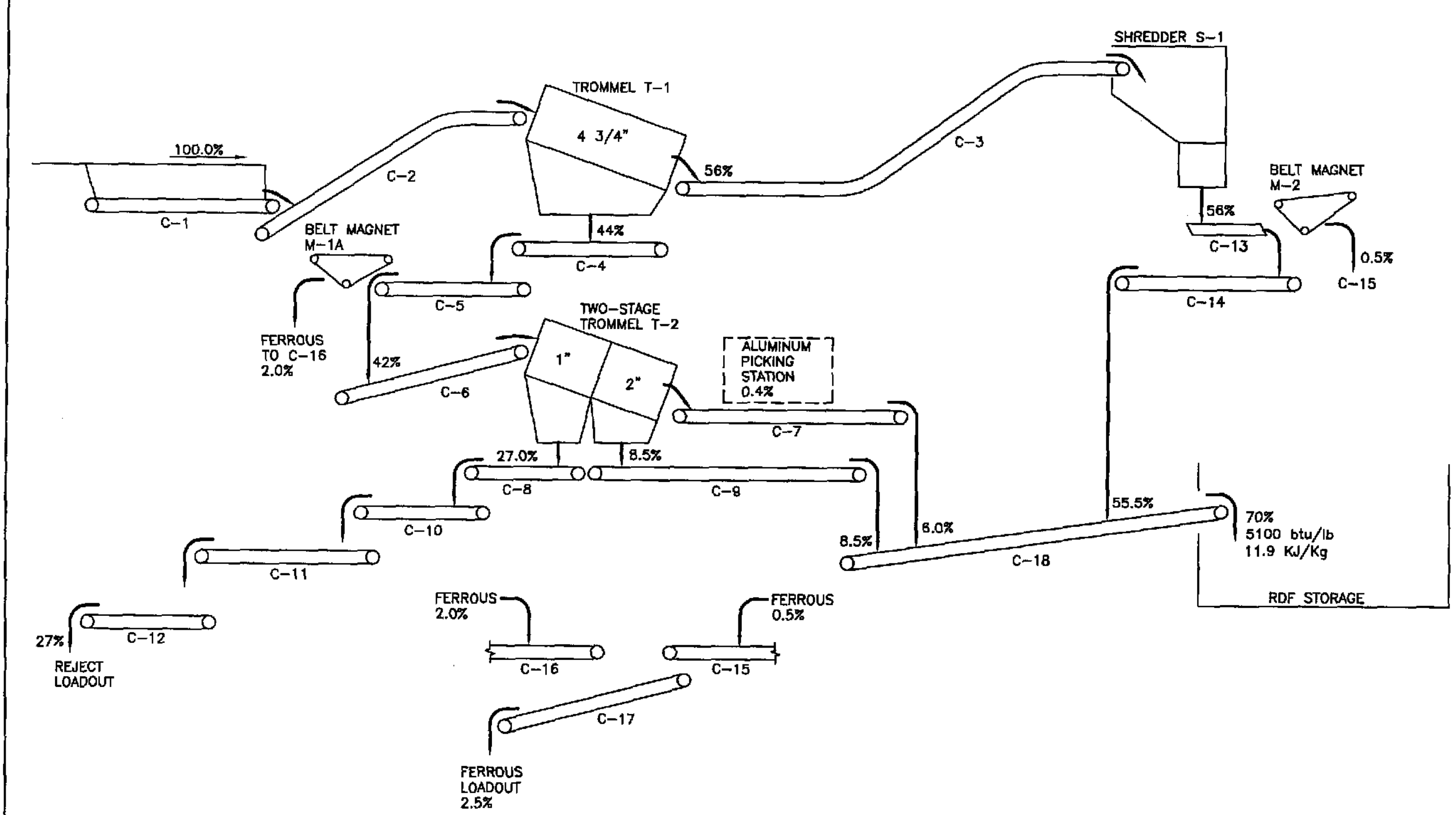
HDR Engineering, Inc.

Conceptual Plant Layout
100,000/50,000 Tonne Annual
RDF Processing

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-6



HDR

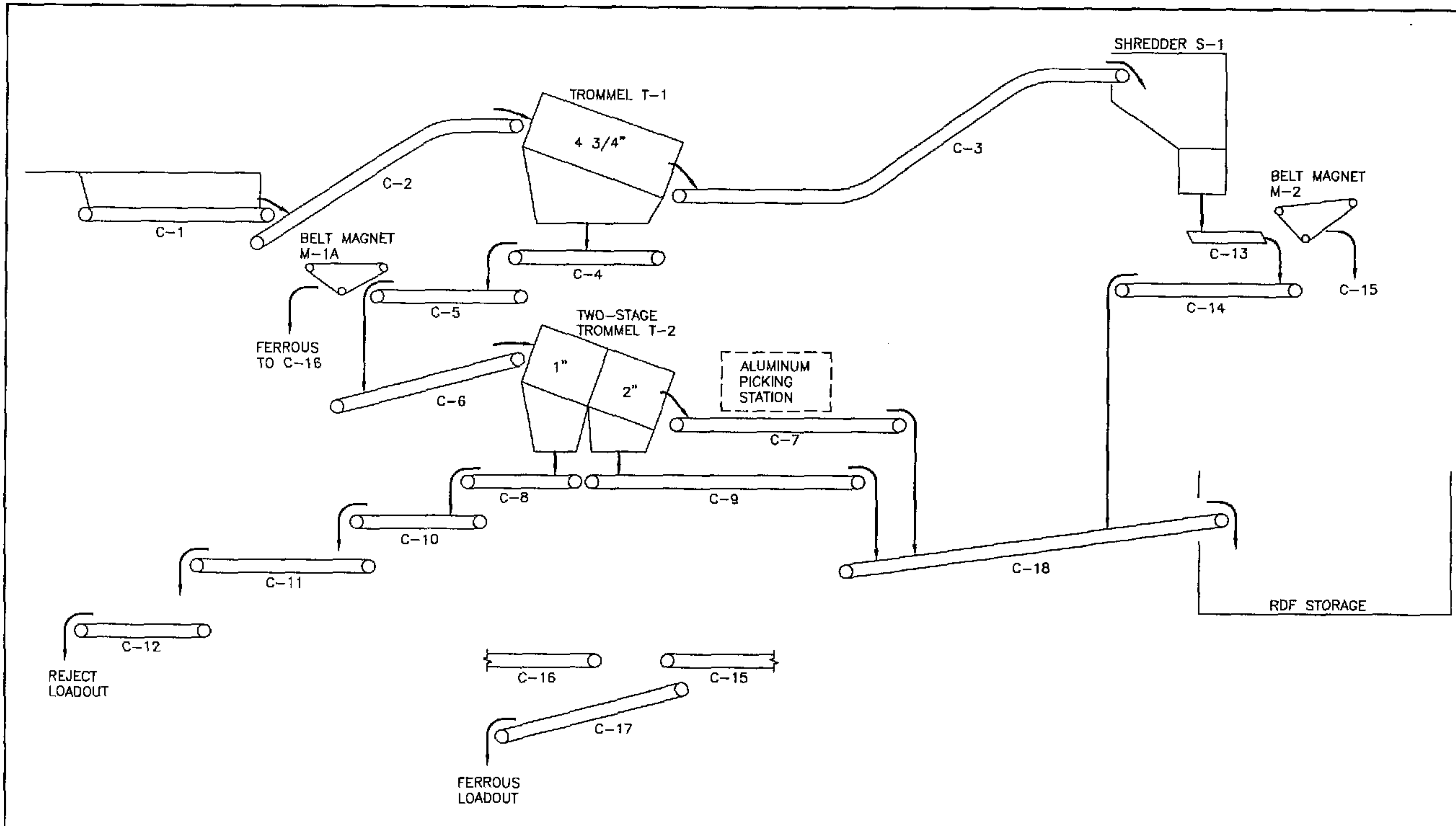
HDR Engineering, Inc.

Conceptual RDF Processing Flow Diagram
100,000/50,000 Tonne Annual
Mass Balance

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-7



HDR

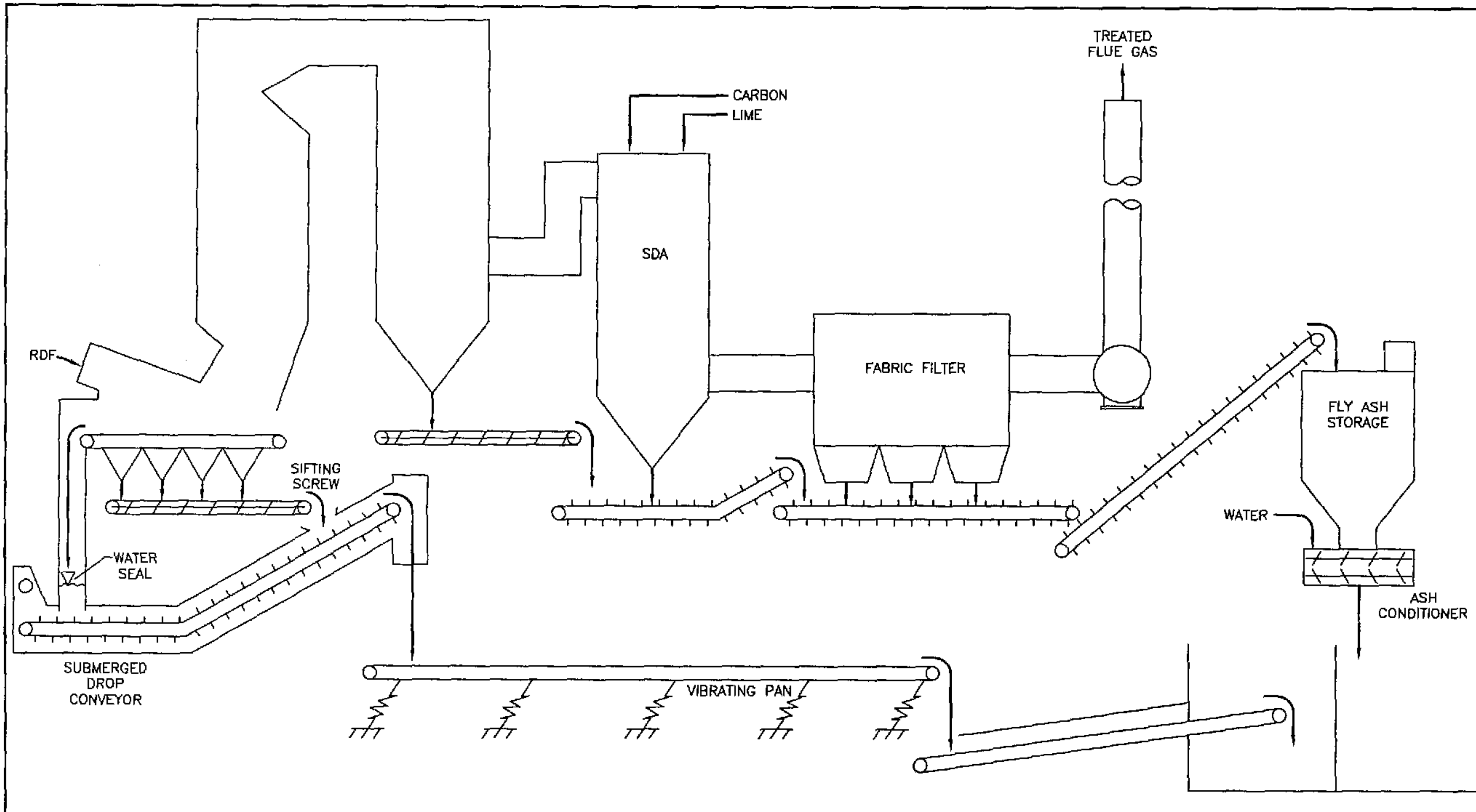
HDR Engineering, Inc.

Mass Burn Concept
Ash Handling Flow Diagram

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-20



HDR

HDR Engineering, Inc.

RDF - FIRED CONCEPT
ASH HANDLING FLOW DIAGRAM

Plzenska teplarenska
Waste-to-Energy Project Feasibility Study

Date 6/2003

Fig. VI-21

03/11/03

APPENDIX D – FINANCIAL PLAN(S)

Appendix D1
Waste to Energy Feasibility Study

Plzenská teplárenská

100,000 tonne/yr Mass Burn

Central Plant Base Case

by

FVB Energy Inc.

for

HDR Engineering Inc

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Input Assumptions and Summary of Results

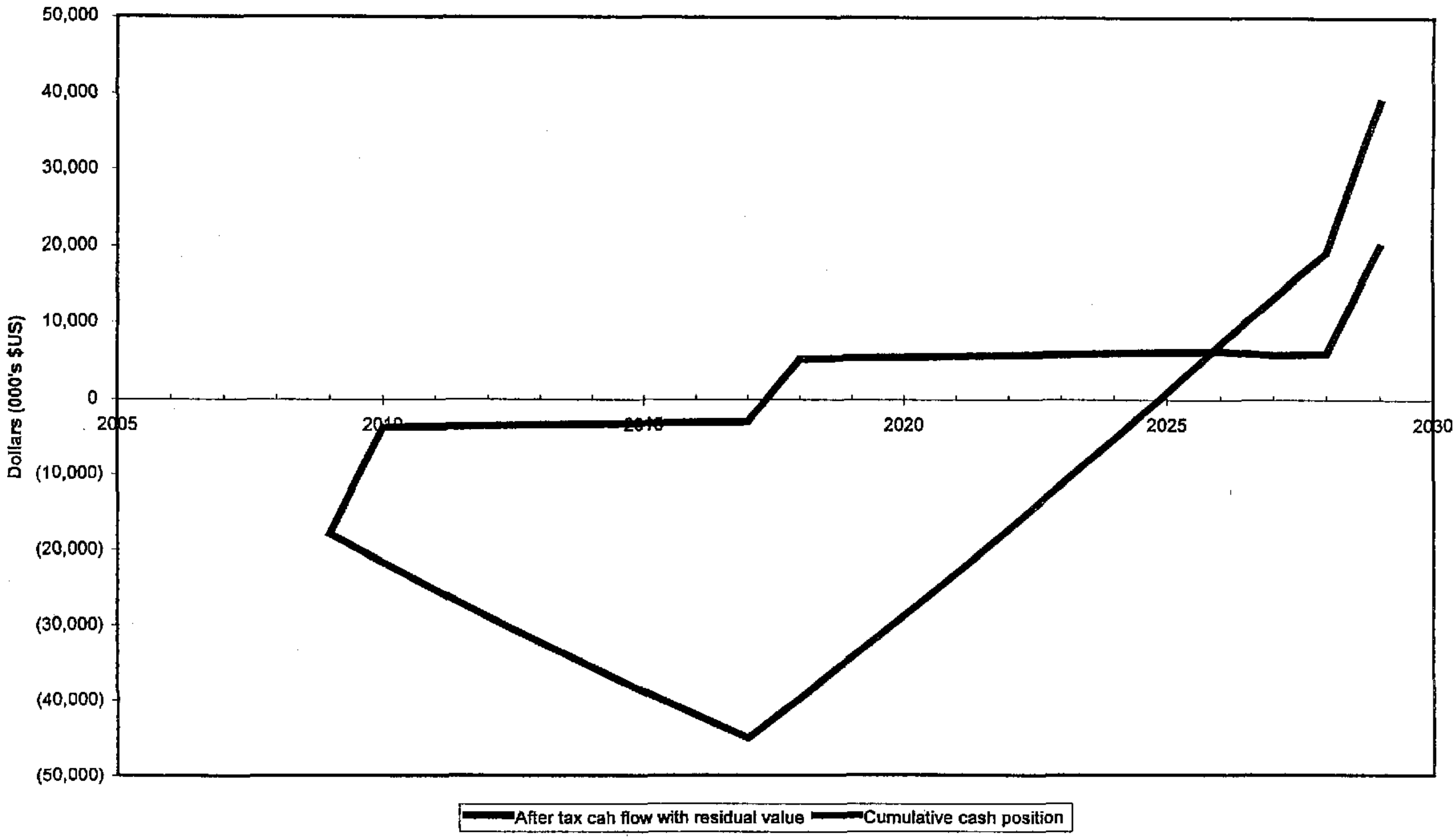
	Cz Units		US Units	
Financial Results				
Economic study period, years	20			
Breakeven, years	**15.9**			
After Tax Internal Rate of Return (IRR)	**5.0%**			
After Tax Net Present Value (NPV) in 1000 $US	0	000's Kč	0	1000 $US
First year of commercial operation	2010			
Fixed costs				
Plant lease cost (2003)	0	Kč	$0	
Escalation factors (%/year)				
Inflation	3.0%			
Heat energy	3.0%			
Electricity	3.0%			
Land	3.0%			
Land lease	3.0%			
I. Labor	5.0%			
II. Facility Maintenance	3.0%			
III Utilities	3.0%			
IV. Process Residue Haul and Disposal	3.0%			
V. Rolling Stock O&M Costs	3.0%			
VI. Miscellaneous Costs	3.0%			
VII.	3.0%			
VIII. Contingency, accounting and administration	3.0%			
IX. Revenue from sale of recycled material	3.0%			
Mass Burn				
MSW total, ton/year	100,000	tonne/yr	110,254	ton/yr
Heat exported	552,581	GJ/yr	523,745	MMBtu/yr
Net electric production	33,118	MWh/yr	33,118,106	kWh/yr
Existing Central Plant				
Heat exported	552,581	GJ/yr	523,745	MMBtu/yr
Net electric production	58,659	MWh/yr	58,659,487	KWh/yr
Lost electric generation				
Existing Central Plant net generation	58,659	MWh/yr	58,659,487	KWh/yr
Proposed Mass Burn Plant net generation	(33,118)	MWh/yr	(33,118,106)	KWh/yr
Lost electric generation	25,541	MWh/yr	25,541,381	KWh/yr
Heat energy				
District heating price	164	Kč/GJ	5.76	$/MMBtu
Variable district heating cost	58	Kč/GJ	2.04	$/MMBtu
Electricity Rates				
Sold from cogeneration	901	Kč/MWh	0.0300	$/kWh
Sold from condensing	610	Kč/MWh	0.0206	$/kWh
Purchased	901	Kč/MWh	0.0300	$/kWh
Variable electric production costs				
Cogeneration	266	Kč/MWh	0.0089	$/kWh
Condensing	619	Kč/MWh	0.0208	$/kWh
Exchange rate, Kč/$US			30	

	Cz Units		US Units	
Solid Waste Rates				
Tipping fee	2,119	Kč/tonne	70.618	$/tonne
Tipping fee escalation	3.0%			
Financial				
Operating Reserve ($US)	0	000's Kč	0	1000 $US
Interest	3.5%			
Discount rate	5.00%			
Equity	25%			
Conventional loan	75%			
Interest	5%			
Term	8			
Subsidized loan	0%			
Interest	4%			
Term	10			
Grant	0%			
Number of payments per year	4			
Interest during construction	9.0%			
Financing charge	1.50%			
Taxes	Federal	State	Federal	State
Marginal tax rate	24%	0%		
Investment tax credit	0%	0%		
Maximum ITC, $000's	0	0	0	0
Energy tax credit	0%	0%		
Maximum ETC, $000's	0	0	0	0
Depreciation				
Depreciation for book purpose	Straight line			
Asset	Years			
Land	n. ap.			
Building	30			
Equipment	17			
Distribution	30			
Other	25			

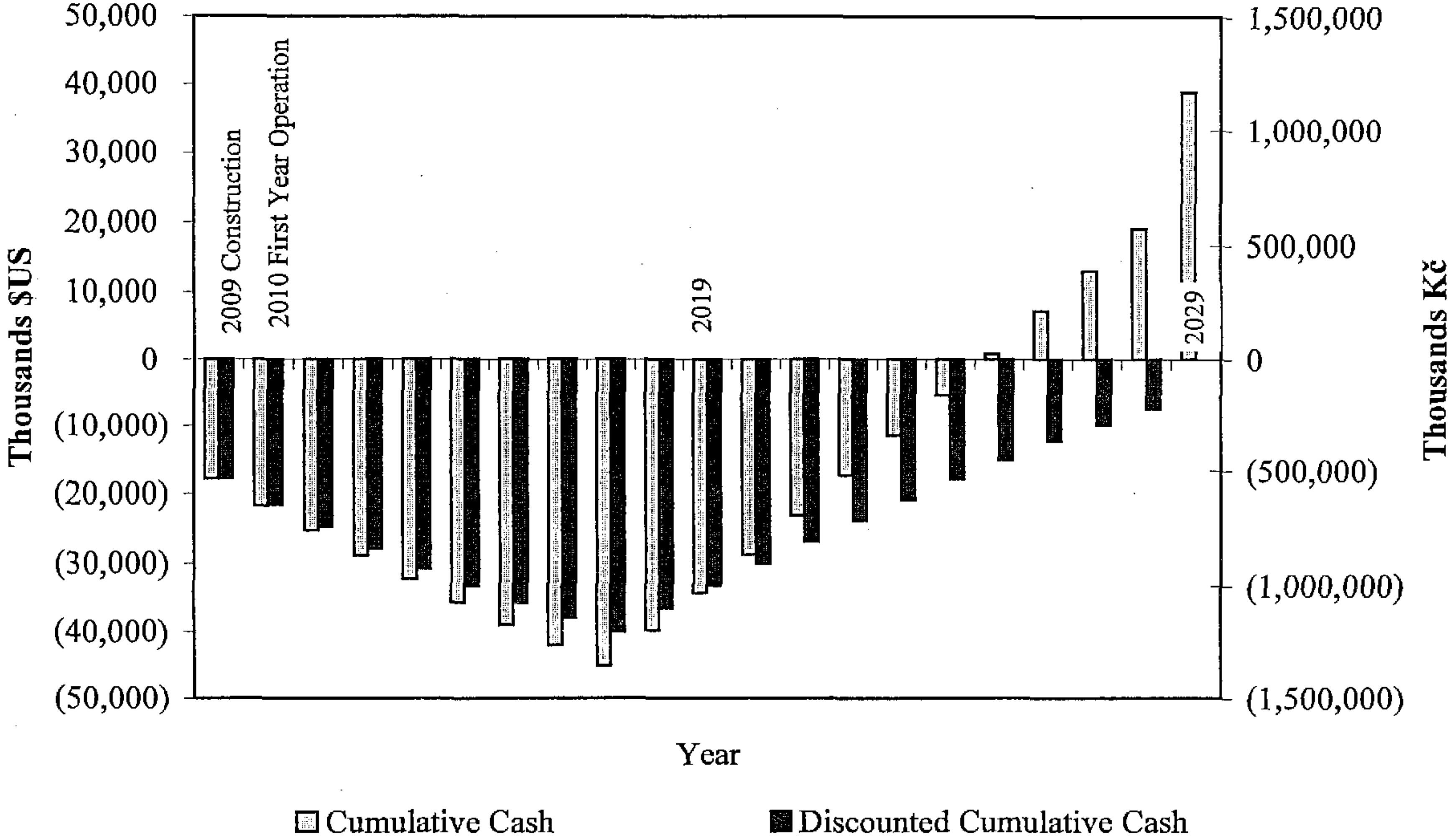
Definitions and nomenclature
- Ccf = 100 cubic feet
- WTE = waste-to-energy
- MSW = municipal solid waste
- MMBtu = million Btu
- MBtu = thousand Btu
- ton = imperial short ton (2,000 pounds)
- tonne = metric ton (1,000 kg)

Note: All costs and prices on this sheet are expressed in 2003$ or 2003Kč

After Tax Breakeven Point



Base Case - Mass Burn at Central Site
Cumulative Cash Position and Discounted Cumulative Cash Position



Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Net Income and Cash Flow	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Net Income (1000 $US)											
WTE revenues		13,694	14,105	14,528	14,964	15,413	15,875	16,352	16,842	17,347	17,868
Adjustments to revenues		(3,923)	(4,041)	(4,162)	(4,287)	(4,416)	(4,548)	(4,685)	(4,825)	(4,970)	(5,119)
Cash O&M expenses		(4,982)	(5,146)	(5,314)	(5,489)	(5,670)	(5,857)	(6,050)	(6,250)	(6,457)	(6,671)
Net operating income		4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Before Tax Net Income											
Net operating income		4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Depreciation		(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)
Interest (not tax deductible)		(2,583)	(2,297)	(1,997)	(1,681)	(1,350)	(1,001)	(635)	(250)	0	0
Net income before tax		(1,116)	(700)	(267)	185	656	1,148	1,661	2,195	2,599	2,756
Income tax		(352)	(383)	(415)	(448)	(481)	(516)	(551)	(587)	(624)	(661)
After Tax Net Income		(1,468)	(1,084)	(682)	(263)	175	632	1,110	1,609	1,975	2,095
Cash Flow (1000 $US)											
Net operating income		4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Interest		(2,583)	(2,297)	(1,997)	(1,681)	(1,350)	(1,001)	(635)	(250)	0	0
Principal		(5,609)	(5,894)	(6,195)	(6,510)	(6,842)	(7,190)	(7,557)	(7,942)	0	0
Income tax		(352)	(383)	(415)	(448)	(481)	(516)	(551)	(587)	(624)	(661)
Cash from operating reserve		0	0	0	0	0	0	0	0	0	0
After tax net cash flow		(3,755)	(3,656)	(3,555)	(3,452)	(3,346)	(3,237)	(3,126)	(3,012)	5,297	5,416
Before tax net cash flow		(3,403)	(3,273)	(3,140)	(3,004)	(2,864)	(2,721)	(2,575)	(2,425)	5,920	6,078
After Tax Financial Performance											
After tax net cash flow		(3,755)	(3,656)	(3,555)	(3,452)	(3,346)	(3,237)	(3,126)	(3,012)	5,297	5,416
Residual value		0	0	0	0	0	0	0	0	0	0
Equity	(17,913)										
Combined cash flow with residual value	(17,913)	(3,755)	(3,656)	(3,555)	(3,452)	(3,346)	(3,237)	(3,126)	(3,012)	5,297	5,416
Cumulative cash position	(17,913)	(21,668)	(25,324)	(28,879)	(32,331)	(35,677)	(38,913)	(42,039)	(45,050)	(39,754)	(34,338)
Breakeven years	15.9										
Internal Rate of Return (IRR)	5.00%										
Net Present Value (NPV)	0										
Operating Reserve Fund (1000$US)											
Beginning	-	-	-	-	-	-	-	-	-	-	-
Disbursement	-	-	-	-	-	-	-	-	-	-	-
Interest income	-	-	-	-	-	-	-	-	-	-	-
Ending	-	-	-	-	-	-	-	-	-	-	-

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Net Income and Cash Flow	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Net Income (1000 $US)										
WTE revenues	18,404	18,956	19,525	20,110	20,714	21,335	21,975	22,634	23,313	24,013
Adjustments to revenues	(5,273)	(5,431)	(5,594)	(5,762)	(5,935)	(6,113)	(6,296)	(6,485)	(6,679)	(6,880)
Cash O&M expenses	(6,893)	(7,122)	(7,359)	(7,605)	(7,859)	(8,122)	(8,395)	(8,677)	(8,969)	(9,271)
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Before Tax Net Income										
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Depreciation	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(757)	(757)	(757)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0
Net income before tax	2,917	3,082	3,250	3,422	3,599	3,779	3,963	6,716	6,908	7,105
Income tax	(700)	(740)	(780)	(821)	(864)	(907)	(951)	(1,612)	(1,658)	(1,705)
After Tax Net Income	2,217	2,342	2,470	2,601	2,735	2,872	3,012	5,104	5,250	5,400
Cash Flow (1000 $US)										
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Interest	0	0	0	0	0	0	0	0	0	0
Principal	0	0	0	0	0	0	0	0	0	0
Income tax	(700)	(740)	(780)	(821)	(864)	(907)	(951)	(1,612)	(1,658)	(1,705)
Cash from operating reserve	0	0	0	0	0	0	0	0	0	0
After tax net cash flow	5,538	5,663	5,792	5,922	6,056	6,193	6,333	5,861	6,008	6,157
Before tax net cash flow	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
After Tax Financial Performance										
After tax net cash flow	5,538	5,663	5,792	5,922	6,056	6,193	6,333	5,861	6,008	6,157
Residual value	0	0	0	0	0	0	0	0	0	13,722
Equity										
Combined cash flow with residual value	5,538	5,663	5,792	5,922	6,056	6,193	6,333	5,861	6,008	19,879
Cumulative cash position	(28,799)	(23,136)	(17,344)	(11,422)	(5,365)	828	7,161	13,023	19,030	38,909
Breakeven years										
Internal Rate of Return (IRR)										
Net Present Value (NPV)										
Operating Reserve Fund (1000$US)										
Beginning	-	-	-	-	-	-	-	-	-	-
Disbursement	-	-	-	-	-	-	-	-	-	-
Interest income	-	-	-	-	-	-	-	-	-	-
Ending	-	-	-	-	-	-	-	-	-	-

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Taxes (1000 $US)	2009	2,010	2,011	2,012	2,013	2,014	2,015	2,016	2,017	2,018	2,019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Net operating income	0	4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Depreciation	0	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0	0
Net income for determining tax	0	1,467	1,597	1,730	1,866	2,006	2,149	2,295	2,445	2,599	2,756
Cumulative losses	0	0	0	0	0	0	0	0	0	0	0
Taxable income	0	1,467	1,597	1,730	1,866	2,006	2,149	2,295	2,445	2,599	2,756
Tax liability	0	352	383	415	448	481	516	551	587	624	661
Tax credits	0	0	0	0	0	0	0	0	0	0	0
Remaining tax credit	0	0	0	0	0	0	0	0	0	0	0
Income tax	0	352	383	415	448	481	516	551	587	624	661
Capital Investment (1000 $US)											
Land	1,003	0	0	0	0	0	0	0	0	0	0
Building	7,895	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	12,351	0	0	0	0	0	0	0	0	0	0
Total investment	64,843	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Taxes (1000 $US)	2,020	2,021	2,022	2,023	2,024	2,025	2,026	2,027	2,028	2,029
Operating year	11	12	13	14	15	16	17	18	19	20
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Depreciation	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(757)	(757)	(757)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0
Net income for determining tax	2,917	3,082	3,250	3,422	3,599	3,779	3,963	6,716	6,908	7,105
Cumulative losses	0	0	0	0	0	0	0	0	0	0
Taxable income	2,917	3,082	3,250	3,422	3,599	3,779	3,963	6,716	6,908	7,105
Tax liability	700	740	780	821	864	907	951	1,612	1,658	1,705
Tax credits	0	0	0	0	0	0	0	0	0	0
Remaining tax credit	0	0	0	0	0	0	0	0	0	0
Income tax	700	740	780	821	864	907	951	1,612	1,658	1,705
Capital investment (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Total investment	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Revenues	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Revenues (1000 $US)											
WTE Plant											
Recycled material sales		74	76	78	81	83	86	88	91	93	96
Heat sales		3,710	3,821	3,936	4,054	4,176	4,301	4,430	4,563	4,700	4,841
Electricity sales		1,224	1,260	1,298	1,337	1,377	1,418	1,461	1,505	1,550	1,596
MSW tipping fee		8,687	8,947	9,216	9,492	9,777	10,070	10,373	10,684	11,004	11,334
Gross revenue		13,694	14,105	14,528	14,964	15,413	15,875	16,352	16,842	17,347	17,868
Off-setting adjustments from existing plant operations											
Heat sales		(2,396)	(2,468)	(2,542)	(2,618)	(2,697)	(2,778)	(2,861)	(2,947)	(3,035)	(3,126)
Electricity sales		(1,528)	(1,573)	(1,621)	(1,669)	(1,719)	(1,771)	(1,824)	(1,879)	(1,935)	(1,993)
Total adjustments		(3,923)	(4,041)	(4,162)	(4,287)	(4,416)	(4,548)	(4,685)	(4,825)	(4,970)	(5,119)
Adjusted Total Revenue											
Recycled material sales		74	76	78	81	83	86	88	91	93	96
Avoided marginal heat costs		1,314	1,353	1,394	1,436	1,479	1,523	1,569	1,616	1,665	1,715
Electricity sales		(304)	(313)	(322)	(332)	(342)	(352)	(363)	(374)	(385)	(397)
MSW tipping fee		8,687	8,947	9,216	9,492	9,777	10,070	10,373	10,684	11,004	11,334
Adjusted Total Revenue from WTE plant		9,771	10,064	10,366	10,677	10,997	11,327	11,667	12,017	12,377	12,749
Solid waste mass distribution											
Total MSW, tonne/yr		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total MSW, tpy		110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254
Unit rates ($US/unit)											
Tipping fee, $/tonne		87	89	92	95	98	101	104	107	110	113
Tipping fee, $/ton		79	81	84	86	89	91	94	97	100	103

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Revenues	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Revenues (1000 $US)										
WTE Plant										
Recycled material sales	99	102	105	108	112	115	118	122	126	129
Heat sales	4,986	5,135	5,290	5,448	5,612	5,780	5,953	6,132	6,316	6,505
Electricity sales	1,644	1,694	1,745	1,797	1,851	1,906	1,963	2,022	2,083	2,146
MSW tipping fee	11,674	12,025	12,385	12,757	13,140	13,534	13,940	14,358	14,789	15,232
Gross revenue	18,404	18,956	19,525	20,110	20,714	21,335	21,975	22,634	23,313	24,013
Off-setting adjustments from existing plant operations										
Heat sales	(3,220)	(3,317)	(3,416)	(3,518)	(3,624)	(3,733)	(3,845)	(3,960)	(4,079)	(4,201)
Electricity sales	(2,053)	(2,114)	(2,178)	(2,243)	(2,311)	(2,380)	(2,451)	(2,525)	(2,601)	(2,679)
Total adjustments	(5,273)	(5,431)	(5,594)	(5,762)	(5,935)	(6,113)	(6,296)	(6,485)	(6,679)	(6,880)
Adjusted Total Revenue										
Recycled material sales	99	102	105	108	112	115	118	122	126	129
Avoided marginal heat costs	1,766	1,819	1,874	1,930	1,988	2,047	2,109	2,172	2,237	2,304
Electricity sales	(409)	(421)	(433)	(446)	(460)	(474)	(488)	(502)	(517)	(533)
MSW tipping fee	11,674	12,025	12,385	12,757	13,140	13,534	13,940	14,358	14,789	15,232
Adjusted Total Revenue from WTE plant	13,131	13,525	13,931	14,349	14,779	15,223	15,679	16,150	16,634	17,133
Solid waste mass distribution										
Total MSW, tonne/yr	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total MSW, tpy	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254
Unit rates ($US/unit)										
Tipping fee, $/tonne	117	120	124	128	131	135	139	144	148	152
Tipping fee, $/ton	106	109	112	116	119	123	126	130	134	138

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Capital Costs (1000 $US)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Construction	64,843	0	0	0	0	0	0	0	0	0	0
Interest during construction	5,836	0	0	0	0	0	0	0	0	0	0
Financing	973	0	0	0	0	0	0	0	0	0	0
Operating reserve	0	0	0	0	0	0	0	0	0	0	0
Total Capital Costs	71,651	0	0	0	0	0	0	0	0	0	0
Construction Costs (1000 $US)											
Plant and Distribution Costs											
Land and site development	1,003	0	0	0	0	0	0	0	0	0	0
Building	7,895	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Engineering, contingency, etc.	12,351	0	0	0	0	0	0	0	0	0	0
Total plant and distribution costs	64,843	0	0	0	0	0	0	0	0	0	0

Values from HDR	2003$
Land and site development	840
Building	6,612
Equipment	36,509
Distribution	0
Engineering, contingency, etc.	10,344
Total plant and distribution costs	54,305

Plzenská teplárenská
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Central Plant Base Case

Operation and Maintenance Costs	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Operation and maintenance costs (1000 $US)											
I. Labor		691	725	762	800	840	882	926	972	1,021	1,072
II. Facility Maintenance		1,914	1,971	2,030	2,091	2,154	2,218	2,285	2,354	2,424	2,497
III Utilities		199	205	211	218	224	231	238	245	252	260
IV. Process Residue Haul and Disposal		1,100	1,132	1,166	1,201	1,238	1,275	1,313	1,352	1,393	1,435
V. Rolling Stock O&M Costs		134	138	143	147	151	156	161	165	170	175
VI. Miscellaneous Costs		170	175	180	185	191	197	203	209	215	221
VII. not used		0	0	0	0	0	0	0	0	0	0
VIII. Contingency, accounting, administration		775	798	822	847	872	898	925	953	982	1,011
Land lease		0	0	0	0	0	0	0	0	0	0
Depreciation		3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322
Total O & M Costs (1000 $US)		8,304	8,467	8,636	8,811	8,991	9,178	9,372	9,572	9,779	9,993
Cash O & M Costs (1000 $US)		4,982	5,146	5,314	5,489	5,670	5,857	6,050	6,250	6,457	6,671

Values from HDR

Mass Burn Plant	2003$
I. Labor	491,000
II. Facility Maintenance	1,556,000
III Utilities	162,000
IV. Process Residue Haul and Disposal	894,000
V. Rolling Stock O&M Costs	109,300
VI. Miscellaneous Costs	138,000
VII. not used	0
VIII. Contingency, accounting and administration	630,000
Total annual operation and maintenance costs	3,980,300
IX. Material sales	(60,000)

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Operation and Maintenance Costs	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Operation and maintenance costs (1000 $US)										
I. Labor	1,125	1,182	1,241	1,303	1,368	1,436	1,508	1,584	1,663	1,746
II. Facility Maintenance	2,572	2,649	2,728	2,810	2,895	2,981	3,071	3,163	3,258	3,356
III Utilities	268	276	284	293	301	310	320	329	339	349
IV. Process Residue Haul and Disposal	1,478	1,522	1,568	1,615	1,663	1,713	1,764	1,817	1,872	1,928
V. Rolling Stock O&M Costs	181	186	192	197	203	209	216	222	229	236
VI. Miscellaneous Costs	228	235	242	249	257	264	272	281	289	298
VII. not used	0	0	0	0	0	0	0	0	0	0
VIII. Contingency, accounting, administration	1,041	1,073	1,105	1,138	1,172	1,207	1,243	1,281	1,319	1,359
Land lease	0	0	0	0	0	0	0	0	0	0
Depreciation	3,322	3,322	3,322	3,322	3,322	3,322	3,322	757	757	757
Total O & M Costs (1000 $US)	10,214	10,443	10,681	10,926	11,181	11,444	11,716	9,434	9,726	10,028
Cash O & M Costs (1000 $US)	6,893	7,122	7,359	7,605	7,859	8,122	8,395	8,677	8,969	9,271

Values from HDR
Mass Burn Plant
I. Labor
II. Facility Maintenance
III Utilities
IV. Process Residue Haul and Disposal
V. Rolling Stock O&M Costs
VI. Miscellaneous Costs
VII. not used
VIII. Contingency, accounting and administration
Total annual operation and maintenance costs
IX. Material sales

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Debt Service

Operating year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Capital cost (1000 $US)	71,651										
Distribution of financing (1000 $US)											
Equity	17,913	0	0	0	0	0	0	0	0	0	0
Conventional loan	53,738	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0	0
Grant	0	0	0	0	0	0	0	0	0	0	0
Total	71,651	0	0	0	0	0	0	0	0	0	0
Debt to be financed (1000 $US)											
Conventional loan	53,738	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0	0
Total debt	53,738	0	0	0	0	0	0	0	0	0	0
Interest rate		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Term		8	7	6	5	4	3	2	1	0	0
Debt Service (1000 $US)											
Conventional loan (P&I)											
Loan -- Year 1		8,191	8,191	8,191	8,191	8,191	8,191	8,191	8,191	0	0
Total		8,191	8,191	8,191	8,191	8,191	8,191	8,191	8,191	0	0
Conventional loan interest											
Loan -- Year 1		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Total		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Conventional loan principal											
Loan -- Year 1		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Total		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Principal at year end											
Loan -- Year 1		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0
Total		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0
Combined debt											
Combined interest											
Conventional loan		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total Interest		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Combined principal											
Conventional loan		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total Principal		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Total interest and principal		8,191	8,191	8,191	8,191	8,191	8,191	8,191	8,191	0	0
Combined remaining principal											
Conventional loan		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total remaining principal		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0

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Debt Service

Operating year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Capital cost (1000 $US)										
Distribution of financing (1000 $US)										
Equity	0	0	0	0	0	0	0	0	0	0
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Grant	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Debt to be financed (1000 $US)										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total debt	0	0	0	0	0	0	0	0	0	0
Interest rate	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Term	0	0	0	0	0	0	0	0	0	0
Debt Service (1000 $US)										
Conventional loan (P&I)										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Conventional loan interest										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Conventional loan principal										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Principal at year end										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Combined debt										
Combined interest										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total interest	0	0	0	0	0	0	0	0	0	0
Combined principal										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total Principal	0	0	0	0	0	0	0	0	0	0
Total interest and principal	0	0	0	0	0	0	0	0	0	0
Combined remaining principal										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total remaining principal	0	0	0	0	0	0	0	0	0	0

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Central Plant Base Case

Depreciation (1000 $US)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
	Original	Less Grants	Net Constr. Cost	Allowable	Depreciable amount						
Land and site development	1,003	0	1,003	0%	0						
Building	7,895	0	7,895	100%	7,895						
Equipment	43,594	0	43,594	100%	43,594						
Distribution	0	0	0	100%	0						
Engineering, contingency, etc.	12,351	0	12,351	100%	12,351						
Interest during construction	5,836	0	5,836	100%	5,836						
Financing	973	0	973	100%	973						
Operating reserve	0	0	0	100%	0						
Total Construction	71,651	0	71,651		70,648						
Grant amount	0										
Net Constuction Cost for depreciation	71,651										
Depreciation (1000 $US)											
Depreciation of building											
Beginning Book Value		7,895	7,632	7,368	7,105	6,842	6,579	6,316	6,053	5,789	5,526
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		263	263	263	263	263	263	263	263	263	263
Ending Book Value		7,632	7,368	7,105	6,842	6,579	6,316	6,053	5,789	5,526	5,263
Depreciation of equipment											
Beginning Book Value		43,594	41,029	38,465	35,901	33,336	30,772	28,208	25,643	23,079	20,515
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564
Ending Book Value		41,029	38,465	35,901	33,336	30,772	28,208	25,643	23,079	20,515	17,950
Depreciation of distribution											
Beginning Book Value		0	0	0	0	0	0	0	0	0	0
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		0	0	0	0	0	0	0	0	0	0
Ending Book Value		0	0	0	0	0	0	0	0	0	0
Depreciation of other investment											
Beginning Book Value		19,160	18,666	18,172	17,678	17,184	16,689	16,195	15,701	15,207	14,713
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		494	494	494	494	494	494	494	494	494	494
Ending Book Value		18,666	18,172	17,678	17,184	16,689	16,195	15,701	15,207	14,713	14,219
Total amount of depreciation		3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322
Residual Value											
Residual book value		67,327	64,005	60,684	57,362	54,040	50,719	47,397	44,076	40,754	37,433
Land		1,033	1,064	1,096	1,129	1,163	1,198	1,234	1,271	1,309	1,348
Remaining debt principal		(42,235)	(36,041)	(29,531)	(22,689)	(15,498)	(7,942)	0	0	0	0
Remaining operating reserve		0	0	0	0	0	0	0	0	0	0
Total residual value		26,124	29,028	32,249	35,802	39,705	43,975	48,631	45,346	42,063	38,781

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant Base Case

Depreciation (1000 $US)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Land and site development										
Building										
Equipment										
Distribution										
Engineering, contingency, etc.										
Interest during construction										
Financing										
Operating reserve										
Total Construction										
Grant amount										
Net Constuction Cost for depreciation										
Depreciation (1000 $US)										
Depreciation of building										
Beginning Book Value	5,263	5,000	4,737	4,474	4,211	3,947	3,684	3,421	3,158	2,895
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	263	263	263	263	263	263	263	263	263	263
Ending Book Value	5,000	4,737	4,474	4,211	3,947	3,684	3,421	3,158	2,895	2,632
Depreciation of equipment										
Beginning Book Value	17,950	15,386	12,822	10,257	7,693	5,129	2,564	(0)	(0)	(0)
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	2,564	2,564	2,564	2,564	2,564	2,564	2,564	0	0	0
Ending Book Value	15,386	12,822	10,257	7,693	5,129	2,564	(0)	(0)	(0)	(0)
Depreciation of distribution										
Beginning Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	0	0	0	0	0	0	0	0	0	0
Ending Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation of other Investment										
Beginning Book Value	14,219	13,725	13,231	12,737	12,243	11,749	11,255	10,761	10,267	9,773
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	494	494	494	494	494	494	494	494	494	494
Ending Book Value	13,725	13,231	12,737	12,243	11,749	11,255	10,761	10,267	9,773	9,279
Total amount of depreciation	3,322	3,322	3,322	3,322	3,322	3,322	3,322	757	757	757
Residual Value										
Residual book value	34,111	30,790	27,468	24,147	20,825	17,503	14,182	13,425	12,668	11,910
Land	1,388	1,430	1,473	1,517	1,563	1,610	1,658	1,708	1,759	1,812
Remaining debt principal	0	0	0	0	0	0	0	0	0	0
Remaining operating reserve	0	0	0	0	0	0	0	0	0	0
Total residual value	35,500	32,220	28,941	25,664	22,388	19,113	15,840	15,132	14,428	13,722

Appendix D2
Waste to Energy Feasibility Study

Plzenská teplárenská

100,000 tonne/yr Mass Burn

Central Plant - Screening Analysis

by

FVB Energy Inc.

for

HDR Engineering Inc

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Input Assumptions and Summary of Results

	Cz Units		US Units	
Financial Results				
Economic study period, years	20			
Breakeven, years	12.2			
After Tax Internal Rate of Return (IRR)	11.5%			
After Tax Net Present Value (NPV) in 1000 $US	820,210	000's Kč	27,340	1000 $US
First year of commercial operation	2010			
Fixed costs				
Plant lease cost (2003$)	0	Kč	$0	
Escalation factors (%/year)				
Inflation	3.0%			
Heat energy	3.0%			
Electricity	3.0%			
Land	3.0%			
Land lease	3.0%			
I. Labor	5.0%			
II. Facility Maintenance	3.0%			
III Utilities	3.0%			
IV. Process Residue Haul and Disposal	3.0%			
V. Rolling Stock O&M Costs	3.0%			
VI. Miscellaneous Costs	3.0%			
VII.	3.0%			
VIII. Contingency, accounting and administration	3.0%			
IX. Revenue from sale of recycled material	3.0%			
Mass Burn				
MSW total, ton/year	100,000	tonne/yr	110,254	ton/yr
Heat exported, MMBtu	552,581	GJ/yr	523,745	MMBtu/yr
Net electric production, kWh/yr	33,118	MWh/yr	33,118,106	kWh/yr
Existing Central Plant				
Heat exported, MMBtu	552,581	GJ/yr	523,745	MMBtu/yr
Net electric production, kWh/yr	58,659	MWh/yr	58,659,487	KWh/yr
Lost electric generation, kWh/yr				
from Central Plant	58,659	MWh/yr	58,659,487	KWh/yr
from Mass Burn Plant	(33,118)	MWh/yr	(33,118,106)	KWh/yr
Lost electric generation, kWh/yr	25,541	MWh/yr	25,541,381	KWh/yr
Heat energy rates, $US/MMBtu				
District heating price	164	Kč/GJ	5.76	$/MMBtu
Marginal district heating cost	58	Kč/GJ	2.04	$/MMBtu
Electricity Rates $US/kWh				
Sold from cogeneration	901	Kč/MWh	0.0300	$/kWh
Sold from condensing	618	Kč/MWh	0.0206	$/kWh
Purchased	901	Kč/MWh	0.0300	$/kWh
Variable electric production costs				
Cogeneration	266	Kč/MWh	0.0089	$/kWh
Condensing	619	Kč/MWh	0.0206	$/kWh
Exchange rate, Kč/$US			30	

	Cz Units		US Units	
Solid Waste Rates				
Tipping fee, $US/ton	2,667	Kč/tonne	88.90	$/tonne
Tipping fee escalation	3.0%			
Financial				
Operating Reserve ($US)	96,000	000's Kč	3,200,000	1000 $US
Interest	3.5%			
Discount rate	5.0%			
Equity	25%			
Conventional loan	75%			
Interest	5.0%			
Term	10			
Subsidized loan	0%			
Interest	4%			
Term	10			
Grant	0%			
Repayment schedule	monthly			
Interest during construction	9.0%			
Financing charge	1.50%			
Taxes	Federal	State	Federal	State
Marginal tax rate	24%	0%		
Investment tax credit	0%	0%		
Maximum ITC, $000's	0	0	0	0
Energy tax credit	0%	0%		
Maximum ETC, $000's	0	0	0	0
Depreciation				
Depreciation for book purpose	Straight line			
Asset	Years			
Land	n. ap.			
Building	30			
Equipment	17			
Distribution	30			
Other	25			

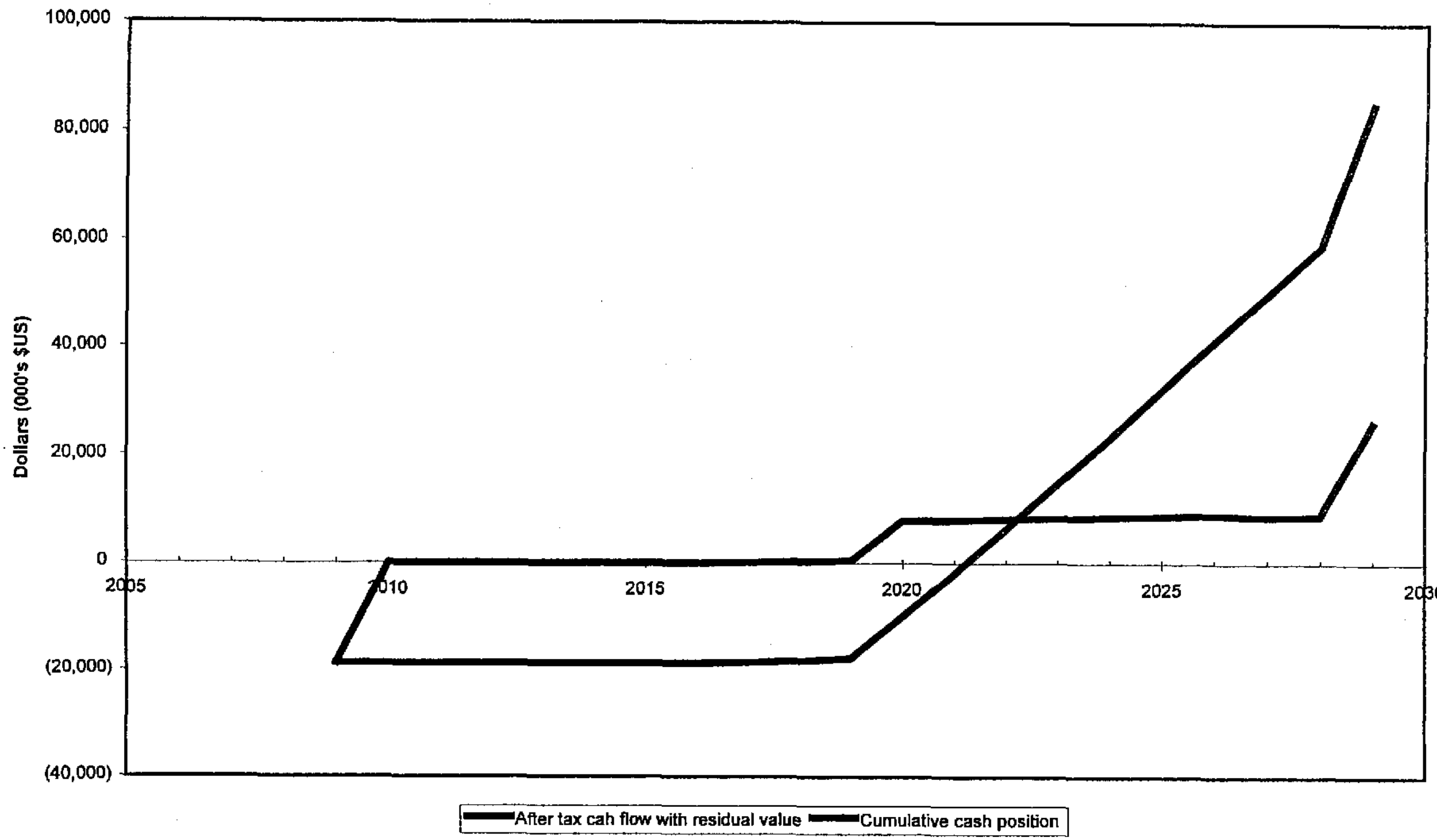
Definitions and nomenclature

Ccf = 100 cubic feet
WTE = waste-to-energy
MSW = municipal solid waste
MMBtu = million Btu
MBtu = thousand Btu
ton = imperial short ton (2,000 pounds)

tonne = metric ton (1,000 kg)

Note: All costs and prices on this sheet are expressed in 2003$ or 2003Kc.

After Tax Breakeven Point



Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis
Net Income and Cash Flow

Net Income and Cash Flow	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Net Income (1000 $US)											
WTE revenues		15,943	16,422	16,914	17,422	17,944	18,483	19,037	19,608	20,197	20,803
Adjustments to revenues		(3,924)	(4,041)	(4,163)	(4,287)	(4,416)	(4,549)	(4,685)	(4,826)	(4,970)	(5,119)
Cash O&M expenses		(4,982)	(5,146)	(5,314)	(5,489)	(5,670)	(5,857)	(6,050)	(6,250)	(6,457)	(6,671)
Net operating income		7,038	7,235	7,437	7,645	7,859	8,078	8,302	8,533	8,769	9,012
Before Tax Net Income											
Net operating income		7,038	7,235	7,437	7,645	7,859	8,078	8,302	8,533	8,769	9,012
Depreciation		(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)
Interest (not tax deductible)		(2,706)	(2,479)	(2,240)	(1,989)	(1,726)	(1,448)	(1,157)	(850)	(528)	(190)
Net income before tax		1,010	1,434	1,876	2,334	2,812	3,308	3,824	4,361	4,920	5,501
Income tax		(892)	(939)	(988)	(1,038)	(1,089)	(1,141)	(1,195)	(1,251)	(1,307)	(1,366)
After Tax Net Income		118	495	888	1,297	1,723	2,166	2,629	3,110	3,612	4,135
Cash Flow (1000 $US)											
Net operating income		7,038	7,235	7,437	7,645	7,859	8,078	8,302	8,533	8,769	9,012
Interest		(2,706)	(2,479)	(2,240)	(1,989)	(1,726)	(1,448)	(1,157)	(850)	(528)	(190)
Principal		(4,439)	(4,666)	(4,905)	(5,156)	(5,420)	(5,697)	(5,988)	(6,295)	(6,617)	(6,955)
Income tax		(892)	(939)	(988)	(1,038)	(1,089)	(1,141)	(1,195)	(1,251)	(1,307)	(1,366)
Cash from operating reserve		1,000	850	696	538	375	209	38	0	0	0
After tax net cash flow		0	0	0	0	0	0	0	137	317	501
Before tax net cash flow		892	939	988	1,038	1,089	1,141	1,195	1,388	1,624	1,867
After Tax Financial Performance											
After tax net cash flow		0	0	0	0	0	0	0	137	317	501
Residual value		0	0	0	0	0	0	0	0	0	0
Equity	(18,713)										
Combined cash flow with resid. valu.	(18,713)	0	0	0	0	0	0	0	137	317	501
Cumulative cash position	(18,713)	(18,713)	(18,713)	(18,713)	(18,713)	(18,713)	(18,713)	(18,713)	(18,576)	(18,259)	(17,758)
Breakeven years	12.2										
Internal Rate of Return (IRR)	11.49%										
Net Present Value (NPV)	27,340										
Operating Reserve Fund (1000$US)											
Beginning	3,200	3,312	2,446	1,697	1,073	582	234	36	0	0	0
Disbursement	-	(1,000)	(850)	(696)	(538)	(375)	(209)	(38)	-	-	-
Interest income	112	133	100	72	47	27	12	2	0	0	0
Ending	3,312	2,446	1,697	1,073	582	234	36	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Net Income and Cash Flow	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Net Income (1000 $US)										
WTE revenues	21,427	22,069	22,732	23,413	24,116	24,839	25,585	26,352	27,143	27,957
Adjustments to revenues	(5,273)	(5,431)	(5,594)	(5,762)	(5,935)	(6,113)	(6,296)	(6,485)	(6,680)	(6,880)
Cash O&M expenses	(6,893)	(7,122)	(7,359)	(7,605)	(7,859)	(8,122)	(8,395)	(8,677)	(8,969)	(9,271)
Net operating income	9,261	9,516	9,778	10,047	10,322	10,604	10,894	11,190	11,494	11,806
Before Tax Net Income										
Net operating income	9,261	9,516	9,778	10,047	10,322	10,604	10,894	11,190	11,494	11,806
Depreciation	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(757)	(757)	(757)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0
Net income before tax	5,939	6,195	6,457	6,725	7,001	7,283	7,572	10,433	10,737	11,049
Income tax	(1,425)	(1,487)	(1,550)	(1,614)	(1,680)	(1,748)	(1,817)	(2,504)	(2,577)	(2,652)
After Tax Net Income	4,514	4,708	4,907	5,111	5,320	5,535	5,755	7,929	8,160	8,397
Cash Flow (1000 $US)										
Net operating income	9,261	9,516	9,778	10,047	10,322	10,604	10,894	11,190	11,494	11,806
Interest	0	0	0	0	0	0	0	0	0	0
Principal	0	0	0	0	0	0	0	0	0	0
Income tax	(1,425)	(1,487)	(1,550)	(1,614)	(1,680)	(1,748)	(1,817)	(2,504)	(2,577)	(2,652)
Cash from operating reserve	0	0	0	0	0	0	0	0	0	0
After tax net cash flow	7,836	8,030	8,229	8,433	8,642	8,856	9,076	8,686	8,918	9,154
Before tax net cash flow	9,261	9,516	9,778	10,047	10,322	10,604	10,894	11,190	11,494	11,806
After Tax Financial Performance										
After tax net cash flow	7,836	8,030	8,229	8,433	8,642	8,856	9,076	8,686	8,918	9,154
Residual value	0	0	0	0	0	0	0	0	0	16,922
Equity										
Combined cash flow with resid. valu.	7,836	8,030	8,229	8,433	8,642	8,856	9,076	8,686	8,918	26,076
Cumulative cash position	(9,923)	(1,893)	6,336	14,768	23,410	32,267	41,343	50,030	58,947	85,023
Breakeven years										
Internal Rate of Return (IRR)										
Net Present Value (NPV)										
Operating Reserve Fund (1000$US)										
Beginning	0	0	0	0	0	0	0	0	0	0
Disbursement	-	-	-	-	-	-	-	-	-	-
Interest income	0	0	0	0	0	0	0	0	0	0
Ending	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Taxes (1000 $US)	2009	2,010	2,011	2,012	2,013	2,014	2,015	2,016	2,017	2,018	2,019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Net operating income	0	7,038	7,235	7,437	7,645	7,859	8,078	8,302	8,533	8,769	9,012
Depreciation	0	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0	0
Net income for determining tax	0	3,716	3,913	4,116	4,324	4,537	4,756	4,981	5,211	5,448	5,691
Cumulative losses	0	0	0	0	0	0	0	0	0	0	0
Taxable income	0	3,716	3,913	4,116	4,324	4,537	4,756	4,981	5,211	5,448	5,691
Tax liability	0	892	939	988	1,038	1,089	1,141	1,195	1,251	1,307	1,366
Tax credits	0	0	0	0	0	0	0	0	0	0	0
Remaining tax credit	0	0	0	0	0	0	0	0	0	0	0
Income tax	0	892	939	988	1,038	1,089	1,141	1,195	1,251	1,307	1,366
Capital investment (1000 $US)											
Land	1,003	0	0	0	0	0	0	0	0	0	0
Building	7,895	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	12,351	0	0	0	0	0	0	0	0	0	0
Total investment	64,843	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments (1000 $US)											
Land	0	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments	43,594	0	0	0	0	0	0	0	0	0	0
Federal ITC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
State ITC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
Total investment tax credit	0	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments (1000 $US)											
Land	0	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments	43,594	0	0	0	0	0	0	0	0	0	0
Federal ETC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
State ETC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
Total energy tax credit	0	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0	0
Total credits (1000 $US)	0	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Taxes (*1000 $US*)	2,020	2,021	2,022	2,023	2,024	2,025	2,026	2,027	2,028	2,029
Operating year	11	12	13	14	15	16	17	18	19	20
Net operating income	9,261	9,516	9,778	10,047	10,322	10,604	10,894	11,190	11,494	11,806
Depreciation	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(757)	(757)	(757)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0
Net income for determining tax	5,939	6,195	6,457	6,725	7,001	7,283	7,572	10,433	10,737	11,049
Cumulative losses	0	0	0	0	0	0	0	0	0	0
Taxable income	5,939	6,195	6,457	6,725	7,001	7,283	7,572	10,433	10,737	11,049
Tax liability	1,425	1,487	1,550	1,614	1,680	1,748	1,817	2,504	2,577	2,652
Tax credits	0	0	0	0	0	0	0	0	0	0
Remaining tax credit	0	0	0	0	0	0	0	0	0	0
Income tax	1,425	1,487	1,550	1,614	1,680	1,748	1,817	2,504	2,577	2,652
Capital Investment (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Total investment	0	0	0	0	0	0	0	0	0	0
ITC qualifying Investments (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments	0	0	0	0	0	0	0	0	0	0
Federal ITC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
State ITC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
Total investment tax credit	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0
ETC qualifying Investments (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments	0	0	0	0	0	0	0	0	0	0
Federal ETC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
State ETC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
Total energy tax credit	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0
Total credits (1000 $US)	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Revenues	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Revenues (1000 $US)											
WTE Plant											
Recycled material sales		74	76	78	81	83	86	88	91	93	96
Heat sales		3,710	3,821	3,936	4,054	4,176	4,301	4,430	4,563	4,700	4,841
Electricity sales		1,224	1,260	1,298	1,337	1,377	1,418	1,461	1,505	1,550	1,596
MSW tipping fee		10,936	11,264	11,602	11,950	12,309	12,678	13,058	13,450	13,854	14,269
Gross revenue		15,943	16,422	16,914	17,422	17,944	18,483	19,037	19,608	20,197	20,803
Off-setting adjustments from existing plant operations											
Heat sales		(2,396)	(2,488)	(2,542)	(2,618)	(2,897)	(2,778)	(2,861)	(2,947)	(3,035)	(3,126)
Electricity sales		(1,528)	(1,573)	(1,621)	(1,669)	(1,719)	(1,771)	(1,824)	(1,879)	(1,935)	(1,993)
Total adjustments		(3,924)	(4,041)	(4,163)	(4,287)	(4,416)	(4,549)	(4,685)	(4,826)	(4,970)	(5,119)
Adjusted Total Revenue											
Recycled material sales		74	76	78	81	83	86	88	91	93	96
Avoided marginal heat costs		1,314	1,353	1,394	1,436	1,479	1,523	1,569	1,616	1,664	1,714
Electricity sales		(304)	(313)	(322)	(332)	(342)	(352)	(363)	(374)	(385)	(397)
MSW tipping fee		10,936	11,264	11,602	11,950	12,309	12,678	13,058	13,450	13,854	14,269
Adjusted Total Revenue from WTE plant		12,020	12,380	12,752	13,134	13,528	13,934	14,352	14,763	15,226	15,683
Solid waste mass distribution											
Total MSW, tonne/yr		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total MSW, tpy		110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254
Unit rates ($US/unit)											
Tipping fee, $/tonne		109	113	116	119	123	127	131	134	139	143
Tipping fee, $/ton		99	102	105	108	112	115	118	122	126	129

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Revenues	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Revenues (1000 $US)										
WTE Plant										
Recycled material sales	99	102	105	108	112	115	118	122	126	129
Heat sales	4,986	5,135	5,290	5,448	5,612	5,780	5,953	6,132	6,316	6,505
Electricity sales	1,844	1,694	1,745	1,797	1,851	1,906	1,963	2,022	2,083	2,146
MSW tipping fee	14,697	15,138	15,592	16,060	16,542	17,038	17,549	18,076	18,618	19,177
Gross revenue	21,427	22,069	22,732	23,413	24,116	24,839	25,585	26,352	27,143	27,957
Off-setting adjustments from existing plant operations										
Heat sales	(3,220)	(3,317)	(3,416)	(3,519)	(3,624)	(3,733)	(3,845)	(3,960)	(4,079)	(4,202)
Electricity sales	(2,053)	(2,114)	(2,178)	(2,243)	(2,311)	(2,380)	(2,451)	(2,525)	(2,601)	(2,679)
Total adjustments	(5,273)	(5,431)	(5,594)	(5,762)	(5,935)	(6,113)	(6,296)	(6,485)	(6,680)	(6,880)
Adjusted Total Revenue										
Recycled material sales	99	102	105	108	112	115	118	122	126	129
Avoided marginal heat costs	1,766	1,819	1,873	1,929	1,987	2,047	2,108	2,172	2,237	2,304
Electricity sales	(409)	(421)	(433)	(446)	(460)	(474)	(488)	(502)	(517)	(533)
MSW tipping fee	14,697	15,138	15,592	16,060	16,542	17,038	17,549	18,076	18,618	19,177
Adjusted Total Revenue from WTE plant	16,154	16,638	17,137	17,652	18,181	18,727	19,288	19,867	20,463	21,077
Solid waste mass distribution										
Total MSW, tonne/yr	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total MSW, tpy	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254
Unit rates ($US/unit)										
Tipping fee, $/tonne	147	151	156	161	165	170	175	181	186	192
Tipping fee, $/ton	133	137	141	146	150	155	159	164	169	174

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Capital Costs (1000 $US)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Construction	64,843	0	0	0	0	0	0	0	0	0	0
Interest during construction	5,836	0	0	0	0	0	0	0	0	0	0
Financing	973	0	0	0	0	0	0	0	0	0	0
Operating reserve	3,200	0	0	0	0	0	0	0	0	0	0
Total Capital Costs	74,851	0	0	0	0	0	0	0	0	0	0
Construction Costs (1000 $US)											
Plant and Distribution Costs											
Land and site development	1,003	0	0	0	0	0	0	0	0	0	0
Building	7,895	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Engineering, contingency, etc.	12,351	0	0	0	0	0	0	0	0	0	0
Total plant and distribution costs	64,843	0	0	0	0	0	0	0	0	0	0

Values from HDR	2003$
Land and site development	840
Building	6,612
Equipment	36,509
Distribution	0
Engineering, contingency, etc.	10,344
Total plant and distribution costs	54,305

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Operation and Maintenance Costs	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Operation and maintenance costs (1000 $US)											
I. Labor		691	725	762	800	840	882	926	972	1,021	1,072
II. Facility Maintenance		1,914	1,971	2,030	2,091	2,154	2,218	2,285	2,354	2,424	2,497
III Utilities		199	205	211	218	224	231	238	245	252	260
IV. Process Residue Haul and Disposal		1,100	1,132	1,166	1,201	1,238	1,275	1,313	1,352	1,393	1,435
V. Rolling Stock O&M Costs		134	138	143	147	151	156	161	165	170	175
VI. Miscellaneous Costs		170	175	180	185	191	197	203	209	215	221
VII. not used		0	0	0	0	0	0	0	0	0	0
VIII. Contingency, accounting, administration		775	798	822	847	872	898	925	953	982	1,011
Land lease		0	0	0	0	0	0	0	0	0	0
Depreciation		3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322
Total O & M Costs (1000 $US)		8,304	8,467	8,636	8,811	8,991	9,178	9,372	9,572	9,779	9,993
Cash O & M Costs (1000 $US)		4,982	5,146	5,314	5,489	5,670	5,857	6,050	6,250	6,457	6,671

Values from HDR

Mass Burn Plant	2003$
I. Labor	491,000
II. Facility Maintenance	1,556,000
III Utilities	162,000
IV. Process Residue Haul and Disposal	894,000
V. Rolling Stock O&M Costs	109,300
VI. Miscellaneous Costs	138,000
VII. not used	0
VIII. Contingency, accounting and administration	630,000
Total annual operation and maintenance costs	3,980,300
IX. Material sales	*(60,000)*

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Operation and Maintenance Costs	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Operation and maintenance costs (1000 $US)										
I. Labor	1,125	1,182	1,241	1,303	1,368	1,436	1,508	1,584	1,663	1,746
II. Facility Maintenance	2,572	2,649	2,728	2,810	2,895	2,981	3,071	3,163	3,258	3,356
III Utilities	268	276	284	293	301	310	320	329	339	349
IV. Process Residue Haul and Disposal	1,478	1,522	1,568	1,615	1,663	1,713	1,764	1,817	1,872	1,928
V. Rolling Stock O&M Costs	181	186	192	197	203	209	216	222	229	236
VI. Miscellaneous Costs	228	235	242	249	257	264	272	281	289	298
VII. not used	0	0	0	0	0	0	0	0	0	0
VIII. Contingency, accounting, administration	1,041	1,073	1,105	1,138	1,172	1,207	1,243	1,281	1,319	1,359
Land lease	0	0	0	0	0	0	0	0	0	0
Depreciation	3,322	3,322	3,322	3,322	3,322	3,322	3,322	757	757	757
Total O & M Costs (1000 $US)	10,214	10,443	10,681	10,926	11,181	11,444	11,716	9,434	9,726	10,028
Cash O & M Costs (1000 $US)	6,893	7,122	7,359	7,605	7,859	8,122	8,395	8,677	8,969	9,271

Values from HDR
Mass Burn Plant
I. Labor
II. Facility Maintenance
III Utilities
IV. Process Residue Haul and Disposal
V. Rolling Stock O&M Costs
VI. Miscellaneous Costs
VII. not used
VIII. Contingency, accounting and administration
Total annual operation and maintenance costs
IX. Material sales

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Debt Service

Operating year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Capital cost (1000 $US)	74,851										
Distribution of financing (1000 $US)											
Equity	18,713	0	0	0	0	0	0	0	0	0	0
Conventional loan	56,138	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0	0
Grant	0	0	0	0	0	0	0	0	0	0	0
Total	74,851	0	0	0	0	0	0	0	0	0	0
Debt to be financed (1000 $US)											
Conventional loan	56,138	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0	0
Total debt	56,138	0	0	0	0	0	0	0	0	0	0
Interest rate		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Term		10	9	8	7	6	5	4	3	2	1
Debt Service (1000 $US)											
Conventional loan (P&I)											
Loan -- Year 1		7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145
Total		7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145
Conventional loan interest											
Loan -- Year 1		2,706	2,479	2,240	1,989	1,726	1,448	1,157	850	528	190
Total		2,706	2,479	2,240	1,989	1,726	1,448	1,157	850	528	190
Conventional loan principal											
Loan -- Year 1		4,439	4,666	4,905	5,156	5,420	5,697	5,988	6,295	6,617	6,955
Total		4,439	4,666	4,905	5,156	5,420	5,697	5,988	6,295	6,617	6,955
Principal at year end											
Loan -- Year 1		51,699	47,033	42,128	36,972	31,552	25,856	19,867	13,572	6,955	0
Total		51,699	47,033	42,128	36,972	31,552	25,856	19,867	13,572	6,955	0
Combined debt											
Combined interest											
Conventional loan		2,706	2,479	2,240	1,989	1,726	1,448	1,157	850	528	190
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total interest		2,706	2,479	2,240	1,989	1,726	1,448	1,157	850	528	190
Combined principal											
Conventional loan		4,439	4,666	4,905	5,156	5,420	5,697	5,988	6,295	6,617	6,955
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total Principal		4,439	4,666	4,905	5,156	5,420	5,697	5,988	6,295	6,617	6,955
Total interest and principal		7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145	7,145
Combined remain principal											
Conventional loan		51,699	47,033	42,128	36,972	31,552	25,856	19,867	13,572	6,955	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total remain principal		51,699	47,033	42,128	36,972	31,552	25,856	19,867	13,572	6,955	0

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100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Debt Service

Operating year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Capital cost (1000 $US)										
Distribution of financing (1000 $US)										
Equity	0	0	0	0	0	0	0	0	0	0
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Grant	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Debt to be financed (1000 $US)										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total debt	0	0	0	0	0	0	0	0	0	0
Interest rate	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Term	0	0	0	0	0	0	0	0	0	0
Debt Service (1000 $US)										
Conventional loan (P&I)										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Conventional loan interest										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Conventional loan principal										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Principal at year end										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Combined debt										
Combined interest										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total interest	0	0	0	0	0	0	0	0	0	0
Combined principal										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total Principal	0	0	0	0	0	0	0	0	0	0
Total interest and principal	0	0	0	0	0	0	0	0	0	0
Combined remain principal										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total remain principal	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Screening Analysis

Depreciation (1000 $US)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
	Original	Less Grants	Net Constr. Cost	Allowable	Depreci able amount						
Land	1,003	0	1,003	0%	0						
Building	7,895	0	7,895	100%	7,895						
Equipment	43,594	0	43,594	100%	43,594						
Distribution	0	0	0	100%	0						
Other (engineering, contingency, etc.)	12,351	0	12,351	100%	12,351						
Interest during construction	5,836	0	5,836	100%	5,836						
Financing	973	0	973	100%	973						
Operating reserve	3,200	0	3,200	100%	3,200						
Total Construction	74,851	0	74,851		73,848						
Grant amount	0										
Net Constuction Cost for depreciation	74,851										
Depreciation (1000 $US)											
Depreciation of building											
Beginning Book Value		7,895	7,632	7,368	7,105	6,842	6,579	6,316	6,053	5,789	5,526
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		263	263	263	263	263	263	263	263	263	263
Ending Book Value		7,632	7,368	7,105	6,842	6,579	6,316	6,053	5,789	5,526	5,263
Depreciation of equipment											
Beginning Book Value		43,594	41,029	38,465	35,901	33,336	30,772	28,208	25,643	23,079	20,515
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564
Ending Book Value		41,029	38,465	35,901	33,336	30,772	28,208	25,643	23,079	20,515	17,950
Depreciation of distribution											
Beginning Book Value		0	0	0	0	0	0	0	0	0	0
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		0	0	0	0	0	0	0	0	0	0
Ending Book Value		0	0	0	0	0	0	0	0	0	0
Depreciation of other Investment											
Beginning Book Value		22,360	21,866	21,372	20,878	20,384	19,889	19,395	18,901	18,407	17,913
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		494	494	494	494	494	494	494	494	494	494
Ending Book Value		21,866	21,372	20,878	20,384	19,889	19,395	18,901	18,407	17,913	17,419
Total amount of depreciation		3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322
Residual Value											
Residual book value		70,527	67,205	63,884	60,562	57,240	53,919	50,597	47,276	43,954	40,633
Land		1,033	1,064	1,096	1,129	1,163	1,198	1,234	1,271	1,309	1,348
Remaining debt principal		(47,033)	(42,128)	(36,972)	(31,552)	(25,856)	(19,867)	(13,572)	(6,955)	0	0
Remaining operating reserve		2,446	1,697	1,073	582	234	36	0	0	0	0
Total residual value		26,973	27,838	29,080	30,720	32,781	35,286	38,259	41,591	45,263	41,981

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Central Plant - Screening Analysis

Depreciation (1000 $US)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Land										
Building										
Equipment										
Distribution										
Other (engineering, contingency, etc.)										
Interest during construction										
Financing										
Operating reserve										
Total Construction										
Grant amount										
Net Constuction Cost for depreciation										
Depreciation (1000 $US)										
Depreciation of building										
Beginning Book Value	5,263	5,000	4,737	4,474	4,211	3,947	3,684	3,421	3,158	2,895
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	263	263	263	263	263	263	263	263	263	263
Ending Book Value	5,000	4,737	4,474	4,211	3,947	3,684	3,421	3,158	2,895	2,632
Depreciation of equipment										
Beginning Book Value	17,950	15,386	12,822	10,257	7,693	5,129	2,564	(0)	(0)	(0)
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	2,564	2,564	2,564	2,584	2,564	2,564	2,564	0	0	0
Ending Book Value	15,386	12,822	10,257	7,693	5,129	2,564	(0)	(0)	(0)	(0)
Depreciation of distribution										
Beginning Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	0	0	0	0	0	0	0	0	0	0
Ending Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation of other Investment										
Beginning Book Value	17,419	16,925	16,431	15,937	15,443	14,949	14,455	13,961	13,467	12,973
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	494	494	494	494	494	494	494	494	494	494
Ending Book Value	16,925	16,431	15,937	15,443	14,949	14,455	13,961	13,467	12,973	12,479
Total amount of depreciation	3,322	3,322	3,322	3,322	3,322	3,322	3,322	757	757	757
Residual Value										
Residual book value	37,311	33,990	30,668	27,347	24,025	20,703	17,382	16,625	15,868	15,110
Land	1,388	1,430	1,473	1,517	1,563	1,610	1,658	1,708	1,759	1,812
Remaining debt principal	0	0	0	0	0	0	0	0	0	0
Remaining operating reserve	0	0	0	0	0	0	0	0	0	0
Total residual value	38,700	35,420	32,141	28,864	25,588	22,313	19,040	18,332	17,626	16,922

Appendix D3
Waste to Energy Feasibility Study

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher Heat Production

by

FVB Energy Inc.
for
HDR Engineering Inc

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher Heat Production

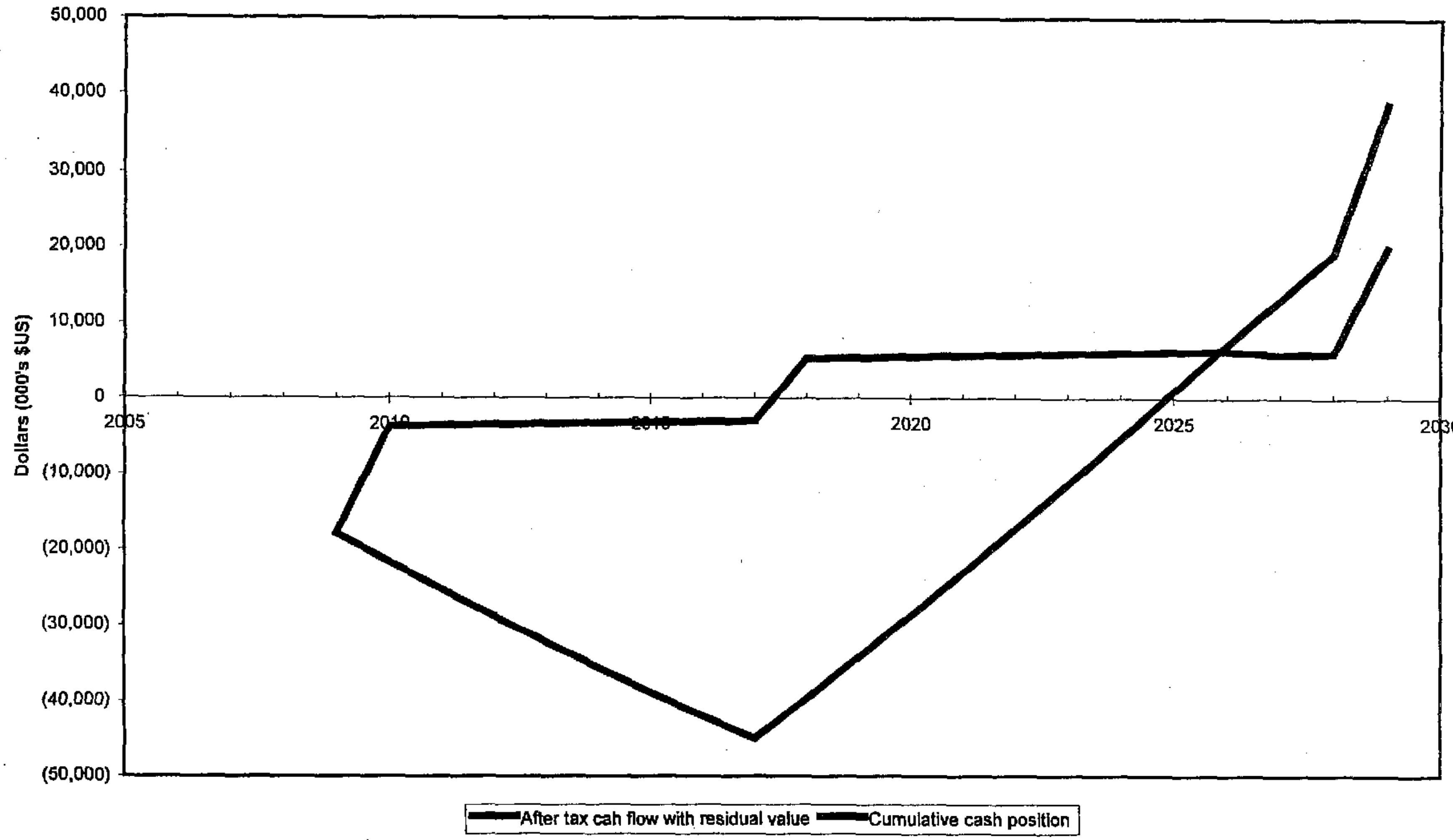
Input Assumptions and Summary of Results	Cz Units		US Units	
Financial Results				
Economic study period, years	20			
Breakeven, years	15.9			
After Tax Internal Rate of Return (IRR)	*5.0%*			
After Tax Net Present Value (NPV) in 1000 $US	(0)	000's Kč	(0)	1000 $US
First year of commercial operation	2010			
Fixed costs				
Plant lease cost (2003)	0	Kč	$0	
Escalation factors (%/year)				
Inflation	3.0%			
Heat energy	3.0%			
Electricity	3.0%			
Land	3.0%			
Land lease	3.0%			
I. Labor	5.0%			
II. Facility Maintenance	3.0%			
III Utilities	3.0%			
IV. Process Residue Haul and Disposal	3.0%			
V. Rolling Stock O&M Costs	3.0%			
VI. Miscellaneous Costs	3.0%			
VII.	3.0%			
VIII. Contingency, accounting and administration	3.0%			
IX. Revenue from sale of recycled material	3.0%			
Mass Burn				
MSW total, ton/year	100,000	tonne/yr	110,254	ton/yr
Heat exported	607,839	GJ/yr	576,120	MMBtu/yr
Net electric production	36,430	MWh/yr	36,429,917	kWh/yr
Existing Central Plant				
Heat exported	607,839	GJ/yr	576,120	MMBtu/yr
Net electric production	64,525	MWh/yr	64,525,436	KWh/yr
Lost electric generation				
Existing Central Plant net generation	64,525	MWh/yr	64,525,436	KWh/yr
Proposed Mass Burn Plant net generation	(36,430)	MWh/yr	(36,429,917)	KWh/yr
Lost electric generation	28,096	MWh/yr	28,095,519	KWh/yr
Heat energy				
District heating price	164	Kč/GJ	5.76	$/MMBtu
Variable district heating cost	58	Kč/GJ	2.04	$/MMBtu
Electricity Rates				
Sold from cogeneration	901	Kč/MWh	0.0300	$/kWh
Sold from condensing	618	Kč/MWh	0.0206	$/kWh
Purchased	901	Kč/MWh	0.0300	$/kWh
Variable electric production costs				
Cogeneration	266	Kč/MWh	0.0089	$/kWh
Condensing	619	Kč/MWh	0.0206	$/kWh
Exchange rate, Kč/$US			30	

	Cz Units		US Units	
Solid Waste Rates				
Tipping fee	**2,094**	Kč/tonne	**69.80**	$/tonne
Tipping fee escalation	3.0%			
Financial				
Operating Reserve ($US)	0	000's Kč	0	1000 $US
Interest	3.5%			
Discount rate	5.00%			
Equity	25%			
Conventional loan	75%			
Interest	5%			
Term	8			
Subsidized loan	0%			
Interest	4%			
Term	10			
Grant	0%			
Number of payments per year	4			
Interest during construction	9.0%			
Financing charge	1.50%			
Taxes	Federal	State	Federal	State
Marginal tax rate	24%	0%		
Investment tax credit	0%	0%		
Maximum ITC, $000's	0	0	0	0
Energy tax credit	0%	0%		
Maximum ETC, $000's	0	0	0	0
Depreciation				
Depreciation for book purpose	Straight line			
Asset	Years			
Land	n. ap.			
Building	30			
Equipment	17			
Distribution	30			
Other	25			

Definitions and nomenclature
Ccf = 100 cubic feet
WTE = waste-to-energy
MSW = municipal solid waste
MMBtu = million Btu
MBtu = thousand Btu
ton = imperial short ton (2,000 pounds)
tonne = metric ton (1,000 kg)

Note: All costs and prices on this sheet are expressed in 2003$ or 2003Kč

After Tax Breakeven Point



Plzenská teplárenská
100,000 tonne/yr Mass Burn Central Plant - Higher Heat Production

Net Income and Cash Flow	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Net Income (1000 $US)											
WTE revenues		14,087	14,509	14,944	15,393	15,855	16,330	16,820	17,325	17,844	18,380
Adjustments to revenues		(4,316)	(4,445)	(4,579)	(4,716)	(4,857)	(5,003)	(5,153)	(5,308)	(5,467)	(5,631)
Cash O&M expenses		(4,982)	(5,146)	(5,314)	(5,489)	(5,670)	(5,857)	(6,050)	(6,250)	(6,457)	(6,671)
Net operating income		4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Before Tax Net Income											
Net operating income		4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Depreciation		(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)
Interest (not tax deductible)		(2,583)	(2,297)	(1,997)	(1,681)	(1,350)	(1,001)	(635)	(250)	0	0
Net income before tax		(1,116)	(700)	(267)	185	656	1,148	1,661	2,195	2,599	2,756
Income tax		(352)	(383)	(415)	(448)	(481)	(516)	(551)	(587)	(624)	(661)
After Tax Net Income		(1,468)	(1,084)	(682)	(263)	175	632	1,110	1,609	1,975	2,095
Cash Flow (1000 $US)											
Net operating income		4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Interest		(2,583)	(2,297)	(1,997)	(1,681)	(1,350)	(1,001)	(635)	(250)	0	0
Principal		(5,609)	(5,894)	(6,195)	(6,510)	(6,842)	(7,190)	(7,557)	(7,942)	0	0
Income tax		(352)	(383)	(415)	(448)	(481)	(516)	(551)	(587)	(624)	(661)
Cash from operating reserve		0	0	0	0	0	0	0	0	0	0
After tax net cash flow		(3,755)	(3,656)	(3,555)	(3,452)	(3,346)	(3,237)	(3,126)	(3,012)	5,297	5,416
Before tax net cash flow		(3,403)	(3,273)	(3,140)	(3,004)	(2,864)	(2,721)	(2,575)	(2,425)	5,920	6,078
After Tax Financial Performance											
After tax net cash flow		(3,755)	(3,656)	(3,555)	(3,452)	(3,346)	(3,237)	(3,126)	(3,012)	5,297	5,416
Residual value		0	0	0	0	0	0	0	0	0	0
Equity	(17,913)										
Combined cash flow with resid. valu.	(17,913)	(3,755)	(3,656)	(3,555)	(3,452)	(3,346)	(3,237)	(3,126)	(3,012)	5,297	5,416
Cumulative cash position	(17,913)	(21,668)	(25,324)	(28,879)	(32,331)	(35,677)	(38,913)	(42,039)	(45,050)	(39,754)	(34,338)
Breakeven years	15.9										
Internal Rate of Return (IRR)	5.00%										
Net Present Value (NPV)	(0)										
Operating Reserve Fund (1000$US)											
Beginning	-	-	-	-	-	-	-	-	-	-	-
Disbursement	-	-	-	-	-	-	-	-	-	-	-
Interest income	-	-	-	-	-	-	-	-	-	-	-
Ending	-	-	-	-	-	-	-	-	-	-	-

Plzenská teplárenská
100,000 tonne/yr Mass Burn Central Plant - Higher Heat Production

Net Income and Cash Flow	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Net Income (1000 $US)										
WTE revenues	18,931	19,499	20,084	20,687	21,307	21,946	22,605	23,283	23,981	24,701
Adjustments to revenues	(5,800)	(5,974)	(6,153)	(6,338)	(6,528)	(6,724)	(6,926)	(7,133)	(7,347)	(7,568)
Cash O&M expenses	(6,893)	(7,122)	(7,359)	(7,605)	(7,859)	(8,122)	(8,395)	(8,677)	(8,969)	(9,271)
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Before Tax Net Income										
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Depreciation	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(757)	(757)	(757)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0
Net income before tax	2,917	3,082	3,250	3,422	3,599	3,779	3,963	6,716	6,908	7,105
Income tax	(700)	(740)	(780)	(821)	(864)	(907)	(951)	(1,612)	(1,658)	(1,705)
After Tax Net Income	2,217	2,342	2,470	2,601	2,735	2,872	3,012	5,104	5,250	5,400
Cash Flow (1000 $US)										
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Interest	0	0	0	0	0	0	0	0	0	0
Principal	0	0	0	0	0	0	0	0	0	0
Income tax	(700)	(740)	(780)	(821)	(864)	(907)	(951)	(1,612)	(1,658)	(1,705)
Cash from operating reserve	0	0	0	0	0	0	0	0	0	0
After tax net cash flow	5,538	5,663	5,792	5,922	6,056	6,193	6,333	5,861	6,008	6,157
Before tax net cash flow	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
After Tax Financial Performance										
After tax net cash flow	5,538	5,663	5,792	5,922	6,056	6,193	6,333	5,861	6,008	6,157
Residual value	0	0	0	0	0	0	0	0	0	13,722
Equity										
Combined cash flow with resid. valu.	5,538	5,663	5,792	5,922	6,056	6,193	6,333	5,861	6,008	19,879
Cumulative cash position	(28,799)	(23,136)	(17,344)	(11,422)	(5,365)	828	7,161	13,023	19,030	38,909
Breakeven years										
Internal Rate of Return (IRR)										
Net Present Value (NPV)										
Operating Reserve Fund (1000$US)										
Beginning	-	-	-	-	-	-	-	-	-	-
Disbursement	-	-	-	-	-	-	-	-	-	-
Interest income	-	-	-	-	-	-	-	-	-	-
Ending	-	-	-	-	-	-	-	-	-	-

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher Heat Production

Taxes (1000 $US)	2009	2,010	2,011	2,012	2,013	2,014	2,015	2,016	2,017	2,018	2,019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Net operating income	0	4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Depreciation	0	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0	0
Net income for determining tax	0	1,467	1,597	1,730	1,866	2,006	2,149	2,295	2,445	2,599	2,756
Cumulative losses	0	0	0	0	0	0	0	0	0	0	0
Taxable income	0	1,467	1,597	1,730	1,866	2,006	2,149	2,295	2,445	2,599	2,756
Tax liability	0	352	383	415	448	481	516	551	587	624	661
Tax credits	0	0	0	0	0	0	0	0	0	0	0
Remaining tax credit	0	0	0	0	0	0	0	0	0	0	0
Income tax	0	352	383	415	448	481	516	551	587	624	661
Capital investment (1000 $US)											
Land	1,003	0	0	0	0	0	0	0	0	0	0
Building	7,895	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	12,351	0	0	0	0	0	0	0	0	0	0
Total investment	64,843	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments (1000 $US)											
Land	0	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments	43,594	0	0	0	0	0	0	0	0	0	0
Federal ITC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
State ITC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
Total investment tax credit	0	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments (1000 $US)											
Land	0	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments	43,594	0	0	0	0	0	0	0	0	0	0
Federal ETC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
State ETC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
Total energy tax credit	0	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0	0
Total credits (1000 $US)	0	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská 100,000 tonne/yr Mass Burn

Central Plant - Higher Heat Production

Taxes (1000 $US)	2,020	2,021	2,022	2,023	2,024	2,025	2,026	2,027	2,028	2,029
Operating year	11	12	13	14	15	16	17	18	19	20
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Depreciation	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(757)	(757)	(757)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0
Net income for determining tax	2,917	3,082	3,250	3,422	3,599	3,779	3,963	6,716	6,908	7,105
Cumulative losses	0	0	0	0	0	0	0	0	0	0
Taxable income	2,917	3,082	3,250	3,422	3,599	3,779	3,963	6,716	6,908	7,105
Tax liability	700	740	780	821	864	907	951	1,612	1,658	1,705
Tax credits	0	0	0	0	0	0	0	0	0	0
Remaining tax credit	0	0	0	0	0	0	0	0	0	0
Income tax	700	740	780	821	864	907	951	1,612	1,658	1,705
Capital investment (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Total Investment	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments	0	0	0	0	0	0	0	0	0	0
Federal ITC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
State ITC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
Total investment tax credit	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments	0	0	0	0	0	0	0	0	0	0
Federal ETC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
State ETC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
Total energy tax credit	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0
Total credits (1000 $US)	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher Heat Production

Revenues	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Revenues (1000 $US)											
WTE Plant											
Recycled material sales		74	76	78	81	83	86	88	91	93	96
Heat sales		4,081	4,203	4,329	4,459	4,593	4,731	4,873	5,019	5,170	5,325
Electricity sales		1,346	1,386	1,428	1,471	1,515	1,560	1,607	1,655	1,705	1,756
MSW tipping fee		8,586	8,843	9,109	9,382	9,663	9,953	10,252	10,560	10,876	11,203
Gross revenue		14,087	14,509	14,944	15,393	15,855	16,330	16,820	17,325	17,844	18,380
Off-setting adjustments from existing plant operations											
Heat sales		(2,636)	(2,715)	(2,796)	(2,880)	(2,966)	(3,055)	(3,147)	(3,241)	(3,339)	(3,439)
Electricity sales		(1,680)	(1,731)	(1,783)	(1,836)	(1,891)	(1,948)	(2,006)	(2,067)	(2,129)	(2,192)
Total adjustments		(4,316)	(4,445)	(4,579)	(4,716)	(4,857)	(5,003)	(5,153)	(5,308)	(5,467)	(5,631)
Adjusted Total Revenue											
Recycled material sales		74	76	78	81	83	86	88	91	93	96
Avoided marginal heat costs		1,445	1,489	1,533	1,579	1,627	1,676	1,726	1,778	1,831	1,886
Electricity sales		(334)	(344)	(355)	(365)	(376)	(388)	(399)	(411)	(424)	(436)
MSW tipping fee		8,588	8,843	9,109	9,382	9,663	9,953	10,252	10,560	10,876	11,203
Adjusted Total Revenue from WTE plant		9,771	10,064	10,366	10,677	10,997	11,327	11,667	12,017	12,377	12,749
Solid waste mass distribution											
Total MSW, tonne/yr		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total MSW, tpy		110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254
Unit rates ($US/unit)											
Tipping fee, $/tonne		86	88	91	94	97	100	102	106	109	112
Tipping fee, $/ton		78	80	83	85	88	90	93	96	99	102

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher Heat Production

Revenues	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Revenues (1000 $US)										
WTE Plant										
Recycled material sales	99	102	105	108	112	115	118	122	126	129
Heat sales	5,484	5,649	5,818	5,993	6,173	6,358	6,549	6,745	6,948	7,156
Electricity sales	1,609	1,863	1,919	1,977	2,036	2,097	2,160	2,225	2,291	2,360
MSW tipping fee	11,539	11,885	12,241	12,609	12,987	13,376	13,778	14,191	14,617	15,055
Gross revenue	18,931	19,499	20,084	20,687	21,307	21,946	22,605	23,283	23,981	24,701
Off-setting adjustments from existing plant operations										
Heat sales	(3,542)	(3,648)	(3,758)	(3,870)	(3,986)	(4,106)	(4,229)	(4,356)	(4,487)	(4,621)
Electricity sales	(2,258)	(2,326)	(2,396)	(2,468)	(2,542)	(2,618)	(2,698)	(2,777)	(2,861)	(2,946)
Total adjustments	(5,800)	(5,974)	(6,153)	(6,338)	(6,528)	(6,724)	(6,926)	(7,133)	(7,347)	(7,568)
Adjusted Total Revenue										
Recycled material sales	99	102	105	108	112	115	118	122	126	129
Avoided marginal heat costs	1,943	2,001	2,061	2,123	2,186	2,252	2,320	2,389	2,461	2,535
Electricity sales	(449)	(463)	(477)	(491)	(506)	(521)	(537)	(553)	(569)	(586)
MSW tipping fee	11,539	11,885	12,241	12,609	12,987	13,376	13,778	14,191	14,617	15,055
Adjusted Total Revenue from WTE plant	13,131	13,525	13,931	14,349	14,779	15,223	15,679	16,150	16,634	17,133
Solid waste mass distribution										
Total MSW, tonne/yr	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total MSW, tpy	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254
Unit rates ($US/unit)										
Tipping fee, $/tonne	115	119	122	126	130	134	138	142	146	151
Tipping fee, $/ton	105	108	111	114	118	121	125	129	133	137

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher Heat Production

Capital Costs (1000 $US)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Construction	64,843	0	0	0	0	0	0	0	0	0	0
Interest during construction	5,836	0	0	0	0	0	0	0	0	0	0
Financing	973	0	0	0	0	0	0	0	0	0	0
Operating reserve	0	0	0	0	0	0	0	0	0	0	0
Total Capital Costs	71,651	0	0	0	0	0	0	0	0	0	0
Construction Costs (1000 $US)											
Plant and Distribution Costs											
Land and site development	1,003	0	0	0	0	0	0	0	0	0	0
Building	7,895	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Engineering, contingency, etc.	12,351	0	0	0	0	0	0	0	0	0	0
Total plant and distribution costs	64,843	0	0	0	0	0	0	0	0	0	0

Values from HDR	2003$
Land and site development	840
Building	6,612
Equipment	36,509
Distribution	0
Engineering, contingency, etc.	10,344
Total plant and distribution costs	54,305

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher Heat Production

Operation and Maintenance Costs	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Operation and maintenance costs (1000 $US)											
I. Labor		691	725	762	800	840	882	926	972	1,021	1,072
II. Facility Maintenance		1,914	1,971	2,030	2,091	2,154	2,218	2,285	2,354	2,424	2,497
III Utilities		199	205	211	218	224	231	238	245	252	260
IV. Process Residue Haul and Disposal		1,100	1,132	1,166	1,201	1,238	1,275	1,313	1,352	1,393	1,435
V. Rolling Stock O&M Costs		134	138	143	147	151	156	161	165	170	175
VI. Miscellaneous Costs		170	175	180	185	191	197	203	209	215	221
VII. not used		0	0	0	0	0	0	0	0	0	0
VIII. Contingency, accounting, administration		775	798	822	847	872	898	925	953	982	1,011
Land lease		0	0	0	0	0	0	0	0	0	0
Depreciation		3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322
Total O & M Costs (1000 $US)		8,304	8,467	8,636	8,811	8,991	9,178	9,372	9,572	9,779	9,993
Cash O & M Costs (1000 $US)		4,982	5,146	5,314	5,489	5,670	5,857	6,050	6,250	6,457	6,671

Values from HDR	
Mass Burn Plant	2003$
I. Labor	491,000
II. Facility Maintenance	1,556,000
III Utilities	162,000
IV. Process Residue Haul and Disposal	*894,000*
V. Rolling Stock O&M Costs	109,300
VI. Miscellaneous Costs	138,000
VII. not used	0
VIII. Contingency, accounting and administration	630,000
Total annual operation and maintenance costs	3,980,300
IX. Material sales	(60,000)

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher Heat Production

Operation and Maintenance Costs	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Operation and maintenance costs (1000 $US)										
I. Labor	1,125	1,182	1,241	1,303	1,368	1,436	1,508	1,584	1,663	1,746
II. Facility Maintenance	2,572	2,649	2,728	2,810	2,895	2,981	3,071	3,163	3,258	3,356
III Utilities	268	276	284	293	301	310	320	329	339	349
IV. Process Residue Haul and Disposal	1,478	1,522	1,568	1,615	1,663	1,713	1,764	1,817	1,872	1,928
V. Rolling Stock O&M Costs	181	186	192	197	203	209	216	222	229	236
VI. Miscellaneous Costs	228	235	242	249	257	264	272	281	289	298
VII. not used	0	0	0	0	0	0	0	0	0	0
VIII. Contingency, accounting, administration	1,041	1,073	1,105	1,138	1,172	1,207	1,243	1,281	1,319	1,359
Land lease	0	0	0	0	0	0	0	0	0	0
Depreciation	3,322	3,322	3,322	3,322	3,322	3,322	3,322	757	757	757
Total O & M Costs (1000 $US)	10,214	10,443	10,681	10,926	11,181	11,444	11,716	9,434	9,726	10,028
Cash O & M Costs (1000 $US)	6,893	7,122	7,359	7,605	7,859	8,122	8,395	8,677	8,969	9,271

Values from HDR
Mass Burn Plant
I. Labor
II. Facility Maintenance
III Utilities
IV. Process Residue Haul and Disposal
V. Rolling Stock O&M Costs
VI. Miscellaneous Costs
VII. not used
VIII. Contingency, accounting and administration
Total annual operation and maintenance costs
IX. Material sales

Plzenská teplárenská
100,000 tonne/yr Mass Burn Central Plant - Higher Heat Production

Debt Service

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Capital cost (1000 $US)	71,651										
Distribution of financing (1000 $US)											
Equity	17,913	0	0	0	0	0	0	0	0	0	0
Conventional loan	53,738	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0	0
Grant	0	0	0	0	0	0	0	0	0	0	0
Total	71,651	0	0	0	0	0	0	0	0	0	0
Debt to be financed (1000 $US)											
Conventional loan	53,738	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0	0
Total debt	53,738	0	0	0	0	0	0	0	0	0	0
LIBOR rate		5.0%	5.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Margin		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Interest rate		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Term		8	7	6	5	4	3	2	1	0	0
Debt Service (1000 $US)											
Conventional loan (P&I)											
Loan -- Year 1		8,191	8,191	8,191	8,191	8,191	8,191	8,191	8,191	0	0
Total		8,191	8,191	8,191	8,191	8,191	8,191	8,191	8,191	0	0
Conventional loan Interest											
Loan -- Year 1		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Total		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Conventional loan principal											
Loan -- Year 1		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Total		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Principal at year end											
Loan -- Year 1		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0
Total		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0
Combined debt											
Combined interest											
Conventional loan		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total interest		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Combined principal											
Conventional loan		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total Principal		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Total interest and principal		8,191	8,191	8,191	8,191	8,191	8,191	8,191	8,191	0	0
Combined remaining principal											
Conventional loan		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total remaining principal		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn Central Plant - Higher Heat Production

Debt Service

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Capital cost (1000 $US)										
Distribution of financing (1000 $US)										
Equity	0	0	0	0	0	0	0	0	0	0
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Grant	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Debt to be financed (1000 $US)										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total debt	0	0	0	0	0	0	0	0	0	0
LIBOR rate	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Margin	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Interest rate	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Term	0	0	0	0	0	0	0	0	0	0
Debt Service (1000 $US)										
Conventional loan (P&I)										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Conventional loan interest										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Conventional loan principal										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Principal at year end										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Combined debt										
Combined interest										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total interest	0	0	0	0	0	0	0	0	0	0
Combined principal										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total Principal	0	0	0	0	0	0	0	0	0	0
Total interest and principal	0	0	0	0	0	0	0	0	0	0
Combined remaining principal										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total remaining principal	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher Heat Production

Depreciation (1000 $US)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
	Original	Less Grants	Net Constr. Cost	Allowable	Depreciable amount						
Land and site development	1,003	0	1,003	0%	0						
Building	7,895	0	7,895	100%	7,895						
Equipment	43,594	0	43,594	100%	43,594						
Distribution	0	0	0	100%	0						
Engineering, contingency, etc.	12,351	0	12,351	100%	12,351						
Interest during construction	5,836	0	5,836	100%	5,836						
Financing	973	0	973	100%	973						
Operating reserve	0	0	0	100%	0						
Total Construction	71,651	0	71,651		70,648						
Grant amount	0										
Net Constuction Cost for depreciation	71,651										
Depreciation (1000 $US)											
Depreciation of building											
Beginning Book Value		7,895	7,632	7,368	7,105	6,842	6,579	6,316	6,053	5,789	5,526
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		263	263	263	263	263	263	263	263	263	263
Ending Book Value		7,632	7,368	7,105	6,842	6,579	6,316	6,053	5,789	5,526	5,263
Depreciation of equipment											
Beginning Book Value		43,594	41,029	38,465	35,901	33,336	30,772	28,208	25,643	23,079	20,515
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564
Ending Book Value		41,029	38,465	35,901	33,336	30,772	28,208	25,643	23,079	20,515	17,950
Depreciation of distribution											
Beginning Book Value		0	0	0	0	0	0	0	0	0	0
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		0	0	0	0	0	0	0	0	0	0
Ending Book Value		0	0	0	0	0	0	0	0	0	0
Depreciation of other investment											
Beginning Book Value		19,160	18,666	18,172	17,678	17,184	16,689	16,195	15,701	15,207	14,713
Depreciation year		1	2	3	4	5	6	7	8	9	10
Depreciation		494	494	494	494	494	494	494	494	494	494
Ending Book Value		18,666	18,172	17,678	17,184	16,689	16,195	15,701	15,207	14,713	14,219
Total amount of depreciation		3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322
Residual Value											
Residual book value		67,327	64,005	60,684	57,362	54,040	50,719	47,397	44,076	40,754	37,433
Land		1,033	1,064	1,096	1,129	1,163	1,198	1,234	1,271	1,309	1,348
Remaining debt principal		(42,235)	(36,041)	(29,531)	(22,689)	(15,498)	(7,942)	0	0	0	0
Remaining operating reserve		0	0	0	0	0	0	0	0	0	0
Total residual value		26,124	29,028	32,249	35,802	39,705	43,975	48,631	45,346	42,063	38,781

Plzenská teplárenská
100,000 tonne/yr Mass Bur
Central Plant - Higher Heat

Depreciation (1000 $US)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Land and site development										
Building										
Equipment										
Distribution										
Engineering, contingency, etc.										
Interest during construction										
Financing										
Operating reserve										
Total Construction										
Grant amount										
Net Constuction Cost for depreciation										
Depreciation (1000 $US)										
Depreciation of building										
Beginning Book Value	5,263	5,000	4,737	4,474	4,211	3,947	3,684	3,421	3,158	2,895
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	263	263	263	263	263	263	263	263	263	263
Ending Book Value	5,000	4,737	4,474	4,211	3,947	3,684	3,421	3,158	2,895	2,632
Depreciation of equipment										
Beginning Book Value	17,950	15,386	12,822	10,257	7,693	5,129	2,564	(0)	(0)	(0)
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	2,564	2,564	2,564	2,564	2,564	2,564	2,564	0	0	0
Ending Book Value	15,386	12,822	10,257	7,693	5,129	2,564	(0)	(0)	(0)	(0)
Depreciation of distribution										
Beginning Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	0	0	0	0	0	0	0	0	0	0
Ending Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation of other Investment										
Beginning Book Value	14,219	13,725	13,231	12,737	12,243	11,749	11,255	10,761	10,267	9,773
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	494	494	494	494	494	494	494	494	494	494
Ending Book Value	13,725	13,231	12,737	12,243	11,749	11,255	10,761	10,267	9,773	9,279
Total amount of depreciation	3,322	3,322	3,322	3,322	3,322	3,322	3,322	757	757	757
Residual Value										
Residual book value	34,111	30,790	27,468	24,147	20,825	17,503	14,182	13,425	12,668	11,910
Land	1,388	1,430	1,473	1,517	1,563	1,610	1,658	1,708	1,759	1,812
Remaining debt principal	0	0	0	0	0	0	0	0	0	0
Remaining operating reserve	0	0	0	0	0	0	0	0	0	0
Total residual value	35,500	32,220	28,941	25,664	22,388	19,113	15,840	15,132	14,426	13,722

Appendix D4
Waste to Energy Feasibility Study

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat Sale Price

by

FVB Energy Inc.
for
HDR Engineering Inc

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat Sale Price

Input Assumptions and Summary of Results

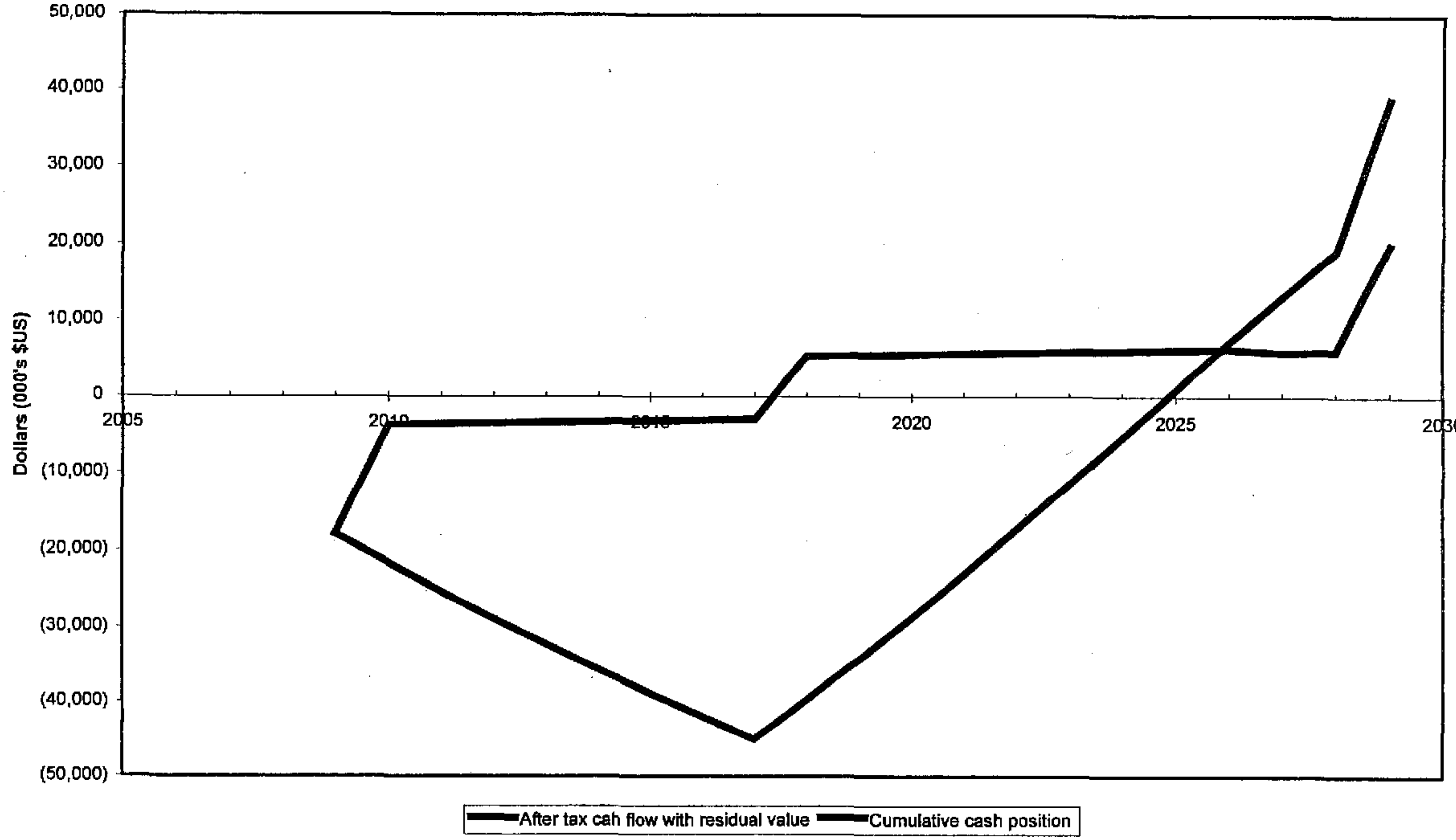
	Cz Units		US Units	
Financial Results				
Economic study period, years	**20**			
Breakeven, years	**15.9**			
After Tax Internal Rate of Return (IRR)	**5.0%**			
After Tax Net Present Value (NPV) in 1000 $US	0	000's Kč	0	1000 $US
First year of commercial operation	2010			
Fixed costs				
Plant lease cost (2003)	0	Kč	$0	
Escalation factors (%/year)				
Inflation	3.0%			
Heat energy	3.0%			
Electricity	3.0%			
Land	3.0%			
Land lease	3.0%			
I. Labor	5.0%			
II. Facility Maintenance	3.0%			
III Utilities	3.0%			
IV. Process Residue Haul and Disposal	3.0%			
V. Rolling Stock O&M Costs	3.0%			
VI. Miscellaneous Costs	3.0%			
VII.	3.0%			
VIII. Contingency, accounting and administration	3.0%			
IX. Revenue from sale of recycled material	3.0%			
Mass Burn				
MSW total, ton/year	100,000	tonne/yr	110,254	ton/yr
Heat exported	552,581	GJ/yr	523,745	MMBtu/yr
Net electric production	33,118	MWh/yr	33,118,106	kWh/yr
Existing Central Plant				
Heat exported	552,581	GJ/yr	523,745	MMBtu/yr
Net electric production	58,659	MWh/yr	58,659,487	KWh/yr
Lost electric generation				
Existing Central Plant net generation	58,659	MWh/yr	58,659,487	KWh/yr
Proposed Mass Burn Plant net generation	(33,118)	MWh/yr	(33,118,106)	KWh/yr
Lost electric generation	25,541	MWh/yr	25,541,381	KWh/yr
Heat energy				
District heating price	164	Kč/GJ	5.76	$/MMBtu
Avoided district heating cost	110	Kč/GJ	3.87	$/MMBtu
Electricity Rates				
Sold from cogeneration	901	Kč/MWh	0.0300	$/kWh
Sold from condensing	618	Kč/MWh	0.0206	$/kWh
Purchased	901	Kč/MWh	0.0300	$/kWh
Variable electric production costs				
Cogeneration	266	Kč/MWh	0.0089	$/kWh
Condensing	619	Kč/MWh	0.0206	$/kWh
Exchange rate, Kč/$US			30	

	Cz Units		US Units	
Solid Waste Rates				
Tipping fee	**1,831**	Kč/tonne	**61.04**	$/tonne
Tipping fee escalation	**3.0%**			
Financial				
Operating Reserve ($US)	0	000's Kč	0	1000 $US
Interest	3.5%			
Discount rate	5.00%			
Equity	25%			
Conventional loan	75%			
Interest	5%			
Term	8			
Subsidized loan	0%			
Interest	4%			
Term	10			
Grant	0%			
Number of payments per year	4			
Interest during construction	9.0%			
Financing charge	1.50%			
Taxes	Federal	State	Federal	State
Marginal tax rate	24%	0%		
Investment tax credit	0%	0%		
Maximum ITC, $000's	0	0	0	0
Energy tax credit	0%	0%		
Maximum ETC, $000's	0	0	0	0
Depreciation				
Depreciation for book purpose	Straight line			
Asset	Years			
Land	n. ap.			
Building	30			
Equipment	17			
Distribution	30			
Other	25			

Definitions and nomenclature
Ccf = 100 cubic feet
WTE = waste-to-energy
MSW = municipal solid waste
MMBtu = million Btu
MBtu = thousand Btu
ton = imperial short ton (2,000 pounds)
tonne = metric ton (1,000 kg)

Note: All costs and prices on this sheet are expressed in 2003$ or 2003Kč

After Tax Breakeven Point



Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District
Heat Sale Price

Net Income and Cash Flow	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Net Income (1000 $US)											
WTE revenues		12,515	12,891	13,278	13,676	14,086	14,509	14,944	15,392	15,854	16,330
Adjustments to revenues		(2,745)	(2,827)	(2,912)	(2,999)	(3,089)	(3,182)	(3,277)	(3,376)	(3,477)	(3,581)
Cash O&M expenses		(4,982)	(5,146)	(5,314)	(5,489)	(5,670)	(5,857)	(6,050)	(6,250)	(6,457)	(6,671)
Net operating income		4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Before Tax Net Income											
Net operating income		4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Depreciation		(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)
Interest (not tax deductible)		(2,583)	(2,297)	(1,997)	(1,681)	(1,350)	(1,001)	(635)	(250)	0	0
Net income before tax		(1,116)	(700)	(267)	185	656	1,148	1,661	2,195	2,599	2,756
Income tax		(352)	(383)	(415)	(448)	(481)	(516)	(551)	(587)	(624)	(661)
After Tax Net Income		(1,468)	(1,084)	(682)	(263)	175	632	1,110	1,609	1,975	2,095
Cash Flow (1000 $US)											
Net operating income		4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Interest		(2,583)	(2,297)	(1,997)	(1,681)	(1,350)	(1,001)	(635)	(250)	0	0
Principal		(5,609)	(5,894)	(6,195)	(6,510)	(6,842)	(7,190)	(7,557)	(7,942)	0	0
Income tax		(352)	(383)	(415)	(448)	(481)	(516)	(551)	(587)	(624)	(661)
Cash from operating reserve		0	0	0	0	0	0	0	0	0	0
After tax net cash flow		(3,755)	(3,656)	(3,555)	(3,452)	(3,346)	(3,237)	(3,126)	(3,012)	5,297	5,416
Before tax net cash flow		(3,403)	(3,273)	(3,140)	(3,004)	(2,864)	(2,721)	(2,575)	(2,425)	5,920	6,078
After Tax Financial Performance											
After tax net cash flow		(3,755)	(3,656)	(3,555)	(3,452)	(3,346)	(3,237)	(3,126)	(3,012)	5,297	5,416
Residual value		0	0	0	0	0	0	0	0	0	0
Equity	(17,913)										
Combined cash flow with resid. valu.	(17,913)	(3,755)	(3,656)	(3,555)	(3,452)	(3,346)	(3,237)	(3,126)	(3,012)	5,297	5,416
Cumulative cash position	(17,913)	(21,668)	(25,324)	(28,879)	(32,331)	(35,677)	(38,913)	(42,039)	(45,050)	(39,754)	(34,338)
Breakeven years	15.9										
Internal Rate of Return (IRR)	5.00%										
Net Present Value (NPV)	0										
Operating Reserve Fund (1000$US)											
Beginning	-	-	-	-	-	-	-	-	-	-	-
Disbursement	-	-	-	-	-	-	-	-	-	-	-
Interest income	-	-	-	-	-	-	-	-	-	-	-
Ending	-	-	-	-	-	-	-	-	-	-	-

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District
Heat Sale Price

Net Income and Cash Flow	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Net Income (1000 $US)										
WTE revenues	16,820	17,324	17,844	18,379	18,931	19,499	20,084	20,686	21,307	21,946
Adjustments to revenues	(3,689)	(3,799)	(3,913)	(4,031)	(4,152)	(4,276)	(4,404)	(4,537)	(4,673)	(4,813)
Cash O&M expenses	(6,893)	(7,122)	(7,359)	(7,605)	(7,859)	(8,122)	(8,395)	(8,677)	(8,969)	(9,271)
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Before Tax Net Income										
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Depreciation	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(757)	(757)	(757)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0
Net income before tax	2,917	3,082	3,250	3,422	3,599	3,779	3,963	6,716	6,908	7,105
Income tax	(700)	(740)	(780)	(821)	(864)	(907)	(951)	(1,612)	(1,658)	(1,705)
After Tax Net Income	2,217	2,342	2,470	2,601	2,735	2,872	3,012	5,104	5,250	5,400
Cash Flow (1000 $US)										
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Interest	0	0	0	0	0	0	0	0	0	0
Principal	0	0	0	0	0	0	0	0	0	0
Income tax	(700)	(740)	(780)	(821)	(864)	(907)	(951)	(1,612)	(1,658)	(1,705)
Cash from operating reserve	0	0	0	0	0	0	0	0	0	0
After tax net cash flow	5,538	5,663	5,792	5,922	6,056	6,193	6,333	5,861	6,008	6,157
Before tax net cash flow	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
After Tax Financial Performance										
After tax net cash flow	5,538	5,663	5,792	5,922	6,056	6,193	6,333	5,861	6,008	6,157
Residual value	0	0	0	0	0	0	0	0	0	13,722
Equity										
Combined cash flow with resid. valu.	5,538	5,663	5,792	5,922	6,056	6,193	6,333	5,861	6,008	19,879
Cumulative cash position	(28,799)	(23,136)	(17,344)	(11,422)	(5,365)	828	7,161	13,023	19,030	38,909
Breakeven years										
Internal Rate of Return (IRR)										
Net Present Value (NPV)										
Operating Reserve Fund (1000$US)										
Beginning	-	-	-	-	-	-	-	-	-	-
Disbursement	-	-	-	-	-	-	-	-	-	-
Interest income	-	-	-	-	-	-	-	-	-	-
Ending	-	-	-	-	-	-	-	-	-	-

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat Sale Price

Taxes (1000 $US)	2009	2,010	2,011	2,012	2,013	2,014	2,015	2,016	2,017	2,018	2,019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Net operating income	0	4,788	4,918	5,051	5,188	5,327	5,470	5,617	5,767	5,920	6,078
Depreciation	0	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)	(3,322)
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0	0
Net income for determining tax	0	1,467	1,597	1,730	1,866	2,006	2,149	2,295	2,445	2,599	2,756
Cumulative losses	0	0	0	0	0	0	0	0	0	0	0
Taxable income	0	1,467	1,597	1,730	1,866	2,006	2,149	2,295	2,445	2,599	2,756
Tax liability	0	352	383	415	448	481	516	551	587	624	661
Tax credits	0	0	0	0	0	0	0	0	0	0	0
Remaining tax credit	0	0	0	0	0	0	0	0	0	0	0
Income tax	0	352	383	415	448	481	516	551	587	624	661
Capital Investment (1000 $US)											
Land	1,003	0	0	0	0	0	0	0	0	0	0
Building	7,895	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	-0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	12,351	0	0	0	0	0	0	0	0	0	0
Total Investment	64,843	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments (1000 $US)											
Land	0	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments	43,594	0	0	0	0	0	0	0	0	0	0
Federal ITC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
State ITC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
Total Investment tax credit	0	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments (1000 $US)											
Land	0	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments	43,594	0	0	0	0	0	0	0	0	0	0
Federal ETC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
State ETC	0	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0	0
Total energy tax credit	0	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0	0
Total credits (1000 $US)	0	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat Sale Price

Taxes (1000 $US)	2,020	2,021	2,022	2,023	2,024	2,025	2,026	2,027	2,028	2,029
Operating year	11	12	13	14	15	16	17	18	19	20
Net operating income	6,238	6,403	6,572	6,744	6,920	7,100	7,285	7,473	7,666	7,862
Depreciation	*(3,322)*	*(3,322)*	*(3,322)*	*(3,322)*	*(3,322)*	*(3,322)*	*(3,322)*	*(757)*	*(757)*	*(757)*
Interest (not tax deductible)	0	0	0	0	0	0	0	0	0	0
Net income for determining tax	2,917	3,082	3,250	3,422	3,599	3,779	3,963	6,716	6,908	7,105
Cumulative losses	0	0	0	0	0	0	0	0	0	0
Taxable income	2,917	3,082	3,250	3,422	3,599	3,779	3,963	6,716	6,908	7,105
Tax liability	700	740	780	821	864	907	951	1,612	1,658	1,705
Tax credits	0	0	0	0	0	0	0	0	0	0
Remaining tax credit	0	0	0	0	0	0	0	0	0	0
Income tax	700	740	780	821	864	907	951	1,612	1,658	1,705
Capital investment (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Total investment	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
ITC qualifying investments (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
ITC qualifying investments	0	0	0	0	0	0	0	0	0	0
Federal ITC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
State ITC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
Total investment tax credit	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments (1000 $US)										
Land	0	0	0	0	0	0	0	0	0	0
Building	0	0	0	0	0	0	0	0	0	0
Equipment	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
ETC qualifying investments	0	0	0	0	0	0	0	0	0	0
Federal ETC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
State ETC	0	0	0	0	0	0	0	0	0	0
Cumulative credit	0	0	0	0	0	0	0	0	0	0
Total energy tax credit	0	0	0	0	0	0	0	0	0	0
Total cumulative credit	0	0	0	0	0	0	0	0	0	0
Total credits (1000 $US)	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská 100,000 tonne/yr Mass Burn Central Plant - Higher District Heat Sale Price

Revenues	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Revenues (1000 $US)											
WTE Plant											
Recycled material sales		74	76	78	81	83	86	88	91	93	96
Heat sales		3,710	3,821	3,936	4,054	4,176	4,301	4,430	4,563	4,700	4,841
Electricity sales		1,224	1,260	1,298	1,337	1,377	1,418	1,461	1,505	1,550	1,596
MSW tipping fee		7,508	7,733	7,965	8,204	8,450	8,704	8,965	9,234	9,511	9,796
Gross revenue		12,515	12,891	13,278	13,676	14,086	14,509	14,944	15,392	15,854	16,330
Off-setting adjustments from existing plant operations											
Heat sales		(1,217)	(1,254)	(1,291)	(1,330)	(1,370)	(1,411)	(1,453)	(1,497)	(1,542)	(1,588)
Electricity sales		(1,528)	(1,573)	(1,621)	(1,669)	(1,719)	(1,771)	(1,824)	(1,879)	(1,935)	(1,993)
Total adjustments		(2,745)	(2,827)	(2,912)	(2,999)	(3,089)	(3,182)	(3,277)	(3,376)	(3,477)	(3,581)
Adjusted Total Revenue											
Recycled material sales		74	76	78	81	83	86	88	91	93	96
Avoided marginal heat costs		2,493	2,568	2,645	2,724	2,806	2,890	2,977	3,066	3,158	3,253
Electricity sales		(304)	(313)	(322)	(332)	(342)	(352)	(363)	(374)	(385)	(397)
MSW tipping fee		7,508	7,733	7,965	8,204	8,450	8,704	8,965	9,234	9,511	9,796
Adjusted Total Revenue from WTE plant		9,771	10,064	10,366	10,677	10,997	11,327	11,667	12,017	12,377	12,749
Solid waste mass distribution											
Total MSW, tonne/yr		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total MSW, tpy		110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254
Unit rates ($US/unit)											
Tipping fee, $/tonna		75	77	80	82	84	87	90	92	95	98
Tipping fee, $/ton		68	70	72	74	77	79	81	84	86	89

Plzenská teplárenská 100,000 tonne/yr Mass Burn Central Plant - Higher District Heat Sale Price

Revenues	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Revenues (1000 $US)										
WTE Plant										
Recycled material sales	99	102	105	108	112	115	118	122	126	129
Heat sales	4,986	5,135	5,290	5,448	5,612	5,780	5,953	6,132	6,316	6,505
Electricity sales	1,644	1,694	1,745	1,797	1,851	1,906	1,963	2,022	2,083	2,146
MSW tipping fee	10,090	10,393	10,705	11,026	11,357	11,697	12,048	12,410	12,782	13,165
Gross revenue	16,820	17,324	17,844	18,379	18,931	19,499	20,084	20,686	21,307	21,946
Off-setting adjustments from existing plant operations										
Heat sales	(1,636)	(1,685)	(1,735)	(1,787)	(1,841)	(1,898)	(1,953)	(2,012)	(2,072)	(2,134)
Electricity sales	(2,053)	(2,114)	(2,178)	(2,243)	(2,311)	(2,380)	(2,451)	(2,525)	(2,601)	(2,679)
Total adjustments	(3,689)	(3,799)	(3,913)	(4,031)	(4,152)	(4,276)	(4,404)	(4,537)	(4,673)	(4,813)
Adjusted Total Revenue										
Recycled material sales	99	102	105	108	112	115	118	122	126	129
Avoided marginal heat costs	3,350	3,451	3,554	3,661	3,771	3,884	4,000	4,120	4,244	4,371
Electricity sales	(409)	(421)	(433)	(446)	(460)	(474)	(488)	(502)	(517)	(533)
MSW tipping fee	10,090	10,393	10,705	11,026	11,357	11,697	12,048	12,410	12,782	13,165
Adjusted Total Revenue from WTE plant	13,131	13,525	13,931	14,349	14,779	15,223	15,679	16,150	16,634	17,133
Solid waste mass distribution										
Total MSW, tonne/yr	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total MSW, tpy	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254	110,254
Unit rates ($US/unit)										
Tipping fee, $/tonne	101	104	107	110	114	117	120	124	128	132
Tipping fee, $/ton	92	94	97	100	103	106	109	113	116	119

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat Sale Price

Capital Costs (1000 $US)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Construction	64,843	0	0	0	0	0	0	0	0	0	0
Interest during construction	5,836	0	0	0	0	0	0	0	0	0	0
Financing	973	0	0	0	0	0	0	0	0	0	0
Operating reserve	0	0	0	0	0	0	0	0	0	0	0
Total Capital Costs	71,651	0	0	0	0	0	0	0	0	0	0
Construction Costs (1000 $US)											
Plant and Distribution Costs											
Land and site development	1,003	0	0	0	0	0	0	0	0	0	0
Building	7,895	0	0	0	0	0	0	0	0	0	0
Equipment	43,594	0	0	0	0	0	0	0	0	0	0
Distribution	0	0	0	0	0	0	0	0	0	0	0
Engineering, contingency, etc.	12,351	0	0	0	0	0	0	0	0	0	0
Total plant and distribution costs	64,843	0	0	0	0	0	0	0	0	0	0

Values from HDR	2003$
Land and site development	840
Building	6,612
Equipment	36,509
Distribution	0
Engineering, contingency, etc.	10,344
Total plant and distribution costs	54,305

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat
Sale Price

Operation and Maintenance Costs	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Operation and maintenance costs (1000 $US)											
I. Labor		691	725	762	800	840	882	926	972	1,021	1,072
II. Facility Maintenance		1,914	1,971	2,030	2,091	2,154	2,218	2,285	2,354	2,424	2,497
III Utilities		199	205	211	218	224	231	238	245	252	260
IV. Process Residue Haul and Disposal		1,100	1,132	1,166	1,201	1,238	1,275	1,313	1,352	1,393	1,435
V. Rolling Stock O&M Costs		134	138	143	147	151	156	161	165	170	175
VI. Miscellaneous Costs		170	175	180	185	191	197	203	209	215	221
VII. not used		0	0	0	0	0	0	0	0	0	0
VIII. Contingency, accounting, administration		775	798	822	847	872	898	925	953	982	1,011
Land lease		0	0	0	0	0	0	0	0	0	0
Depreciation		3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322
Total O & M Costs (1000 $US)		8,304	8,467	8,636	8,811	8,991	9,178	9,372	9,572	9,779	9,993
Cash O & M Costs (1000 $US)		4,982	5,146	5,314	5,489	5,670	5,857	6,050	6,250	6,457	6,671

Values from HDR	
Mass Burn Plant	2003$
I. Labor	491,000
II. Facility Maintenance	1,556,000
III Utilities	162,000
IV. Process Residue Haul and Disposel	894,000
V. Rolling Stock O&M Costs	109,300
VI. Miscellaneous Costs	138,000
VII. not used	0
VIII. Contingency, accounting and administration	630,000
Total annual operation and maintenance costs	3,980,300
IX. Material sales	(60,000)

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat
Sale Price

Operation and Maintenance Costs	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Operation and maintenance costs (1000 $US)										
I. Labor	1,125	1,182	1,241	1,303	1,368	1,436	1,508	1,584	1,663	1,746
II. Facility Maintenance	2,572	2,649	2,728	2,810	2,895	2,981	3,071	3,163	3,258	3,356
III Utilities	268	276	284	293	301	310	320	329	339	349
IV. Process Residue Haul and Disposal	1,478	1,522	1,568	1,615	1,663	1,713	1,764	1,817	1,872	1,928
V. Rolling Stock O&M Costs	181	186	192	197	203	209	216	222	229	236
VI. Miscellaneous Costs	228	235	242	249	257	264	272	281	289	298
VII. not used	0	0	0	0	0	0	0	0	0	0
VIII. Contingency, accounting, administration	1,041	1,073	1,105	1,138	1,172	1,207	1,243	1,281	1,319	1,359
Land lease	0	0	0	0	0	0	0	0	0	0
Depreciation	3,322	3,322	3,322	3,322	3,322	3,322	3,322	757	757	757
Total O & M Costs (1000 $US)	10,214	10,443	10,681	10,926	11,181	11,444	11,716	9,434	9,726	10,028
Cash O & M Costs (1000 $US)	6,893	7,122	7,359	7,605	7,859	8,122	8,395	8,677	8,969	9,271

Values from HDR
Mass Burn Plant
I. Labor
II. Facility Maintenance
III Utilities
IV. Process Residue Haul and Disposal
V. Rolling Stock O&M Costs
VI. Miscellaneous Costs
VII. not used
VIII. Contingency, accounting and administration
Total annual operation and maintenance costs
IX. Material sales

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat
Sale Price
Debt Service

Operating year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
Capital cost (1000 $US)	71,651										
Distribution of financing (1000 $US)											
Equity	17,913	0	0	0	0	0	0	0	0	0	0
Conventional loan	53,738	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0	0
Grant	0	0	0	0	0	0	0	0	0	0	0
Total	71,651	0	0	0	0	0	0	0	0	0	0
Debt to be financed (1000 $US)											
Conventional loan	53,738	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0	0
Total debt	53,738	0	0	0	0	0	0	0	0	0	0
LIBOR rate		5.0%	5.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Margin		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Interest rate		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Term		8	7	6	5	4	3	2	1	0	0
Debt Service (1000 $US)											
Conventional loan (P&I)											
Loan -- Year 1		8,191	8,191	8,191	8,191	8,191	8,191	8,191	8,191	0	0
Total		8,191	8,191	8,191	8,191	8,191	8,191	8,191	8,191	0	0
Conventional loan interest											
Loan -- Year 1		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Total		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Conventional loan principal											
Loan -- Year 1		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Total		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Principal at year end											
Loan -- Year 1		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0
Total		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0
Combined debt											
Combined interest											
Conventional loan		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total interest		2,583	2,297	1,997	1,681	1,350	1,001	635	250	0	0
Combined principal											
Conventional loan		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total Principal		5,609	5,894	6,195	6,510	6,842	7,190	7,557	7,942	0	0
Total interest and principal		8,191	8,191	8,191	8,191	8,191	8,191	8,191	8,191	0	0
Combined remaining principal											
Conventional loan		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0
Subsidized loan		0	0	0	0	0	0	0	0	0	0
Total remaining principal		48,130	42,235	36,041	29,531	22,689	15,498	7,942	0	0	0

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat
Sale Price
Debt Service

Operating year	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Capital cost (1000 $US)										
Distribution of financing (1000 $US)										
Equity	0	0	0	0	0	0	0	0	0	0
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Grant	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Debt to be financed (1000 $US)										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total debt	0	0	0	0	0	0	0	0	0	0
LIBOR rate	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Margin	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Interest rate	**5.00%**	**5.00%**	**5.00%**	**5.00%**	**5.00%**	**5.00%**	**5.00%**	**5.00%**	**5.00%**	**5.00%**
Term	0	0	0	0	0	0	0	0	0	0
Debt Service (1000 $US)										
Conventional loan (P&I)										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Conventional loan interest										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Conventional loan principal										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Principal at year end										
Loan -- Year 1	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Combined debt										
Combined interest										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total interest	0	0	0	0	0	0	0	0	0	0
Combined principal										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total Principal	0	0	0	0	0	0	0	0	0	0
Total interest and principal	0	0	0	0	0	0	0	0	0	0
Combined remaining principal										
Conventional loan	0	0	0	0	0	0	0	0	0	0
Subsidized loan	0	0	0	0	0	0	0	0	0	0
Total remaining principal	0	0	0	0	0	0	0	0	0	0

Plzenská teplárenská 100,000 tonne/yr Mass Burn Central Plant - Higher District Heat Sale Price

Depreciation (1000 $US)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating year	0	1	2	3	4	5	6	7	8	9	10
	Original	Less Grants	Net Constr. Cost	Allowable	Depreciable amount						
Land and site development	1,003	0	1,003	0%	0						
Building	7,895	0	7,895	100%	7,895						
Equipment	43,594	0	43,594	100%	43,594						
Distribution	0	0	0	100%	0						
Engineering, contingency, etc.	12,351	0	12,351	100%	12,351						
Interest during construction	5,836	0	5,836	100%	5,836						
Financing	973	0	973	100%	973						
Operating reserve	0	0	0	100%	0						
Total Construction	71,651	0	71,651		70,648						
Grant amount	0										
Net Constuction Cost for depreciation	71,651										

Depreciation (1000 $US)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Depreciation of building										
Beginning Book Value	7,895	7,632	7,368	7,105	6,842	6,579	6,316	6,053	5,789	5,526
Depreciation year	1	2	3	4	5	6	7	8	9	10
Depreciation	263	263	263	263	263	263	263	263	263	263
Ending Book Value	7,632	7,368	7,105	6,842	6,579	6,316	6,053	5,789	5,526	5,263
Depreciation of equipment										
Beginning Book Value	43,594	41,029	38,465	35,901	33,336	30,772	28,208	25,643	23,079	20,515
Depreciation year	1	2	3	4	5	6	7	8	9	10
Depreciation	2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564	2,564
Ending Book Value	41,029	38,465	35,901	33,336	30,772	28,208	25,643	23,079	20,515	17,950
Depreciation of distribution										
Beginning Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation year	1	2	3	4	5	6	7	8	9	10
Depreciation	0	0	0	0	0	0	0	0	0	0
Ending Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation of other investment										
Beginning Book Value	19,160	18,666	18,172	17,678	17,184	16,689	16,195	15,701	15,207	14,713
Depreciation year	1	2	3	4	5	6	7	8	9	10
Depreciation	494	494	494	494	494	494	494	494	494	494
Ending Book Value	18,666	18,172	17,678	17,184	16,689	16,195	15,701	15,207	14,713	14,219
Total amount of depreciation	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322	3,322
Residual Value										
Residual book value	67,327	64,005	60,684	57,362	54,040	50,719	47,397	44,076	40,754	37,433
Land	1,033	1,064	1,096	1,129	1,163	1,198	1,234	1,271	1,309	1,348
Remaining debt principal	(42,235)	(36,041)	(29,531)	(22,669)	(15,498)	(7,942)	0	0	0	0
Remaining operating reserve	0	0	0	0	0	0	0	0	0	0
Total residual value	26,124	29,028	32,249	35,802	39,705	43,975	48,631	45,346	42,063	38,781

Plzenská teplárenská
100,000 tonne/yr Mass Burn
Central Plant - Higher District Heat Sale Price

Depreciation (1000 $US)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Operating year	11	12	13	14	15	16	17	18	19	20
Land and site development										
Building										
Equipment										
Distribution										
Engineering, contingency, etc.										
Interest during construction										
Financing										
Operating reserve										
Total Construction										
Grant amount										
Net Constuction Cost for depreciation										
Depreciation (1000 $US)										
Depreciation of building										
Beginning Book Value	5,263	5,000	4,737	4,474	4,211	3,947	3,684	3,421	3,158	2,895
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	263	263	263	263	263	263	263	263	263	263
Ending Book Value	5,000	4,737	4,474	4,211	3,947	3,684	3,421	3,158	2,895	2,632
Depreciation of equipment										
Beginning Book Value	17,950	15,386	12,822	10,257	7,693	5,129	2,564	(0)	(0)	(0)
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	2,564	2,564	2,564	2,564	2,564	2,564	2,564	0	0	0
Ending Book Value	15,386	12,822	10,257	7,693	5,129	2,564	(0)	(0)	(0)	(0)
Depreciation of distribution										
Beginning Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	0	0	0	0	0	0	0	0	0	0
Ending Book Value	0	0	0	0	0	0	0	0	0	0
Depreciation of other investment										
Beginning Book Value	14,219	13,725	13,231	12,737	12,243	11,749	11,255	10,761	10,267	9,773
Depreciation year	11	12	13	14	15	16	17	18	19	20
Depreciation	494	494	494	494	494	494	494	494	494	494
Ending Book Value	13,725	13,231	12,737	12,243	11,749	11,255	10,761	10,267	9,773	9,279
Total amount of depreciation	3,322	3,322	3,322	3,322	3,322	3,322	3,322	757	757	757
Residual Value										
Residual book value	34,111	30,790	27,468	24,147	20,825	17,503	14,182	13,425	12,668	11,910
Land	1,388	1,430	1,473	1,517	1,563	1,610	1,658	1,708	1,759	1,812
Remaining debt principal	0	0	0	0	0	0	0	0	0	0
Remaining operating reserve	0	0	0	0	0	0	0	0	0	0
Total residual value	35,500	32,220	28,941	25,664	22,388	19,113	15,840	15,132	14,426	13,722

RDF Conveyor & Storage				Length Adj.	Dia. Adj.
RDF conveyor		$ 2,461	$ 4,381	$ 37	$ 32
RDF retrieval system					$ 340
Storage Building					$ 271
					$ 643
Subtotal		$ 31,378	$ 56,228	$ 23,587	$ 19,759
Contingency	10%	$ 3,138	$ 5,623	$ 2,359	$ 1,976
Total RDF Plant		**$ 34,516**	**$ 61,851**	**$ 25,945**	**$ 21,735**

Project:	Plzenska teplarenska WTE Feasibility Study
Technology:	Mass Burn Facility-Roudna
Date:	06/11/03
Estimate Basis:	Conceptual Layout (100,000 Annual tonnage)
Costs:	2003$
Location:	Plzen, Czech Republic

Alternate B- Appendix B3
COST SUMMARY
MASS BURN FACILITY-ROUDNA
Conceptual Layout (100,000 Annual tonnage)

	USD		USD
Estimated Range of Total Capital Costs	56,373,000	to	68,901,000
Estimated Range of Annual Amortized Capital Cost	5,742,000	to	7,018,000
Estiimated Range of Annual Operations & Maint. Costs	4,195,300	to	4,615,000
Estimated Range of Annual Costs	9,937,300	to	11,633,000

YEAR 2003 ANNUAL TONNAGE	100,000	Tonnes	
COST PER Metric Ton (Tonne)- (Before Revenues) (2003$)	$99	to	$116

Note: Annual Operations Cost does not include marketing & transfer of recovered materials,

[illegible]

Alternate B- Appendix B3
MASS BURN FACILITY-ROUDNA
CAPITAL COST SUMMARY [1]
Conceptual Layout (100,000 Annual tonnage)

			Estimated Costs
I.	SITE AQUISITION		$ 774,510
II.	SITE DEVELOPMENT		$ 4,232,000
III.	SCALE HOUSE AND SCALES		$ 156,000
IV.	BUILDINGS		$ 6,555,700
V.	PROCESSING EQUIPMENT		$ 566,000
VI.	MOBILE EQUIPMENT		$ 420,000
VII.	POWER BLOCK EQUIPMENT		$ 37,965,000
	SUBTOTAL CONSTRUCTION AND EQUIPMENT		$ 50,669,210
	CONTINGENCY	10%	$ 5,067,000
	DESIGN/ENGINEERING	5%	$ 2,787,000
	PERMITTING	2.3%	$ 1,282,000
	Surveyinig and Soils		$ 45,000
	CONSTRUCTION INSPECTION	5%	$ 2,787,000
	TOTAL CAPITAL COST (FACILITY IMPLEMENTATION)		$ 62,637,210

NOTES:

(1) All costs rounded to 1000's

(2) All costs in 2003 $.

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

I. SITE AQUISITION

Item	Quantity	Units	Unit Price	Item Cost	Total
Property Purchase	25,817	Sq. Meter	$30	$774,510	
Subtotal I					$ 774,510

II. SITE DEVELOPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Site Preparation Conversion = 0.3048					$ 2,228,200
Excavation -foundations(1)	9,800	Cu. Meters	$22	$215,600	
General Earthwork (2)	7,646	Cu. Meters	$12	$91,800	
Earth Fill Material	81,400	Cu. Meters	$22	$1,790,800	
Slope Stabilization	2,700	Cu. Meters	$40	$108,000	
Finishing Grassing & Grading	1,000	Sq. Meters	$22	$22,000	
Demolition (Warehouse Buildings)	0	Cu. Meters	$12	$0	
Site Improvements					$ 1,676,900
Approach /Roadways Concrete (3)	80	Sq. Meter	$60	$4,800	
Asphalt Roadways & Parking	23,392	Sq. Meter	$65	$1,520,500	
Retaining Walls	153	Cu. Meters	$450	$68,800	
Site Drainage	1	L.S.	$40,000	$40,000	
Fencing(4)	580	m	$48	$27,800	
Landscaping (Minimal)	1	L.S.	$15,000	$15,000	
Site Utilities(5)					$ 327,100
Fire Protection	350	m	$135	$47,300	
Water Supply	350	m	$135	$47,300	
Well Field	0	LS	$50,000	$0	
Sewer System	350	m	$150	$52,500	
Electrical(6)	1	L.S.	$180,000	$180,000	
Subtotal II					$ 4,232,200

Notes:

(1) Based on estimated building Area (sm). Demolition calculated separately

(2) General Earthwork includes moving soil, backfill, embankment, loadout tunnel excav, etc.

(3) Roadway unit price includes curbs, gutters, etc.

(4) Assumes perimeter fencing at 6' (1829 mm)(w/ barbed wire) with gates and litter fencing around maneuvering area of 15' (4572 mm)height.

(5) Utilities unit price includes excavation, bedding material, piping installed, backfill, etc.

(6) Electrical includes high voltage service transformer

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[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

III. SCALE HOUSE AND SCALES

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Building (1)	37	sm	$538	$19,914	
Concrete Slabwork(2)	11	Cu. Meters	$262	$3,000	
Concrete Footings	8	Cu. Meters	$523	$4,000	
Interior Treatments(3)	37	sm	$538	$19,914	
Motor Truck Scales & Foundations	2	LS	$60,000	$120,000	
Mechanical(4)	37	sm	$108	$3,983	
Electrical(5)	37	sm	$129	$4,779	
Subtotal III					$155,676

Notes:

(1) No additional facilities for waste delivery truck drivers or admintration activities areas, are included.

(2) Assumes stable soil with good load bearing capacity. Slab floor is 6"(152 mm) reinforced concrete.

(3) Includes tile, painting, window covers and funiture

(4) Building mechanical includes drains, plumbing, air handling, fire protection, etc.

(5) Electrical includes lighting, power, communications, etc.

IV. BUILDINGS

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Buildings - Preengineered	557	sm	$ 810	$451,500	
Ash Concrete Push Walls(3)	100	Cu. Meters	$ 523	$52,300	
Metal Buildings - Engineered	50,000	Cu. Meters	$ 100	$5,000,000	
Concrete Pit (3)	3,200	Cu. Meters	$ 290	$928,000	
Overhead Doors	6	ea	$ 10,000	$60,000	
Admin. Area (Control Room)	74	sm	$ 860	$63,900	
Subtotal IV					$6,555,700

Notes:

(1) Metal bldg. includes structural steel, column free bldg. (long span), 30 ft. (9144 mm)clear height, & 20 yr roofing warranty with mechanical and e

(2) Assumes stable soil with good load bearing capacity. Slab floor is 10" (254 mm) reinforced concrete on grade;
12" (305 mm)on structural slabs

(3) 4 ft (1219 mm)thick wall with 10 ft (3038 mm) thick mat

V. PROCESSING EQUIPMENT

Item	Quantity	Type	Units	Unit Price	Item Cost	Total
Overhead Cranes (1)	2	2.5 Cu. Meter Grapple	Each	$ 283,000	$ 566,000	
Subtotal V						$566,000

Notes:

(1) Crane quotes from Kone Cranes

VI. MOBILE EQUIPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Ash Trucks and Trailers	2	Each	$125,000	$250,000	
Loader	1	Each	$150,000	$150,000	
Pick-up/Utility Truck	1	Each	$20,000	$20,000	
Subtotal VI					$420,000

Notes:

(1) Loader used for ash loading and general maintenance activities

VII. POWER BLOCK EQUIPMENT

Item	Quantity	Unit	Unit Price	Item Cost	Total
Mass Burn Boiler-delivered(1)	1	LS	$21,656,000	$21,656,000	
SNCR (NOx Control)	1	LS	$156,000	$156,000	
Continuous Emissions Monitoring (4)	1	LS	$219,450	$219,450	
Bottom Ash Handling	1	LS	$449,000	$449,000	
Flyash Handling/Conditioning	1	LS	$426,000	$426,000	
Aux Cooling Water System	1	LS	$66,000	$66,000	
Additional Cooling Towers	2	Cell	$143,000	$286,000	
Condensate System	1	LS	$228,000	$228,000	
Chem Feed	1	LS	$124,000	$124,000	

[illegible]

Circulating Water System	1	LS	$65,000	$65,000	
Waste Water System	1	LS	$65,000	$65,000	
Water Treatment	1	LS	$224,000	$224,000	
Fire Protection	1	LS	$193,000	$193,000	
Feedwater System	1	LS	$175,000	$175,000	
Compressed Air System	1	LS	$49,000	$49,000	
Service Water System	1	LS	$47,000	$47,000	
Stack (Erected) (50 m)	1	LS	$290,000	$290,000	
Heat Exchangers	2	LS	$65,000	$130,000	
Steam Piping	1	LS	$125,000	$125,000	
Steam Turbine (3)	1	LS	$1,400,000	$1,400,000	
Substation & Electrical System	1	LS	$2,928,000	$2,049,600	
Equipment Subtotal					$28,443,050
Boiler Erection (Labor)	1	LS	$6,496,800	$6,496,800	
Steam Turbine Installation (3)	1	LS	$98,000	$98,000	
Mechanical Systems Installation (Labor)	1	LS	$1,661,600	$1,661,600	
Electrical Installation (Labor)	1	LS	$1,045,296	$1,045,300	
Installation Subtotal					$9,301,700
Shop Tools & Equip.	1	Allowance	$50,000	$50,000	
Office Furnishings	0.5	Allowance	$40,000	$20,000	
Spare Parts	1	Allowance	$150,000	$150,000	
Miscellaneous Items					$220,000
Subtotal VII					$37,964,750

Notes:

(1) Based on equipment quote from Babcock and Wilcox

(2) Assumes that all or a portion of these systems are provided at the existing Central Plant

(3) Based on equipment qoute and installation estimate from Skoda and Dresser Rand

(4) Based on Quote from OPSIS

Subtotal I through VII	$50,668,836

Alternate B- Appendix B3
MASS BURN FACILITY-ROUDNA
OPERATIONS AND MAINTENANCE COST SUMMARY [(1)]
Conceptual Layout (100,000 Annual tonnage)

			Estimated Costs[(2)]
I.	LABOR		$ 556,000
II.	FACILITY MAINTENANCE		$ 1,702,000
III.	UTILITIES		$ 163,000
IV.	PROCESS RESIDUE HAUL & DISPOSAL		$ 894,000
V.	ROLLING STOCK O&M COSTS		$ 109,300
VI.	MISCELLANEOUS COSTS		$ 158,000
	SUBTOTAL OPERATION & MAINTENANCE		$ 3,582,300
	CONTINGENCY	10%	$ 358,000
	ACCOUNTING, SUPPLIES, MISC.	5%	$ 197,000
	ADMINISTRATION	3%	$ 118,000
	TOTAL ANNUAL OPERATION & MAINTENANCE COST		$ 4,255,300
VIII.	MINUS (Estimated see proforr MATERIAL SALES REVENUES[(3)]		$ (60,000)
	NET ANNUAL OPERATION & MAINTENANCE COST		$ 4,195,300
		Cost / Tonne	$ 41.95

NOTES:
(1) All costs rounded to 1000's
(2) All costs in 2003 $.
(3) Doesn't include energy revenues

[illegible]

I. LABOR

Job Classification	Personnel(1)	$/hr	hrs/yr (6)	OT Hrs	Annual Cost	% OT	Total
Facility Manager (2)	1	$20.00	2,016	0	$40,320	0%	
Operating Engineer (3)	1	$14.55	2,016	0	$29,333	0%	
Shift Supervisor (3)	5	$12.61	2,016	0	$127,109	0%	
Administrative / Clerical (4)	2	$4.67	2,016	208	$21,728	10%	
Scale Attendant (4)	2	$4.90	2,016	208	$22,814	10%	
Lead Equipment Operator (4)	4	$7.47	2,016	312	$74,189	15%	
Equipment Operators (4)	5	$4.90	2,016	312	$60,858	15%	
Mechanic (4)	2	$7.23	2,016	208	$33,678	10%	
Elect / Electronics Specialist (4)	2	$7.47	2,016	208	$34,765	10%	
Welders (4)	1	$7.00	2,016	208	$16,296	10%	
Helper (4)	2	$5.83	2,016	208	$27,160	10%	
Residue Disposal Drivers (4)	2	$5.13	2,016	208	$23,901	10%	
Spotters/Laborers (4)	4	$4.67	2,016	208	$43,456	10%	
Subtotal	33						$556,000

Notes:

(1) Based on a 24-hour, seven day per week operation.

(2) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]

(3) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]

(4) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]

(5) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]
and overtime pay is 1.5 times straight time

(6) Assumes standard Czech working hours

II. FACILITY MAINTENANCE

Item	% of Capital Value	Quantity	Unit	Unit Price	Annual Cost	Total
Site Maintenance (1)	1.5%	1	L.S.	$ 30,060	$30,060	
Building Repair & Replacement	3.3%	1	L.S.	$ 221,000	$221,000	
Equipment Maintenance (3)	2.0%	1	L.S.	$ 580,181	$580,181	
Equipment Replacement (3)	3.0%	1	L.S.	$ 870,272	$870,272	
Subtotal						$ 1,702,000

Notes:

(1) Site maintenance is estimated as % capital construction cost for site improvements and site utilities.

(2) Building repair base on a 30 year depreciation of the original capital cost with escalation.

(3) Equipment maintenance (annual needs) and replacement (periodic needs) estimated based on assumed 20 life. This is an annual fund arr

[illegible]

III. UTILITIES

Item	Quantity	Unit	Unit Price	Annual Cost	Total
Electricity Purchase (1)	500	MWH/yr	$ 30.04	$ 15,020	
Natural Gas (2)	236,298	m3	$ 0.20	$ 47,623	
Telephone (Mobile/Fixed) (3)	25	Phones	$ 360	$ 9,000	
Water	13,229	m3	$ 0.33	$ 4,321	
Sewer (4)	3,307	m3	$ 0.33	$ 1,080	
Lime Reagent	1,001	Tonne/yr	$ 76.20	$ 76,269	
Ammonia Reagent	375	Tonne/yr	$ 20.00	$ 7,507	
Carbon Reagent	45	Tonne/yr	$ 50.00	$ 2,250	
Subtotal					$ 163,071

Notes:

(1) Electricity purchase accounts for energy use during downtimes only; in-house power provided by the system otherwise.

(2) Gas used for start-up and shutdown only to maintain "good combustion control"

(3) Based on mobile phones for entire staff except drivers, helpers and laborers.

(4) Sewer use based on 25% of water use; evaporation and an ash quench account for rest.

IV. PROCESS RESIDUE HAUL & DISPOSAL

Item	Cost /Load(1)	Quantity	Unit	Unit Price	Annual Cost	Total
Process Residue Haul	$ 43	1,257	Tonne	$ 2.15	$ 2,703	
Ash Haul	$ 43	31,678	Tonne	$ 2.15	$ 68,107	
Landfill Disposal Fees		32,935	Tonne	$ 25.00	$ 823,368	
Subtotal						$ 894,178

Notes:

(1) Cost assumes truck operating costs per 20-tonne load

V. ROLLING STOCK O&M COSTS

Fuel	Weeks	Unit Rate	Units	Unit Price	Annual Cost	Total
Loader	52	1,325	l/wk	$0.85	$58,600	
Pick-up Truck	52	114	l/wk	$0.85	$5,000	
Maintenance	**# Vehicles**	**Quantity**	**Units**	**Unit Price**	**Annual Cost**	**Total**
Loader	1	1	L.S.	$8,250	$8,300	
Pick-up Truck	1	19,200	Km/Yr	$0.13	$2,400	
General O&M		1	L.S.	$35,000	$35,000	
Subtotal						$109,300

Notes:

(1) Based on Owning and Operating Cost Methodology in the Caterpillar Performance Handbook.

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

VI. MISCELLANEOUS COSTS

Item	Usage (1)	Quantity	Unit	Unit Price	Annual Cost	Total
Property Insurance (2)	1	0.3%			$150,700	
Flood Insurance (2)	0	1.2%			$0	
Property Taxes (3)	1	2,601	m^2	$0.78	$2,000	
Pollution Fees (4)		1	L.S.	$ 5,075	$ 5,075	
Subtotal						$ 157,775

Notes:

(1) Multiplier used to adjust costs for various potential sites. Zero means expense not applicable to this site.

(2) Based on % of capital construction costs.

(3) Based on area of developed property area.

(4) Based on analysis in report on Environmental Considerations and assuming 7446 combustion hours per at unit capacity.

Subtotal I through VI	$3,582,323

VII. MATERIAL SALES REVENUES(3)

Material	Units	Unit	Unit Value	Annual Revenues	Total
Net Electric Generation	33,118,106	MWh		$0	Addressed in Pro Forma
Net Steam Generation	250,267,506	Tonne		$0	Addressed in Pro Forma
Aluminum	-	Tonne	$800	$0	No recovery provided
Ferrous Metals (from ash residue)	2,400	Tonne	$25	$60,000	
Subtotal VIII	2,400	Tonne Recycled			$60,000

Labor Rate Assumptions	Base Labor Rates Model Value $/Hour	US $ $/Hour	CZK Kc/Hr
Facility Manager	$ 13.33	$ 13.33	400.00
Operating Engineer	$ 10.00	$ 10.00	300.00
Shift Supervisor	$ 8.67	$ 8.67	260.00
Administrative/Clerical	$ 3.33	$ 3.33	100.00
Scale Attendant	$ 3.50	$ 3.50	105.00
Lead Equipment Operator	$ 5.33	$ 5.33	160.00
Equipment Operators	$ 3.50	$ 3.50	105.00
Picking Crew	$ 3.33	$ 3.33	100.00
Mechanic	$ 5.17	$ 5.17	155.00
Electrician/Electronics Specialist	$ 5.33	$ 5.33	160.00
Welders	$ 5.00	$ 5.00	150.00
Helpers	$ 4.17	$ 4.17	125.00
Residue Disposal Drivers	$ 3.67	$ 3.67	110.00
Spotters/Laborers	$ 3.33	$ 3.33	100.00

Project:	Plzeňsko [illegible] WTE Feasibility Study
Technology:	Mass Burn Facility-Roudna
Estimate Basis:	Conceptual Layout (100,000 Annual tonnage)
Costs:	2003$
Location:	Plzen, Czech Republic

Conversion factor = 3.785412

Domestic Usage	Assumptions	Gallons/Yr	Liters/Year
Average People/Day	8		
Lpd/person	95		
Lpd	744		
days/week	7		
weeks/year	52		
Lpy		71,500	270,657

			Liters/Year
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

			Liters/Year
Total Water Usage		3,494,802	13,229,264
Evaporation/Ash Quench	75%	2,621,101	9,921,948
Total Sewer Usage		873,700	3,307,316

Reagent Usage Estimates

	Qty/Ton (lb/ton)	Kg/Tonne	Annual Usage (tonnes)	Annual Cost
Lime (limestone)	20	10.0	1,001	$78,259
Ammonia	7.5	3.8	375	$7,825
Carbon	0.87	0.45	45	$2,345

Energy Generation Assumptions

	Gross Gen/ tonne	Increase Power/ tonne	Net Gen/Tonne	Net Annual Generation	
Steam Production (Kg)	2634	132	2503	250,257,504	Tonne
Electricity Production (kWh)	376	45	331.2	33,118,106	KWh

Assumes backpressure turbine	7	Kg/KW-hr	35,380	Kg/hr	0% Margin

Energy Consumption Assumptions

Item	mmBtu/Ton		MMBTU		ft^3/yr	m^3/yr
Natural Gas (mmBTU)	0.0757		8,344		8,344,411	236,314
	MJ/Tonne		GJ			m^3/yr
Natural Gas (MJ)	88.03		8,803			236,298
Item	**Qty/Tonne**	**hp**	**load factor**	**kw**	**hrs/year**	**kwh/yr**
Power Purchase Req. (kWh/Tonne	5.0					500,000
Total Purchase						500,000

MSW Quanitites and Characteristics

Waste Quantity (Annual metric ton-Tonne)	100,000	Tonne	
Daily Delivery (5 Days per week)	451	Tonne/Day	
Capacity Factor	85%		
Throughput Capacity (7 Days per week)	322	Tonne/Day	
Annual Throughput	100,000	Tonne	
MSW HHV (B&W)	10	MJ/Kg	
Boiler Efficiency (B&W)	71%		
Fuel Feed Rate (B&W)	13,430	Kg/hr	322 tonne/day
Gross Steam Production (B&W)	35,380	Kg/hr	2634 Kg(steam)/tonne waste

MSW Storage Calculations

Pit Storage	4	Days	
Pit Storage	1,289	tonne	
MSW Density	267	Kg/Cu Meter	
MSW Pit Capacity	4,829	Cu. Meter	
Pit Area	400	sm	8 m deep plus 50% of vol. up to charging level
Pit length	30	meter	14 meter wide

Residue Disposal

	Percent Of Input			
				0 Truckloads/Day5
Reject Residue Disposal	1.5%	5	tpd5	4 Truckloads/Day7
Ash Disposal	27%	87.0	tpd7	5.0 Truckloads/Day
Truck Payload (Tons)		20	tons/truck	10 HRs/day
Assumes disposal of rejects and ash residue		59	HRS/week	2 Round Trip Haul

Basic Conceptual Layout Dimensions

		Length	Span	Area	Height	Number of Levels
Conversion Factor	M to Ft	3.28084				
Exterior Maneuvering	Feet	120.0	60.0	7,200		
	Meters	36.6	18.3	669		
MSW Tipping Floor	Feet	120.0	35.0	4,200	40.0	1.0
	Meters	36.6	10.7	390	12.2	
Boiler Bldg	Feet	60.0	85.0	5,100	135.0	1.0
	Meters	18.3	25.9	474	41.1	
Turbine Building	Feet	60.0	45.0	2,700	15.0	2.0
	Meters	18.3	13.7	251	4.6	
Maintenance/Storage	Feet	60.0	45.0	2,700	15.0	1.0
	Meters	18.3	13.7	251	4.6	
Admin/ Control Room	Feet	60.0	45.0	2,700	15.0	2.0
	Meters	18.3	13.7	251	4.6	
Refuse Storage Bldg (Pit)	Feet	120.0	60.0	7,200	115.0	1.0
	Meters	36.6	18.3	669	35.1	
Ash Storage Bldg	Feet	50.0	30.0	1,500	30.0	1.0
	Meters	15.2	9.1	139	9.1	
Site Development	Feet	350.0	80.0	28,000		
	Meters	106.7	24.4	2,601		
		Total Bldg Floor Area		**26,100**	S.F	
				2,425	S.M	

Demolition Estimate

		Length	Span	Area	Height	Volume
Conversion Factor	M to Ft	3.28084	3.28084	10.7639111	3.28084	CY to m3
Warehouse #1	Feet	40	20	800.0	16	474
	Meters	12.2	6.1	74.3	4.9	-
Warehouse #2	Feet	40	18	720.0	16	427
	Meters	12.2	5.5	66.9	4.9	-
Warehouse #3	Feet	37	21	777.0	16	460
	Meters	11.3	6.4	72.2	4.9	-
Condensate Piping Relocation	Feet	400			12	
	Meters	122			3.7	

Project:	[illegible] WTE Feasibility Study
Technology:	Mass Burn Facility-P-Energetika
Date:	[illegible]
Estimate Basis:	Conceptual Layout (100,000 Annual tonnage)
Costs:	[illegible]
Location:	[illegible], Czech Republic

Alternate A - Appendix B4
COST SUMMARY
MASS BURN FACILITY-P-ENERGETIKA
Conceptual Layout (100,000 Annual tonnage)

	USD		USD
Estimated Range of Total Capital Costs	53,210,000	to	65,034,000
Estimated Range of Annual Amortized Capital Cost	5,420,000	to	6,624,000
Estiimated Range of Annual Operations & Maint. Costs	4,176,300	to	4,594,000
Estimated Range of Annual Costs	9,596,300	to	11,218,000

YEAR 2003 ANNUAL TONNAGE	100,000	Tonnes	
COST PER Metric Ton (Tonne)- (Before Revenues) (2003$)	$96	to	$112

Note: Annual Operations Cost does not include marketing & transfer of recovered materials,

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Alternate A - Appendix B4
MASS BURN FACILITY-P-ENERGETIKA
CAPITAL COST SUMMARY [1]
Conceptual Layout (100,000 Annual tonnage)

			Estimated Costs
I.	SITE AQUISITION		$ 440,550
II.	SITE DEVELOPMENT		$ 1,758,000
III.	SCALE HOUSE AND SCALES		$ 156,000
IV.	BUILDINGS		$ 6,555,700
V.	PROCESSING EQUIPMENT		$ 566,000
VI.	MOBILE EQUIPMENT		$ 420,000
VII.	POWER BLOCK EQUIPMENT		$ 37,965,000
	SUBTOTAL CONSTRUCTION AND EQUIPMENT		$ 47,861,250
	CONTINGENCY	10%	$ 4,786,000
	DESIGN/ENGINEERING	5%	$ 2,632,000
	PERMITTING	2.3%	$ 1,211,000
	CONSTRUCTION INSPECTION	5%	$ 2,632,000
	TOTAL CAPITAL COST (FACILITY IMPLEMENTATION)		$ 59,122,250

NOTES:

(1) All costs rounded to 1000's

(2) All costs in 2003 $.

I. SITE ADUISITION

Item	Quantity	Units	Unit Price	Item Cost	Total
Property Purchase	14,685	Sq. Meter	$30	$440,550	
Subtotal I					$ 440,550

II. SITE DEVELOPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Site Preparation Conversion= 0.3048					$ 250,700
Excavation -foundations(1)	9,800	Cu. Meters	$22	$215,600	
General Earthwork (2)	2,800	Cu. Meters	$12	$33,600	
Earth Fill Material	0	Cu. Meters	$22	$0	
Slope Stabilization	0	Cu. Meters	$40	$0	
Finishing Grassing & Grading	1	Ha	$1,500	$1,500	
Demolition (Warehouse Buildings)	0	Cu. Meters	$12	$0	
Site Improvements					$ 1,100,300
Approach /Roadways Concrete (3)	80	Sq. Meter	$60	$4,800	
Asphalt Roadways & Parking	14,580	Sq. Meter	$65	$947,700	
Retaining Walls	153	Cu. Meters	$450	$68,800	
Site Drainage	1	L.S.	$40,000	$40,000	
Fencing(4)	500	m	$48	$24,000	
Landscaping (Minimal)	1	L.S.	$15,000	$15,000	
Site Utilities(5)					$ 407,100
Fire Protection	350	m	$135	$47,300	
Water Supply	350	m	$135	$47,300	
Well Field	0	LS	$50,000	$0	
Sewer System	350	m	$150	$52,500	
Electrical(6)	1	L.S.	$260,000	$260,000	
Subtotal II					$ 1,758,100

Notes:

(1) Based on estimated building Areas (sm). Demolition calculated separately

(2) General Earthwork includes moving soil, backfill, embankment, loadout tunnel excav, etc.

(3) Roadway unit price includes curbs, gutters, etc.

(4) Assumes perimeter fencing at 6' (1829 mm)(w/ barbed wire) with gates and litter fencing around maneuvering area of 15' (4572 mm)height.

(5) Utilities unit price includes excavation, bedding material, piping installed, backfill, etc.

(6) Electrical includes high voltage service transformer

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[illegible]	[illegible]

III. SCALE HOUSE AND SCALES

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Building (1)	37	sm	$538	$19,914	
Concrete Slabwork(2)	11	Cu. Meters	$262	$3,000	
Concrete Footings	8	Cu. Meters	$523	$4,000	
Interior Treatments(3)	37	sm	$538	$19,914	
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Mechanical(4)	37	sm	$108	$3,983	
Electrical(5)	37	sm	$129	$4,779	
Subtotal III					$155,676

Notes:

(1) No additional facilities for waste delivery truck drivers or admintration activities areas, are included.

(2) Assumes stable soil with good load bearing capacity. Slab floor is 6"(152 mm) reinforced concrete.

(3) Includes tile, painting, window covers and funiture

(4) Building mechanical includes drains, plumbing, air handling, fire protection, etc.

(5) Electrical includes lighting, power, communications, etc.

IV. BUILDINGS

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Buildings - Preengineered	557	sm	$ 810	$451,500	
Ash Concrete Push Walls(3)	100	Cu. Meters	$ 523	$52,300	
Metal Buildings - Engineered	50,000	Cu. Meters	$ 100	$5,000,000	
Concrete Pit (3)	3,200	Cu. Meters	$ 290	$928,000	
Overhead Doors	6	ea	$ 10,000	$60,000	
Admin. Area (Control Room)	74	sm	$ 860	$63,900	
Subtotal IV					$6,555,700

Notes:

(1) Metal bldg. includes structural steel, column free bldg. (long span), 30 ft. (9144 mm)clear height, & 20 yr roofing warranty with mechanical and e

(2) Assumes stable soil with good load bearing capacity. Slab floor is 10" (254 mm) reinforced concrete on grade; 12" (305 mm)on structural slabs

(3) 4 ft (1219 mm)thick wall with 10 ft (3038 mm) thick mat

[illegible]

V. PROCESSING EQUIPMENT

Item	Quantity	Type	Units	Unit Price	Item Cost	Total
Overhead Cranes (1)	2	2.5 Cu. Meter Grapple	Each	$ 283,000	$ 566,000	
Subtotal V						$566,000

Notes:

(1) Crane quotes from Kone Cranes

VI. MOBILE EQUIPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Ash Trucks and Trailers	2	Each	$125,000	$250,000	
Loader	1	Each	$150,000	$150,000	
Pick-up/Utility Truck	1	Each	$20,000	$20,000	
Subtotal VI					$420,000

Notes:

(1) Loader used for ash loading and general maintenance activities

VII. POWER BLOCK EQUIPMENT

Item	Quantity	Unit	Unit Price	Item Cost	Total
Mass Burn Boiler-delivered(1)	1	LS	$21,656,000	$21,656,000	
SNCR (NOx Control)	1	LS	$156,000	$156,000	
Continuous Emissions Monitoring (4)	1	LS	$219,450	$219,450	
Bottom Ash Handling	1	LS	$449,000	$449,000	
Flyash Handling/Conditioning	1	LS	$426,000	$426,000	
Aux Cooling Water System	1	LS	$66,000	$66,000	
Additional Cooling Towers	2	Cell	$143,000	$286,000	
Condensate System	1	LS	$228,000	$228,000	
Chem Feed (2)	1	LS	$124,000	$124,000	

[illegible]	[illegible]				
[illegible]	[illegible]				
[illegible]	[illegible]				
[illegible]	[illegible]				
[illegible]	[illegible]				
[illegible]	[illegible]				
Circulating Water System	1	LS	$85,000	$85,000	
Waste Water System	1	LS	$65,000	$65,000	
Water Treatment	1	LS	$224,000	$224,000	
Fire Protection	1	LS	$193,000	$193,000	
Feedwater System	1	LS	$175,000	$175,000	
Compressed Air System	1	LS	$49,000	$49,000	
Service Water System	1	LS	$47,000	$47,000	
Stack (Erected) (50 m)	1	LS	$290,000	$290,000	
Heat Exchangers	2	LS	$65,000	$130,000	
Steam Piping	1	LS	$125,000	$125,000	
Steam Turbine (3)	1	LS	$1,400,000	$1,400,000	
Substation & Electrical System	1	LS	$2,928,000	$2,049,600	
Equipment Subtotal					$28,443,050
Boiler Erection (Labor)	1	LS	$6,496,800	$6,496,800	
Steam Turbine Installation (3)	1	LS	$98,000	$98,000	
Mechanical Systems Installation (Labor)	1	LS	$1,661,600	$1,661,600	
Electrical Installation (Labor)	1	LS	$1,045,296	$1,045,300	
Installation Subtotal					$9,301,700
Shop Tools & Equip.	1	Allowance	$50,000	$50,000	
Office Furnishings	0.5	Allowance	$40,000	$20,000	
Spare Parts	1	Allowance	$150,000	$150,000	
Miscellaneous Items					$220,000
Subtotal VII					$37,964,750

Notes:

(1) Based on equipment quote from Babcock and Wilcox

(2) Assumes that all or a portion of these systems are provided at the existing Central Plant

(3) Based on equipment qoute and installation estimate from Skoda and Dresser Rand

(4) Based on Quote from OPSIS

Subtotal 1 through VII	$47,860,776

[illegible]

Alternate A - Appendix B4
MASS BURN FACILITY-P-ENERGETIKA
OPERATIONS AND MAINTENANCE COST SUMMARY [1]
Conceptual Layout (100,000 Annual tonnage)

			Estimated Costs[2]
I. LABOR			$ 556,000
II. FACILITY MAINTENANCE			$ 1,694,000
III. UTILITIES			$ 163,000
IV. PROCESS RESIDUE HAUL & DISPOSAL			$ 894,000
V. ROLLING STOCK O&M COSTS			$ 109,300
VI. MISCELLANEOUS COSTS			$ 149,000
	SUBTOTAL OPERATION & MAINTENANCE		$ 3,565,300
	CONTINGENCY	10%	$ 357,000
	ACCOUNTING, SUPPLIES, MISC.	5%	$ 196,000
	ADMINISTRATION	3%	$ 118,000
TOTAL ANNUAL OPERATION & MAINTENANCE COST			$ 4,236,300
VIII.	MINUS (Estimated see proforr MATERIAL SALES REVENUES[3]		$ (60,000)
NET ANNUAL OPERATION & MAINTENANCE COST			$ 4,176,300
		Cost / Tonne	$ 41.76

NOTES:

(1) All costs rounded to 1000's
(2) All costs in 2003 $.
(3) Doesn't include energy revenues

[illegible]

I. LABOR

Job Classification	Personnel(1)	$/hr	hrs/yr (6)	OT Hrs	Annual Cost	% OT	Total
Facility Manager (2)	1	$20.00	2,016	0	$40,320	0%	
Operating Engineer (3)	1	$14.55	2,016	0	$29,333	0%	
Shift Supervisor (3)	5	$12.61	2,016	0	$127,109	0%	
Administrative / Clerical (4)	2	$4.67	2,016	208	$21,728	10%	
Scale Attendant (4)	2	$4.90	2,016	208	$22,814	10%	
Lead Equipment Operator (4)	4	$7.47	2,016	312	$74,189	15%	
Equipment Operators (4)	5	$4.90	2,016	312	$60,858	15%	
Mechanic (4)	2	$7.23	2,016	208	$33,678	10%	
Elect / Electronics Specialist (4)	2	$7.47	2,016	208	$34,765	10%	
Welders (4)	1	$7.00	2,016	208	$16,296	10%	
Helper (4)	2	$5.83	2,016	208	$27,160	10%	
Residue Disposal Drivers (4)	2	$5.13	2,016	208	$23,901	10%	
Spotters/Laborers (4)	4	$4.67	2,016	208	$43,456	10%	
Subtotal	33						$556,000

Notes:

(1) Based on a 24-hour, seven day per week operation.

(2) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]

(3) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]

(4) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]

(5) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]
and overtime pay is 1.5 times straight time

(6) Assumes standard Czech working hours

II. FACILITY MAINTENANCE

Item	% of Capital Value	Quantity	Unit	Unit Price	Annual Cost	Total
Site Maintenance (1)	1.5%	1	L.S.	$ 22,611	$22,611	
Building Repair & Replacement	3.3%	1	L.S.	$ 221,000	$221,000	
Equipment Maintenance (3)	2.0%	1	L.S.	$ 580,181	$580,181	
Equipment Replacement (3)	3.0%	1	L.S.	$ 870,272	$870,272	
Subtotal						$ 1,694,000

Notes:

(1) Site maintenance is estimated as % capital construction cost for site improvements and site utilities.

(2) Building repair base on a 30 year depreciation of the original capital cost with escalation.

(3) Equipment maintenance (annual needs) and replacement (periodic needs) estimated based on assumed 20 life. This is an <u>annual fund arr</u>

III. UTILITIES

Item	Quantity	Unit	Unit Price	Annual Cost	Total
Electricity Purchase (1)	500	MWH/yr	$ 30.04	$ 15,020	
Natural Gas (2)	236,298	m3	$ 0.20	$ 47,623	
Telephone (Mobile/Fixed) (3)	25	Phones	$ 360	$ 9,000	
Water	13,229	m3	$ 0.33	$ 4,321	
Sewer (4)	3,307	m3	$ 0.33	$ 1,080	
Lime Reagent	1,001	Tonne/yr	$ 76.20	$ 76,269	
Ammonia Reagent	375	Tonne/yr	$ 20.00	$ 7,507	
Carbon Reagent	45	Tonne/yr	$ 50.00	$ 2,250	
Subtotal					$ 163,071

Notes:

(1) Electricity purchase accounts for energy use during downtimes only; in-house power provided by the system otherwise.

(2) Gas used for start-up and shutdown only to maintain "good combustion control"

(3) Based on mobile phones for entire staff except drivers, helpers and laborers.

(4) Sewer use based on 25% of water use; evaporation and an ash quench account for rest.

IV. PROCESS RESIDUE HAUL & DISPOSAL

Item	Cost /Load(1)	Quantity	Unit	Unit Price	Annual Cost	Total
Process Residue Haul	$ 43	1,257	Tonne	$ 2.15	$ 2,703	
Ash Haul	$ 43	31,678	Tonne	$ 2.15	$ 68,107	
Landfill Disposal Fees		32,935	Tonne	$ 25.00	$ 823,368	
Subtotal						$ 894,178

Notes:

(1) Cost assumes truck operating costs per 20-tonne load

V. ROLLING STOCK O&M COSTS

Fuel	Weeks	Unit Rate	Units	Unit Price	Annual Cost	Total
Loader	52	1,325	l/wk	$0.85	$58,600	
Pick-up Truck	52	114	l/wk	$0.85	$5,000	
Maintenance	**# Vehicles**	**Quantity**	**Units**	**Unit Price**	**Annual Cost**	**Total**
Loader	1	1	L.S.	$8,250	$8,300	
Pick-up Truck	1	19,200	Km/Yr	$0.13	$2,400	
General O&M		1	L.S.	$35,000	$35,000	
Subtotal						$109,300

Notes:

(1) Based on Owning and Operating Cost Methodology in the Caterpillar Performance Handbook.

[illegible]

VI. MISCELLANEOUS COSTS

Item	Usage (1)	Quantity	Unit	Unit Price	Annual Cost	Total
Property Insurance (2)	1	0.3%			$142,300	
Flood Insurance (2)	0	1.2%			$0	
Property Taxes (3)	1	2,601	m^2	$0.78	$2,000	
Pollution Fees (4)		1	L.S.	$ 5,075	$ 5,075	
Subtotal						$ 149,375

Notes:

(1) Multiplier used to adjust costs for various potential sites. Zero means expense not applicable to this site.

(2) Based on % of capital construction costs.

(3) Based on area of developed property area.

(4) Based on analysis in report on Environmental Considerations and assuming 7446 combustion hours per at unit capacity.

Subtotal I through VI	$3,565,923

VII. MATERIAL SALES REVENUES(3)

Material	Units	Unit	Unit Value	Annual Revenues	Total
Net Electric Generation	33,118,106	MWh		$0	Addressed in Pro Forma
Net Steam Generation	250,267,506	Tonne		$0	Addressed in Pro Forma
Aluminum	-	Tonne	$800	$0	No recovery provided
Ferrous Metals (from ash residue)	2,400	Tonne	$25	$60,000	
Subtotal VIII	2,400	Tonne Recycled			$60,000

	Base Labor Rates		
Labor Rate Assumptions	**Model Value**	**US $**	**CZK**
	$/Hour	**$/Hour**	**Kc/Hr**
Facility Manager	$ 13.33	$ 13.33	400.00
Operating Engineer	$ 10.00	$ 10.00	300.00
Shift Supervisor	$ 8.67	$ 8.67	260.00
Administrative/Clerical	$ 3.33	$ 3.33	100.00
Scale Attendant	$ 3.50	$ 3.50	105.00
Lead Equipment Operator	$ 5.33	$ 5.33	160.00
Equipment Operators	$ 3.50	$ 3.50	105.00
Picking Crew	$ 3.33	$ 3.33	100.00
Mechanic	$ 5.17	$ 5.17	155.00
Electrician/Electronics Specialist	$ 5.33	$ 5.33	160.00
Welders	$ 5.00	$ 5.00	150.00
Helpers	$ 4.17	$ 4.17	125.00
Residue Disposal Drivers	$ 3.67	$ 3.67	110.00
Spotters/Laborers	$ 3.33	$ 3.33	100.00

(1) Kc/Hr rates are rates as provided by PT

Project:	**Plezenska teplarenska WTE Feasibility Study**
Technology:	**Mass Burn Facility-P-Energetika**
Estimate Basis:	**Conceptual Layout (100,000 Annual tonnage)**
Costs:	**2003$**
Location:	**Plzen, Czech Republic**

		Conversion factor =	3.785412
Domestic	**Assumptions**	**Gallons/Yr**	**Liters/Year**
Average People/Day	8		
Lpd/person	95		
Lpd	744		
days/week	7		
weeks/year	52		
Lpy		71,500	270,657

			Liters/Year
[illegible]	[illegible]	[illegible]	[illegible]
Spray Dryer [illegible]	[illegible]	[illegible]	[illegible]
Washdown [illegible]	[illegible]	[illegible]	[illegible]

			Liters/Year
Total Water Usage		3,494,802	13,229,264
Evaporation/Ash Quench	75%	2,621,101	9,921,948
Total Sewer Usage		873,700	3,307,316

Reagent Usage Estimates

	Qty/Ton (lb/Ton)	Kg/Tonne	Annual Usage (tonnes)	Estimated Annual Cost
Lime (limestone)	20	10.0	1,001	$76,2[illegible]
Ammonia	7.5	3.8	375	$7,825
Carbon	0.87	0.45	45	$2,345

Energy Generation Assumptions

	Gross Gen/tonne	In-House Power/tonne	Net Gen/Tonne	Net Annual Generation	
Steam Production (Kg)	2634	132	2503	250,267,50[illegible]	Tonne
Electricity Production (kWh)	378	45	331.2	33,118,10[illegible]	KWh

Assumes backpressure turbine	7	Kg/KW-hr	35,380	Kg/hr	0% Margin

Energy Consumption Assumptions

Item	**mmBtu/Ton**		**MMBTU**		**ft^3/yr**	**m^3/yr**
Natural Gas (mmBTU)	0.0757		8,344		8,344,411	236,314
	MJ/Tonne		**GJ**			**m^3/yr**
Natural Gas (MJ)	88.03		8,803			236,298
Item	**Qty/Tonne**	**hp**	**load factor**	**kw**	**hrs/year**	**kWh/yr**
Power Purchase Req. (kWh/Tonne	5.0					500,000
Total Purchase						500,000

MSW Quanitites and Characteristics

Waste Quantity (Annual metric ton-Tonne)	100,000	Tonne		
Daily Delivery (5 Days per week)	451	Tonne/Day		
Capacity Factor	85%			
Throughput Capacity (7 Days per week)	322	Tonne/Day		
Annual Throughput	100,000	Tonne		
MSW HHV (B&W)	10.1	MJ/Kg		
Boiler Efficiency (B&W)	71%			
Fuel Feed Rate (B&W)	13,430	Kg/hr	322	tonne/day
Gross Steam Production (B&W)	35,380	Kg/hr	2634	Kg(steam)/tonne waste

MSW Storage Calculations

Pit Storage	4	Days		
Pit Storage	1,289	tonne		
MSW Density	267	Kg/Cu Meter		
MSW Pit Capacity	4,829	Cu. Meter		
Pit Area	400	sm	8	m deep plus 50% of vol. ı
Pit length	30	meter	14	meter wide

Residue Disposal

	Percent Of Input				
				0	Truckloads/Day5
Reject Residue Disposal	1.5%	5	tpd5	4	Truckloads/Day7
Ash Disposal	27%	87.0	tpd7	5.0	Truckloads/Day
Truck Payload (Tons)		20	tons/truck	10	HRs/day
Assumes disposal of rejects and ash residue		59	HRS/week	2	Round Trip Haul

Basic Conceptual Layout Dimensions

		Length	Span	Area	Height	Number of Levels
Conversion Factor	M to Ft	3.28084				
Exterior Maneuvering	Feet	120.0	60.0	7,200		
	Meters	36.6	18.3	669		
MSW Tipping Floor	Feet	120.0	35.0	4,200	40.0	1.0
	Meters	36.6	10.7	390	12.2	
Boiler Bldg	Feet	60.0	85.0	5,100	135.0	1.0
	Meters	18.3	25.9	474	41.1	
Turbine Building	Feet	60.0	45.0	2,700	15.0	2.0
	Meters	18.3	13.7	251	4.6	
Maintenance/Storage	Feet	60.0	45.0	2,700	15.0	1.0
	Meters	18.3	13.7	251	4.6	
Admin/ Control Room	Feet	60.0	45.0	2,700	15.0	2.0
	Meters	18.3	13.7	251	4.6	
Refuse Storage Bldg (Pit)	Feet	120.0	60.0	7,200	115.0	1.0
	Meters	36.6	18.3	669	35.1	
Ash Storage Bldg	Feet	50.0	30.0	1,500	30.0	1.0
	Meters	15.2	9.1	139	9.1	
Site Development	Feet	350.0	80.0	28,000		
	Meters	106.7	24.4	2,601		
		Total Bldg Floor Area		**26,100**	S.F	
				2,425	S.M.	

Demolition Estimate

		Length	Span	Area	Height	Volume
Conversion Factor	M to Ft	3.28084	3.28084	10.7639111	3.28084	[illegible]
Warehouse #1	Feet	40	20	800.0	16	474
	Meters	12.2	6.1	74.3	4.9	-
Warehouse #2	Feet	40	18	720.0	16	427
	Meters	12.2	5.5	66.9	4.9	-
Warehouse #3	Feet	37	21	777.0	16	460
	Meters	11.3	6.4	72.2	4.9	-
Condensate Piping Relocation	Feet	400			12	
	Meters	122			3.7	

Project:	[illegible] WTE Feasibility Study
Technology:	Mass Burn Facility Central Plant
Date:	[illegible]
Estimate Basis:	Conceptual Layout (50,000 Annual tonnage)
Costs:	USD
Location:	Plzen, Czech Republic

Base Case-Alternate C - Appendix B5

COST SUMMARY

MASS BURN FACILITY CENTRAL PLANT

Conceptual Layout (50,000 Annual tonnage)

	USD		USD
Estimated Range of Total Capital Costs	33,195,000	to	40,572,000
Estimated Range of Annual Amortized Capital Cost	3,381,000	to	4,132,000
Estiimated Range of Annual Operations & Maint. Costs	2,650,300	to	2,915,000
Estimated Range of Annual Costs	6,031,300	to	7,047,000

YEAR 2003 ANNUAL TONNAGE	50,000	Tonnes	
Estimated Cost per Processed Tonne	$121	to	$141

Note: Annual Operations Cost does not include marketing & transfer of recovered materials,

[illegible]

Base Case-Alternate C - Appendix B5
MASS BURN FACILITY CENTRAL PLANT
CAPITAL COST SUMMARY [1]
Conceptual Layout (50,000 Annual tonnage)

			Estimated Costs
I.	SITE AQUISITION		$ -
II.	SITE DEVELOPMENT		$ 595,000
III.	SCALE HOUSE AND SCALES		$ 156,000
IV.	BUILDINGS		$ 4,241,200
V.	PROCESSING EQUIPMENT		$ 519,120
VI.	MOBILE EQUIPMENT		$ 420,000
VII.	POWER BLOCK EQUIPMENT		$ 23,927,000
	SUBTOTAL CONSTRUCTION AND EQUIPMENT		$ 29,858,320
	CONTINGENCY	10%	$ 2,986,000
	DESIGN/ENGINEERING	5%	$ 1,642,000
	PERMITTING	2.3%	$ 755,000
	CONSTRUCTION INSPECTION	5%	$ 1,642,000
	TOTAL CAPITAL COST (FACILITY IMPLEMENTATION)		$ 36,883,320

NOTES:

(1) All costs rounded to 1000's

(2) All costs in 2003 $.

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

I. SITE AQUISITION

Item	Quantity	Units	Unit Price	Item Cost	Total
Property Purchase	-	Sq. Meter	$30	$0	
Subtotal I					$

II. SITE DEVELOPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Site Preparation Conversion= 0.3048					$ 188,800
Excavation -foundations(1)	5,090	Cu. Meters	$22	$112,000	
General Earthwork (2)	2,615	Cu. Meters	$12	$31,400	
Earth Fill Material	0	Cu. Meters	$22	$0	
Slope Stabilization	0	Cu. Meters	$40	$0	
Finishing Grassing & Grading	0	Sq Meter	$22	$0	
Relocation of Circ Water Piping	244	Meter	$135	$32,900	
Demolition (Warehouse Buildings)	1,041	Cu. Meters	$12	$12,500	
Site Improvements					$ 188,900
Approach /Roadways Concrete (3)	80	Sq. Meter	$60	$4,800	
Asphalt Roadways & Parking	1,236	Sq. Meter	$65	$80,300	
Retaining Walls	153	Cu. Meters	$450	$68,800	
Site Drainage	1	L.S.	$20,000	$20,000	
Fencing(4)	0	m	$48	$0	
Landscaping (Minimal)	1	L.S.	$15,000	$15,000	
Site Utilities(5)					$ 216,900
Fire Protection	183	m	$135	$24,700	
Water Supply	183	m	$135	$24,700	
Well Field	0	LS	$50,000	$0	
Sewer System	183	m	$150	$27,500	
Electrical(6)	1	L.S.	$140,000	$140,000	
Subtotal II					$ 594,600

Notes:

(1) Based on estimated building Areas (sm). Demolition calculated separately

(2) General Earthwork includes moving soil, backfill, embankment, loadout tunnel excav, etc.

(3) Roadway unit price includes curbs, gutters, etc.

(4) Assumes perimeter fencing at 6' (1829 mm)(w/ barbed wire) with gates and litter fencing around maneuvering area of 15' (4572 mm)height.

(5) Utilities unit price includes excavation, bedding material, piping installed, backfill, etc.

(6) Electrical includes high voltage service transformer

III. SCALE HOUSE AND SCALES

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Building (1)	37	sm	$538	$19,914	
Concrete Slabwork(2)	11	Cu. Meters	$262	$3,000	
Concrete Footings	8	Cu. Meters	$523	$4,000	
Interior Treatments(3)	37	sm	$538	$19,914	
Motor Truck Scales & Foundations	2	LS	$60,000	$120,000	
Mechanical(4)	37	sm	$108	$3,983	
Electrical(5)	37	sm	$129	$4,779	
Subtotal III					$155,676

Notes:

(1) No additional facilities for waste delivery truck drivers or admintration activities areas, are included.

(2) Assumes stable soil with good load bearing capacity. Slab floor is 6"(152 mm) reinforced concrete.

(3) Includes tile, painting, window covers and funiture

(4) Building mechanical includes drains, plumbing, air handling, fire protection, etc.

(5) Electrical includes lighting, power, communications, etc.

IV. BUILDINGS

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Buildings - Preengineered	372	sm	$ 810	$301,000	
Ash Concrete Push Walls(3)	100	Cu. Meters	$ 523	$52,300	
Metal Buildings - Engineered	33,000	Cu. Meters	$ 100	$3,300,000	
Concrete Pit (3)	1,600	Cu. Meters	$ 290	$464,000	
Overhead Doors	6	ea	$ 10,000	$60,000	
Admin. Area (Control Room)	74	sm	$ 860	$63,900	
Subtotal IV.					$4,241,200

Notes:

(1) Metal bldg. includes structural steel, column free bldg. (long span), 30 ft. (9144 mm)clear height, & 20 yr roofing warranty with mechanical and e

(2) Assumes stable soil with good load bearing capacity. Slab floor is 10" (254 mm) reinforced concrete on grade;
12" (305 mm)on structural slabs

(3) 4 ft (1219 mm)thick wall with 10 ft (3038 mm) thick mat

V. PROCESSING EQUIPMENT

Item	Quantity	Type	Units	Unit Price	Item Cost	Total
Overhead Cranes (1)	2	1.6 Cu. Meter Grapple	Each	$ 259,560	$ 519,120	
Subtotal V						$519,120

Notes:

(1) Crane quotes from Kone Cranes

VI. MOBILE EQUIPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Ash Trucks and Trailers	2	Each	$125,000	$250,000	
Loader	1	Each	$150,000	$150,000	
Pick-up/Utility Truck	1	Each	$20,000	$20,000	
Subtotal VI					$420,000

Notes:

(1) Loader used for ash loading and general maintenance activities

VII. POWER BLOCK EQUIPMENT

Item	Quantity	Unit	Unit Price	Item Cost	Total
RDF Boiler Delivered	1	LS	$13,600,000	$13,600,000	
SNCR (NOx Control)	1	LS	$156,000	$156,000	
Continuous Emissions Monitoring (4)	1	LS	$219,450	$219,450	
Bottom Ash Handling	1	LS	$449,000	$257,900	
Flyash Handling/Conditioning	1	LS	$426,000	$244,700	
Aux Cooling Water System	1	LS	$66,000	$37,900	
Additional Cooling Towers	0	Cell	$143,000	$0	
Condensate System	1	LS	$228,000	$131,000	
Chem Feed (2)	0	LS	$124,000	$35,600	

[illegible]	[illegible]				
[illegible]	[illegible]				
[illegible]	[illegible]				
[illegible]	[illegible]				
[illegible]	[illegible]				
[illegible]	[illegible]				
Circulating Water System	0	LS	$111,[illegible]	$38,600	
Waste Water System	1	LS	$132,100	$75,900	
Water Treatment	0	LS	$224,000	$77,200	
Fire Protection	0	LS	$193,000	$66,500	
Feedwater System	0	LS	$175,000	$60,300	
Compressed Air System	1	LS	$49,000	$28,100	
Service Water System	1	LS	$47,000	$27,000	
Stack (Erected) (65 m)	1	LS	$350,000	$283,500	
Heat Exchangers	1	LS	$65,000	$65,000	
Steam Piping	1	LS	$125,000	$71,800	
Steam Turbine (3)	1	LS	$975,000	$975,000	
Substation & Electrical System	0.2	LS	$2,928,000	$585,600	
Equipment Subtotal					$17,037,050
Boiler Erection (Labor)	1	LS	$4,080,000	$4,080,000	
Steam Turbine Installation (3)	1	LS	$73,125	$73,100	
Mechanical Systems Installation (Labor)	1	LS	$1,553,239	$1,553,200	
Electrical Installation (Labor)	1	LS	$1,024,800	$1,024,800	
Installation Subtotal					$6,731,100
Shop Tools & Equip.	1	Allowance	$50,000	$50,000	
Office Furnishings	0.2	Allowance	$40,000	$9,000	
Spare Parts	1	Allowance	$100,000	$100,000	
Miscellaneous Items					$159,000
Subtotal VII					$23,927,150

Notes:

(1) Based on equipment quote from Babcock and Wilcox

(2) Assumes that all or a portion of these systems are provided at the existing Central Plant

(3) Based on equipment qoute and installation estimate from Skoda and Dresser Rand

(4) Based on Quote from OPSIS

Subtotal I through VII	$29,857,746

[illegible]

Base Case-Alternate C - Appendix B5
MASS BURN FACILITY CENTRAL PLANT
OPERATIONS AND MAINTENANCE COST SUMMARY [(1)]
Conceptual Layout (50,000 Annual tonnage)

			Estimated Costs[(2)]
I.	LABOR		$ 491,000
II.	FACILITY MAINTENANCE		$ 1,029,000
III.	UTILITIES		$ 85,000
IV.	PROCESS RESIDUE HAUL & DISPOSAL		$ 447,000
V.	ROLLING STOCK O&M COSTS		$ 109,300
VI.	MISCELLANEOUS COSTS		$ 95,000
	SUBTOTAL OPERATION & MAINTENANCE		$ 2,256,300
	CONTINGENCY	10%	$ 226,000
	ACCOUNTING, SUPPLIES, MISC.	5%	$ 124,000
	ADMINISTRATION	3%	$ 74,000
	TOTAL ANNUAL OPERATION & MAINTENANCE COST		$ 2,680,300
VIII.	MINUS (Estimated see proforr MATERIAL SALES REVENUES[(3)]		$ (30,000)
	NET ANNUAL OPERATION & MAINTENANCE COST		$ 2,650,300
		Cost / Tonne	$ 53.01

NOTES:
(1) All costs rounded to 1000's
(2) All costs in 2003 $.
(3) Doesn't include energy revenues

[illegible]

I. LABOR

Job Classification	Personnel(1)	$/hr	hrs/yr (6)	OT Hrs	Annual Cost	% OT	Total
Facility Manager (2)	1	$20.00	2,016	0	$40,320	0%	
Operating Engineer (3)	0.5	$14.55	2,016	0	$14,666	0%	
Shift Supervisor (3)	5	$12.61	2,016	0	$127,109	0%	
Administrative / Clerical (4)	0.5	$4.67	2,016	208	$5,189	10%	
Scale Attendant (4)	2	$4.90	2,016	208	$21,795	10%	
Lead Equipment Operator (4)	4	$7.47	2,016	312	$69,530	15%	
Equipment Operators (4)	5	$4.90	2,016	312	$57,036	15%	
Mechanic (4)	1	$7.23	2,016	208	$16,087	10%	
Elect / Electronics Specialist (4)	2	$7.47	2,016	208	$33,212	10%	
Welders (4)	1	$7.00	2,016	208	$15,568	10%	
Helper (4)	2	$5.83	2,016	208	$25,947	10%	
Residue Disposal Drivers (4)	2	$5.13	2,016	208	$22,833	10%	
Spotters/Laborers (4)	4	$4.67	2,016	208	$41,515	10%	
Subtotal	30						$491,000

Notes:

(1) Based on a 24-hour, seven day per week operation.
(2) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]
(3) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]
(4) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]
(5) Includes fringe benefits (retirement, ss, workers comp, health & life insurance, [illegible]
and overtime pay is 1.5 times straight time
(6) Assumes standard Czech working hours

II. FACILITY MAINTENANCE

Item	% of Capital Value	Quantity	Unit	Unit Price	Annual Cost	Total
Site Maintenance (1)	1.5%	1	L.S.	$ 6,087	$6,087	
Building Repair & Replacement	3.3%	1	L.S.	$ 145,000	$145,000	
Equipment Maintenance (3)	2.0%	1	L.S.	$ 351,123	$351,123	
Equipment Replacement (3)	3.0%	1	L.S.	$ 526,685	$526,685	
Subtotal						$ 1,029,000

Notes:

(1) Site maintenance is estimated as % capital construction cost for site improvements and site utilities.
(2) Building repair base on a 30 year depreciation of the original capital cost with escalation.
(3) Equipment maintenance (annual needs) and replacement (periodic needs) estimated based on assumed 20 life. This is an annual fund am

[illegible]

III. UTILITIES

Item	Quantity	Unit	Unit Price	Annual Cost	Total
Electricity Purchase (1)	250	MWH/yr	$ 30.04	$ 7,510	
Natural Gas (2)	118,149	m3	$ 0.20	$ 23,812	
Telephone (Mobile/Fixed) (3)	22	Phones	$ 360	$ 7,920	
Water	6,797	m3	$ 0.33	$ 2,220	
Sewer (4)	1,699	m3	$ 0.33	$ 555	
Lime Reagent	500	Tonne/yr	$ 76.20	$ 38,135	
Ammonia Reagent	188	Tonne/yr	$ 20.00	$ 3,753	
Carbon Reagent	23	Tonne/yr	$ 50.00	$ 1,125	
Subtotal					$ 85,030

Notes:

(1) Electricity purchase accounts for energy use during downtimes only; in-house power provided by the system otherwise.

(2) Gas used for start-up and shutdown only to maintain "good combustion control"

(3) Based on mobile phones for entire staff except drivers, helpers and laborers.

(4) Sewer use based on 25% of water use; evaporation and an ash quench account for rest.

IV. PROCESS RESIDUE HAUL & DISPOSAL

Item	Cost /Load(1)	Quantity	Unit	Unit Price	Annual Cost	Total
Process Residue Haul	$ 43	629	Tonne	$ 2.15	$ 1,351	
Ash Haul	$ 43	15,839	Tonne	$ 2.15	$ 34,054	
Landfill Disposal Fees		16,467	Tonne	$ 25.00	$ 411,684	
Subtotal						$ 447,089

Notes:

(1) Cost assumes truck operating costs per 20-tonne load

V. ROLLING STOCK O&M COSTS

Fuel	Weeks	Unit Rate	Units	Unit Price	Annual Cost	Total
Loader	52	1,325	l/wk	$0.85	$58,600	
Pick-up Truck	52	114	l/wk	$0.85	$5,000	
Maintenance	**# Vehicles**	**Quantity**	**Units**	**Unit Price**	**Annual Cost**	**Total**
Loader	1	1	L.S.	$8,250	$8,300	
Pick-up Truck	1	19,200	Km/Yr	$0.13	$2,400	
General O&M		1	L.S.	$35,000	$35,000	
Subtotal						$109,300

Notes:

(1) Based on Owning and Operating Cost Methodology in the Caterpillar Performance Handbook.

[illegible]

VI. MISCELLANEOUS COSTS

Item	Usage (1)	Quantity	Unit	Unit Price	Annual Cost	Total
Property Insurance (2)	1	0.3%			$88,300	
Flood Insurance (2)	0	1.2%			$0	
Property Taxes (3)	1	2,601	m^2	$0.78	$2,000	
Pollution Fees (4)		1	L.S.	$ 5,075	$ 5,075	
Subtotal						$ 95,375

Notes:

(1) Multiplier used to adjust costs for various potential sites. Zero means expense not applicable to this site.

(2) Based on % of capital construction costs.

(3) Based on area of developed property area.

(4) Based on analysis in report on Environmental Considerations and assuming 7446 combustion hours per at unit capacity.

Subtotal I through VI	$2,256,793

VII. MATERIAL SALES REVENUES(3)

Material	Units	Unit	Unit Value	Annual Revenues	Total
Net Electric Generation	15,534,755	MWh		$0	Addressed in Pro Forma
Net Steam Generation	125,246,932	Tonne		$0	Addressed in Pro Forma
Aluminum	-	Tonne	$800	$0	No recovery provided
Ferrous Metals (from ash residue)	1,200	Tonne	$25	$30,000	
Subtotal VIII	1,200	Tonne Recycled			$30,000

	Base Labor Rates		
Labor Rate Assumptions	**Model Value**	**US $**	**CZK**
	$/Hour	**$/Hour**	**Kc/Hr**
Facility Manager	$ 13.33	$ 13.33	*400.00*
Operating Engineer	$ 10.00	$ 10.00	300.00
Shift Supervisor	$ 8.67	$ 8.67	260.00
Administrative/Clerical	$ 3.33	$ 3.33	100.00
Scale Attendant	$ 3.50	$ 3.50	105.00
Lead Equipment Operator	$ 5.33	$ 5.33	160.00
Equipment Operators	$ 3.50	$ 3.50	105.00
Picking Crew	$ 3.33	$ 3.33	100.00
Mechanic	$ 5.17	$ 5.17	155.00
Electrician/Electronics Specialist	$ 5.33	$ 5.33	160.00
Welders	$ 5.00	$ 5.00	150.00
Helpers	$ 4.17	$ 4.17	125.00
Residue Disposal Drivers	$ 3.67	$ 3.67	110.00
Spotters/Laborers	$ 3.33	$ 3.33	100.00

(1) Kc/Hr rates are rates as provided by PT

(2) Conversion @ 30 Kc per USD

Project:	[illegible] WTE Feasibility Study
Technology:	Mass Burn Facility Central Plant
Estimate Basis:	Conceptual Layout ([illegible] Annual tonnes)
Costs:	[illegible]
Location:	Plzeň, Czech Republic

Conversion factor = 3.785412

Domestic	Assumptions	Gallons/Yr	Liters/Year	[illegible]
Average People/Day	7			
Lpd/person	95			
Lpd	676			
days/week	7			
weeks/year	52			
Lpy		65,000	246,052	

		Liters/Year	Estimated Annual Cost
Boiler water Blowdown	[illegible]	[illegible]	[illegible]
Spray Dryer/Ag. to Water[illegible]	[illegible]	[illegible]	[illegible]
Washdown	[illegible]	[illegible]	[illegible]

			Liters/Year
Total Water Usage		1,795,460	6,796,555
Evaporation/Ash Quench	75%	1,346,595	5,097,416
Total Sewer Usage		448,865	1,699,139

Reagent Usage Estimates

[illegible]	[illegible] (lb/ton)	Kg/Tonne	Annual Usage (tonnes)	[illegible]
Lime (limestone)	20	10.0	500	$38,135
Ammonia	7.5	3.8	188	$3,913
Carbon	0.87	0.45	23	$1,173

Energy Generation Assumptions

	[illegible] (lb/ton)	[illegible] (Kg/Tonne)	[illegible] Gen/Tonne	[illegible]	
Steam Production (Kg)	2637	132	2505	125,248,932	Tonne
Electricity Production (kWh)	353	42	310.7	15,534,755	KWh

Assumes backpressure turbine	7.5	Kg/KW-hr	17,706	Kg/hr	0% Margin

Energy Consumption Assumptions

Item	mmBtu/Ton		MMBTU		ft³/yr	m³/yr
Natural Gas (mmBTU)	0.0757		4,172		4,172,206	118,157
	MJ/Tonne		**GJ**			**m³/yr**
Natural Gas (MJ)	88.03		4,402			118,149

Item	Qty/Tonne	hp	load factor	kw	hrs/year	kwh/yr
Power Purchase Req. (kWh/Tonne	5.0					250,000
Total Purchase						250,000

MSW Quanitites and Characteristics

Waste Quantity (Annual metric ton-Tonne)	50,000	Tonne	
Daily Delivery (5 Days per week)	226	Tonne/Day	
Capacity Factor	85%		
Throughput Capacity (7 Days per week)	161	Tonne/Day	
Annual Throughput	50,000	Tonne	
MSW HHV (B&W)	10	MJ/Kg	
Boiler Efficiency (B&W)	71%		
Fuel Feed Rate (B&W)	6,715	Kg/hr	161 tonne/day
Gross Steam Production (B&W)	17,706	Kg/hr	2637 Kg(steam)/tonne waste

MSW Storage Calculations

Pit Storage	4	Days	
Pit Storage	645	tonne	
MSW Density	267	Kg/Cu Meter	
MSW Pit Capacity	2,414	Cu. Meter	
Pit Area	200	sm	8 m deep plus 50% of vol. up to charging level
Pit length	19	meter	11 meter wide

Residue Disposal

	Percent Of Input			
				0 Truckloads/Day5
Reject Residue Disposal	1.5%	2	tpd5	2 Truckloads/Day7
Ash Disposal	27%	43.5	tpd7	2.0 Truckloads/Day
Truck Payload (Tons)		20	tonne/trucl	4 HRs/day
Assumes disposal of rejects and ash residue		24	HRS/week	2 Round Trip Haul

Basic Conceptual Layout Dimensions

		Length	Span	Area	Height	Number of Levels
Conversion Factor	M to Ft	3.28084				
Exterior Maneuvering	Feet	65.0	60.0	3,900		
	Meters	19.8	18.3	362		
MSW Tipping Floor	Feet	65.0	35.0	2,275	40.0	1.0
	Meters	19.8	10.7	211	12.2	
Boiler Bldg	Feet	60.0	85.0	5,100	140.0	1.0
	Meters	18.3	25.9	474	42.7	
Turbine Building	Feet	70.0	45.0	3,150	20.0	2.0
	Meters	21.3	13.7	293	6.1	
Maintenance/Storage (on site)	Feet	48.0	36.0	1,728	20.0	1.0
	Meters	0.0	0.0	-	6.1	
Admin/ Control Room	Feet	48.0	36.0	1,728	15.0	2.0
	Meters	14.6	11.0	161	4.6	
Refuse Storage Bldg (Pit)	Feet	62.0	45.0	2,790	115.0	1.0
	Meters	18.9	13.7	259	35.1	
Ash Storage Bldg	Feet	35.0	30.0	1,050	30.0	1.0
	Meters	10.7	9.1	98	9.1	
Site Development	Feet	350.0	80.0	28,000		
	Meters	106.7	24.4	2,601		
		Total Bldg Floor Area		17,821	S.F	
				1,495	S.M	

Demolition Estimate (1)

		Length	Width	Area	Height	Volume
Conversion Factor	M to Ft	3.28084	3.28084	10.76391	3.28084	1.30795
Warehouse #1	Feet	40	20	800.0	16	474
	Meters	12.2	6.1	74.3	4.9	362
Warehouse #2	Feet	40	18	720.0	16	427
	Meters	12.2	5.5	66.9	4.9	326
Warehouse #3	Feet	37	21	777.0	16	460
	Meters	11.3	6.4	72.2	4.9	352
Circulating water Piping Relocation	Feet	400			12	
	Meters	122			3.7	

Note:
(1) Demolition of warehouses and relocation of Circ. water pipe on the Central Plant site only

Project:	Plzeňská teplárenská WTE Feasibility Study
Technology:	Mass Burn Facility P-Energetika
Date:	6/11/03
Estimate Basis:	Conceptual Layout (50,000 annual tonnage)
Costs:	2003 $
Location:	Plzen, Czech Republic

Alternate A - Appendix B6
COST SUMMARY
MASS BURN FACILITY-P-ENERGETIKA
Conceptual Layout (50,000 Annual tonnage)

	USD		USD
Estimated Range of Total Capital Costs	36,366,000	to	44,448,000
Estimated Range of Annual Amortized Capital Cost	3,704,000	to	4,527,000
Estiimated Range of Annual Operations & Maint. Costs	2,844,300	to	3,129,000
Estimated Range of Annual Costs	6,548,300	to	7,656,000

YEAR 2003 ANNUAL TONNAGE 50,000 Tonnes

Estimated Cost per Processed Tonne $131 to $153

Note: Annual Operations Cost does not include marketing & transfer of recovered materials,

Alternate A - Appendix B6
MASS BURN FACILITY-P-ENERGETIKA
CAPITAL COST SUMMARY [1]
Conceptual Layout (50,000 Annual tonnage)

			Estimated Costs
I. SITE AQUISITION			$ 440,550
II. SITE DEVELOPMENT			$ 1,436,000
III. SCALE HOUSE AND SCALES			$ 156,000
IV. BUILDINGS			$ 4,341,200
V. PROCESSING EQUIPMENT			$ 519,120
VI. MOBILE EQUIPMENT			$ 420,000
VII. POWER BLOCK EQUIPMENT			$ 25,397,000
	SUBTOTAL CONSTRUCTION AND EQUIPMENT		$ 32,709,870
	CONTINGENCY	10%	$ 3,271,000
	DESIGN/ENGINEERING	5%	$ 1,799,000
	PERMITTING	2.3%	$ 828,000
	CONSTRUCTION INSPECTION	5%	$ 1,799,000
	TOTAL CAPITAL COST (FACILITY IMPLEMENTATION)		$ 40,406,870

NOTES:

(1) All costs rounded to 1000's

(2) All costs in 2003 $.

[illegible]

I. SITE AQUISITION

Item	Quantity	Units	Unit Price	Item Cost	Total
Property Purchase	14,685	Sq. Meter	$30	$440,550	
Subtotal I					$ 440,550

II. SITE DEVELOPMENT

Item	Quantity	Units	Unit Price	Item Cost	Total
Site Preparation Conversion= 0.3048					$ 152,200
Excavation -foundations(1)	5,491	Cu. Meters	$22	$120,800	
General Earthwork (2)	2,615	Cu. Meters	$12	$31,400	
Earth Fill Material	0	Cu. Meters	$22	$0	
Slope Stabilization	0	Cu. Meters	$40	$0	
Finishing Grassing & Grading	1	Sq meter	$22	$0	
Relocation of Circ Water Piping	0	Meter	$135	$0	
Demolition (Warehouse Buildings)	0	Cu. Meters	$12	$0	
Site Improvements					$ 1,016,400
Approach /Roadways Concrete (3)	80	Sq. Meter	$60	$4,800	
Asphalt Roadways & Parking	13,289	Sq. Meter	$65	$863,800	
Retaining Walls	153	Cu. Meters	$450	$68,800	
Site Drainage	1	L.S.	$40,000	$40,000	
Fencing(4)	500	m	$48	$24,000	
Landscaping (Minimal)	1	L.S.	$15,000	$15,000	
Site Utilities(5)					$ 267,100
Fire Protection	350	m	$135	$47,300	
Water Supply	350	m	$135	$47,300	
Well Field	0	LS	$50,000	$0	
Sewer System	350	m	$150	$52,500	
Electrical(6)	1	L.S.	$120,000	$120,000	
Subtotal II					$ 1,435,700

Notes:

(1) Based on estimated building Areas (sm). Demolition calculated separately

(2) General Earthwork includes moving soil, backfill, embankment, loadout tunnel excav, etc.

(3) Roadway unit price includes curbs, gutters, etc.

(4) Assumes perimeter fencing at 6' (1829 mm)(w/ barbed wire) with gates and litter fencing around maneuvering area of 15' (4572 mm)height.

(5) Utilities unit price includes excavation, bedding material, piping installed, backfill, etc.

(6) Electrical includes high voltage service transformer

[illegible]

III. SCALE HOUSE AND SCALES

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Building (1)	37	sm	$538	$19,914	
Concrete Slabwork(2)	11	Cu. Meters	$262	$3,000	
Concrete Footings	8	Cu. Meters	$523	$4,000	
Interior Treatments(3)	37	sm	$538	$19,914	
Motor Truck Scales & Foundations	2	LS	$60,000	$120,000	
Mechanical(4)	37	sm	$108	$3,983	
Electrical(5)	37	sm	$129	$4,779	
Subtotal III					$155,676

Notes:

(1) No additional facilities for waste delivery truck drivers or admintration activities areas, are included.

(2) Assumes stable soil with good load bearing capacity. Slab floor is 6"(152 mm) reinforced concrete.

(3) Includes tile, painting, window covers and funiture

(4) Building mechanical includes drains, plumbing, air handling, fire protection, etc.

(5) Electrical includes lighting, power, communications, etc.

IV. BUILDINGS

Item	Quantity	Units	Unit Price	Item Cost	Total
Metal Buildings - Preengineered	372	sm	$ 810	$301,000	
Ash Concrete Push Walls(3)	100	Cu. Meters	$ 523	$52,300	
Metal Buildings - Engineered	34,000	Cu. Meters	$ 100	$3,400,000	
Concrete Pit (3)	1,600	Cu. Meters	$ 290	$464,000	
Overhead Doors	6	ea	$ 10,000	$60,000	
Admin. Area (Control Room)	74	sm	$ 860	$63,900	
Subtotal IV					$4,341,200

Notes:

(1) Metal bldg. includes structural steel, column free bldg. (long span), 30 ft. (9144 mm)clear height, & 20 yr roofing warranty with mechanical and e

(2) Assumes stable soil with good load bearing capacity. Slab floor is 10" (254 mm) reinforced concrete on grade;
12" (305 mm)on structural slabs

(3) 4 ft (1219 mm)thick wall with 10 ft (3038 mm) thick mat