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U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

MONGOLIAN ENERGY SECTOR PROJECT

COMPONENT III

AEP-0438-C-00-3023-00

Task 1

"VALUE ENGINEERING/VALUE ANALYSIS"

REPORT

June 1993

MORRISON KNUDSEN ® CORPORATION

LTA-007/93

MORRISON KNUDSEN CORPORATION

MORRISON-KNUDSEN PLAZA
PO BOX 73/BOISE, IDAHO U S A 83729
PHONE (208) 386-5000/TELEX 368439

June 21, 1993

Agency for International Development
PRE/Cap/Engr
Washington, D. C. 20523

SUBJECT: AEP-0438-C-00-3023-00
Task 1 Interim Report Transmittal

Dear Sir:

Transmitted for your review are five (5) copies of the subject Report, in accordance with Section F.7(a) of the Contract. In addition, two (2) copies are being provided to USAID OAR/M and three (3) copies to the Project Manager in ASIA/DR/PD simultaneously in accordance with Section C.5(c) of the Contract. Two additional copies are being provided to the AID Development Information Services Clearinghouse (POL/CDIE).

In questions you may have regarding this interim report may be addressed to Mr. Ron Hamagami, in Morrison Knudsen's Boise Home Office, or to myself in Mongolia.

Sincerely,

Bruce P. DeMarcus

Bruce P. DeMarcus
Project Leader

cc: AID, OAR/M
AID, ASIA/DR/PD
AID, POL/CDIE
R. Hamagami
D. Price

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SECTION 1

1.0 EXECUTIVE SUMMARY

The United States Agency for International Development (USAID) has entered into a contract with Morrison Knudsen Corporation (MK) to perform services to the Mongolian Energy Sector Project (ESP), Component III, Contract No. AEP-0438-C-00-3023-00, dated April 23, 1993. Task 1 of Component III, the subject of this report, involved the use of Value Engineering (VE) methodology to arrive at a prioritized list of essential equipment, repair parts and consumables for purchase to assist the Mongolian Ministry of Fuel and Energy during the 1993-1994 heating season.

The Mongolian Energy Sector is currently undergoing a crisis situation. Outdated equipment and methodologies in the country's coal mines, power stations, and central heating plants have resulted in a condition which provides unacceptably low reliability factors in both branches of the energy sector. During the 1992-1993 heating season, these conditions came dangerously close to catastrophic results. The coal mines were barely able to provide the minimum amount of coal required to keep the vital central heating systems in operation and the power plants are in such a state of disrepair that a guaranteed coal supply would do little to ease the concern. A shutdown of these heating boilers would most surely have resulted in severe loss of human life and property.

In addition to the short term emergency planning for the upcoming heating season, Task 1 also involves preparation for the 1994-1995 and 1995-1996 heating seasons. Emphasis for these longer range goals will be shifting to replacement of outdated equipment and training of the Mongolian management, engineering, procurement and maintenance personnel to achieve a technically and economically stable energy sector.

1.1 VALUE ENGINEERING

Value Engineering / Value Analysis is a systematic approach to problem-solving which places emphasis on reducing the cost of a product or project without diminishing the quality of the end result. During the course of Components I and II of the Energy Sector Project, a list of equipment, parts and supplies for use during the 1993-1994 heating season was prepared in cooperation with personnel from the Ministry of Fuel and Energy. VE analysis was applied to this list to determine those items most essential and cost effective. The VE approach utilizes the following seven phases in the project evaluation:

- General Phase
- Information Phase
- Function Phase
- Creation Phase
- Evaluation Phase
- Investigation Phase
- Recommendation Phase

The VE meetings were hosted by USAID. The meetings began with an introduction of the VE approach, then split into power and mining groups for analysis of the respective procurement priority lists. Finally, a management committee met to review the findings prior to presentation to Minister Jigjid of the Mongolian government and Mr. William Nance, USAID representative to Mongolia.

1.2 MINING OPERATIONS

The Mongolian coal mining industry is experiencing a downward spiral of efficiency due to aging equipment fleets and outmoded methodology. While the long term goal is to renovate the methodology and equipment fleets, the immediate goal is to increase the efficiency of existing major mining equipment, including drills, draglines, shovels, overburden rail systems, and haul trucks, to enable the mines to produce enough coal to provide heating and electricity for the nation.

Several areas are identified for improvement:

- Blasting Initiation Systems. The lack of such a system leads to poor digging conditions for the excavators, reducing their efficiency.

- Large Road Graders and Tracked Bulldozers. The haul roads are the arteries for the mines. Lack of proper road maintenance results in increased tire wear and structural fatigue of the haul trucks. Adequately sized graders and tracked bulldozers can construct and maintain the haul roads in serviceable condition, even in Mongolia's severe weather.

- Large Front End Loaders. Coal containing unacceptable amounts of waste rock, or dilution, can be improved by large front end loaders and tracked bulldozers. The bulldozers can doze waste rock from the surface of coal seams and prepare drill benches on the exposed coal. The front end loaders can remove small pockets of waste from the coal much more easily than can an electric shovel.

- Maintenance Support Equipment. Equipment such as fuel & lube trucks, tire handling trucks and maintenance trucks all reduce the productive time lost when major mine equipment and support equipment breaks down.

- Radio Communications. Mine supervision can much more easily control the equipment fleets when radio communication with each piece is available. Changes in priorities can be quickly relayed to operators and equipment breakdowns can be readily communicated to maintenance personnel.

- Personnel Vehicles. Use of personnel vehicles, or mantrips, greatly improves the productive time of equipment operators. The practice of using production equipment to taxi personnel to and from shop and other facilities decreases the available productive time and increases wear and tear on the equipment, especially tracked equipment.

Another goal which spans both the short term and long term phases of the Component III efforts is training of mine personnel. This training program will be thoroughly developed during Task 2 and implemented in Tasks 8-10. The training will influence many areas of the mine, including management, blasting technology, haul road construction and maintenance, and preventive maintenance.

The importance of reaching a balanced mix between puchasing new equipment and spare parts to maintain the current mining equipment was a driving force for the VE participants. At the beginning of the meetings, a list of new equipment, equipment rebuilds, spare parts and consummables for the mines totalling over $30 million was presented. Each item was visited and revisited during the course of the meeting. Due to the limited budget available, some important support equipment had to be removed from the list of purchases to allow the purchase of critical spare parts. At the end of the meeting, less than $14 million remained.

The VE participants prioritized these remaining purchases to further identify the most critical expenditures. The final list also identified the suggested country of origin for each of the items. Due to the severe cutting of the original list of $30 million, all the remaining items should be considered critical; however, two Priority Levels were established. Table 1-1 lists the Level One Priority categories and the Level Two Priority items are summarized in Table 1-2.

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TABLE 1 - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
PRIORITY ONE MINING ITEMS

I.1	0.75-lb Cast Primers	$ 311,200	USA
	Primadet # 12, 30-ft	205,893	USA
	Primadet # 12, 12-ft	75,684	USA
	MS-65 Surface Delays	53,040	USA
	25-Grain Detonating Cord	187,018	USA
	EZ Det 25-350x18m	67,390	USA
	EZ Trunk Line, 17-ms x 9-m	2,722	USA
	Subtotal	902,947	
I.2	Dragline Parts, 20/90 @ 15/90	230,000	CIS
I.3	Electro Brushes	12,400	CIS
I.4	Rail Shifting Car Spare Parts	25,000	CIS
I.5	Railway Materials	949,986	CIS
I.6	Heating Plant Parts	107,876	CIS
I.7	Coal Loading Complex Spares	213,353	CIS
I.8	Shovel Parts, EKG-8i, EKG-4y	320,000	CIS
I.9	Coal Crusher - Feeder Breaker	478,300	USA
I.10	Overhead Trolley Lines for Electric Locomotive	116,600	CIS
I.11	Conveyor Zipper Splices	24,144	USA
I.12	Batteries - Railroad	29,784	USA
I.13	Small Engine Parts	82,412	CIS
I.14	T-130 Bulldozer Parts	92,474	CIS
I.15	Drill Rigs HV Electric Cable	89,250	CIS
I.16	Kraz Dump Car Parts	359,830	CIS
I.16	Kraz Dump Car Tires	113,777	USA
I.17	Aluminum Overhead Trans. Wire	82,260	USA
I.18	Polish Dump Car Parts	350,000	CIS
I.19	Railway Communication Parts	213,070	CIS
I.20	Electric Locomotive Parts	122,774	CIS
I.21	Diesel Locomotive Parts	173,711	CIS
I.22	Diesel Locomotive Rebuilds	270,000	CIS
	TOTAL	**$5,359,948**	
	AMERICAN SUBTOTAL	**$1,631,212**	

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TABLE 1 - 2
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
PRIORITY TWO MINING ITEMS

II.1	10/70 Dragline Bucket	242,016	USA
II.2	Ammonium Nitrate Blasting Prill	754,000	SWE
II.3	Bagged Emulsion, 130mm x 2m	532,000	SWE
II.4	Ammonit Cartridges, 20mm (Nalaikh)	10,000	CIS
II.5	Tire Handling Truck	291,975	USA
II.6	YAMZ-240 Engine Spare Parts	215,288	CIS
II.7	Electric Motors	1,508,400	CIS
II.8	HV Electric Cable	350,200	CIS
II.9	Water Pump Parts	165,200	CIS
II.10	Belaz Truck Tires	90,000	CIS
II.11	Haul Truck Tires	251,520	USA
II.12	Batteries	75,917	USA
II.13	Wire Rope	360,723	USA
II.14	Conveyor Belt	277,550	CIS
II.15	15/90 Dragline Bucket	190,296	USA
II.16	20/90 Dragline Bucket	234,300	USA
II.17	Dragline Parts, 13/50, 10/70, 6/45	100,000	CIS
II.18	Belaz Dump Truck Parts	556,863	CIS
II.19	Komatsu Dump Truck Parts	213,796	JAP
II.20	DET-250 Bulldozer Parts	165,042	CIS
II.21	10/70 Drag. Bucket Wear Parts	71,440	USA
II.22	15/90 Drag. Bucket Wear Parts	96,360	USA
II.23	20/90 Drag. Bucket Wear Parts	96,360	USA
II.24	CAT 16G Motor Grader	1,248,960	USA
II.25	Nalaikh Underground Mine Parts	100,000	CIS
II.26	Shovel Parts EKG 5a	120,000	CIS
	TOTAL	**$8,318,206**	
	AMERICAN TOTAL	**$3,159,867**	
	GRAND TOTAL	**$13,678,154**	
	AMERICAN GRAND TOTAL	**$ 4,791,079**	

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1.3 POWER AND HEATING OPERATIONS

The Component III Request for Proposal Scope of Work included responsibility for both the Darkhan Power and Heating Plant and Power Plant # 3 in Ulaanbaatar; however the Value Engineering meetings were attended by Dr. Otto Pflueger, a representative of the Government of Germany. Dr. Pflueger indicated Germany's desire to participate in the assistance to the Mongolian Energy Sector Project by performing work at the Darkhan Plant. The MFE and USAID accepted the offer and reassigned the Component III team to Plant # 3.

The power and heating VE committee was also restricted by the current funding limits. The Mongolian managers were told they would have to manage with the minimum parts and materials required for plant operation. Should additional funding become available from USAID or other sources, consideration must be given to major power and heating plant repairs and/or upgrades.

The six low-pressure boilers and four low-pressure turbine generators were built in 1968 by Soviet engineers. In 1976 seven high-pressure boilers and four high-pressure turbine generators were added to bring the total capacity to 148 mW. The low-pressure boilers currently operate at 75 % availability and the high-pressure boilers at only 55 %.

Coal quality has been one of the largest contributors to low plant availability. Designed to burn the coal from the Sharyn Gol Mine, Plant # 3 frequently has had to blend in Baga Nuur coal, which is of lower heat content and higher ash and moisture content than Shary Gol. In addition, both mines are producing coal of lesser quality than originally planned. Due to the lack of adequate inventories, the mines have many times had to ship uncrushed, run-of-mine coal to Plant # 3. This poses additonal problems which the plant is ill-equipped to handle.

The pulverized coal delivery system has experienced severe erosion and corrosion in all ball mills, classifiers, cyclones, primary air fans, PC pipes and associated parts. The superheaters and economizers are also in very poor condition due to temperature

fluctuations caused by poor fuel, abrasiveness of the ash, and/or poor water quality. Electric motors at the plant are a major concern, having generally outlived their serviceability.

General plant maintenance is very poor. Poor or broken lighting resulting in poor visibility even during daylight hours is a concern. Approximately 40 % of the plant's glazing is broken or missing entirely. A portion of the roof on the high-pressure side has collapsed due to heavy snow; there are no cranes currently in Mongolia capable of reaching the heights necessary to make the repairs.

Table 1-3 presents a summary of the power VE committee's final recommendations for purchase. Beginning with a list totaling $5.3 million, the committee cut the list to $3,245,759.

This is not nearly enough to address the many needs of Plant # 3. Tools are in very short supply but monies cannot be diverted from the critical spare parts to purchase tools; they would be unnecessary if there are no parts to install. Consumables such as good quality welding rod, nuts, and bolts are also needed. As future funding becomes available, these types of items should be addressed.

Training for the power plant staff is critical to the overall success of the Energy Sector Project. Basic management and financial training, development of uniform procedures for maintenance operations, and institution of technical procedures for calibration and testing must be accomplished. The language of training is also an issue. Since the vast majority of training material is in English or Western European language, the initial training will be in English; however, translations to Mongolian will be made where appropriate to facilitate the training process.

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TABLE 1 - 3
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
POWER / THERMAL PRIORITY ITEMS

ITEM DESCRIPTION	ESTIMATED COST
LOW - PRESSURE BOILERS	$ 398,775
HIGH - PRESSURE BOILERS	1,595,100
COAL HANDLING SYSTEM	36,491
SUPERHEATERS AND ECONOMIZERS	186,375
TURBINES, MOTORS AND ELECTRICAL PARTS	972,852
TOOLS	19,710
CONSUMABLES	36,456
TOTAL POWER / THERMAL ITEMS	$ 3,245,759

1.4 ENVIRONMENTAL ASSESSMENT

An environmental assessment of the two largest coal mines, Baga Nuur and Sharyn Gol, and the Ulaanbaatar power plants addresses the existing conditions, identifies the current high-risk situations and proposes short-term actions where warranted and productive. Given the current serious nature of the Mongolia Energy Sector, it is imperative the available resources be allocated where the greatest need exists.

Possibly the greatest environmental concern in the ESP is water quality and quantity. The arid climate and previous misuse of the available resource makes water a high priority. Air quality is also a concern, especially in Ulaanbaatar and the other cities.

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Equally important is the health and safety of employees at the mines and power and heating plants. In many cases, the simplest of safety rules are not observed:

- Hard hats not being worn
- Poor or non-existent lighting
- Dust accumulation

At the mines, the most noticeable safety violations were on the haul roads, lack of hard hats and poorly protected electrical distribution networks. Poorly maintained haulroads result in violation of lane travel to avoid potholes, rocks and debris. A haul road maintenance program with large motor graders can alleviate this problem.

Lack of hard hats is dangerous even when other conditions are controlled. Hard hats should become a mandatory requirement for all mine employees.

Dragline trail cables were not grounded, splices were uninsulated, cables had obviously been stretched and employees do not use insulated gloves when handling the cable. An electrical safety training program should be instituted and strictly enforced at the mines.

Control of runoff from mined areas is nearly non-existent; however, probably due to the arid climate, little erosion is evident and there are no observed signs of pyrite oxidation. Dewatering/depressurization is a potential source of pollutants. At Sharyn Gol, depressurization is not required and no obvious signs of pollutants exist in the dewatering system. Depressurization waters at Baga Nuur are used as make-up water at the mine's thermal plant. Revegetation of regraded spoils would mitigate any of the observed water control concerns.

Air quality concerns at the mine relate primarily to fugitive dust emissions from the haul roads. A properly scheduled haul road watering program can minimize the effects of these emissions.

The efficacy of each of these safety-related improvements could be measured by documenting pre-implementation rates of injury or times to complete certain tasks, collecting post-implementation data and comparing the two.

Two primary safety concerns were noted at Power Plant # 3. The most notable was the lack of cleanliness. A thick coating of coal dust and ash exists virtually throughout the plant. The addition of water from leaking pipes turns this dust to mud. In addition, conditions such as poor lighting, open manholes and poorly maintained stairs constantly threaten worker safety.

There are several potential water quality problems associated with the power/thermal plants such as cooling tower blowdown, ash pond supernatant and sanitary sewage. The only observed discharge was supernatant from the ash pond at Power Plant # 3. A new pond is currently under construction from which the water will be recirculated.

In all plants observed, the most obvious pollutant contribution is in the form of fly ash from the stacks. Even though particulate control devices are in place at the majority of the plants, fly ash collection is far from optimum.

Indoor air quality, light levels and temperatures should be monitored, both before and after implementation of cleanup, repairs and/or replacement. Detonation frequency in boilers and pulverizers should be monitored and compared for pre- and post implementation.

SECTION 2

2.0 INTRODUCTION

2.1 GENERAL

Morrison Knudsen Corporation (MK) is under contract to the United States Agency for International Development (USAID) to perform Component III of the Mongolian Energy Sector Project (ESP). This report deals with Task 1 of Component III, Value Engineering/Value Analysis (VE). The purpose of this task is to review the results and status of Components I and II to determine the appropriate course of action for future USAID efforts.

The energy industry of Mongolia is currently undergoing a crisis situation. Lack of production from the country's operating coal mines and deterioration of the power plants providing electricity and district heating to the inhabitants have resulted in extremely low reliability of the entire system. Component I of the ESP dealt with emergency procurement and installation of equipment, spare parts, and consumable supplies for both the mines and the power plants during the 1992-1993 heating season. Despite these efforts, the country came dangerously close to being without power and heat during the coldest months of the year. This would have resulted in catastrophic conditions.

The most important of these problems is the shortage of coal fuel. The two most productive coal mines, Baga Nuur and Sharyn Gol, have been unable to uncover and produce enough coal to keep up with the demand from the coal fired power plants. Additionally, overall coal quality from the mines has been inferior to the plant boiler design specifications, resulting in decreased power and heating production from the power plants.

The power and heating plants also have developed many operational problems inherent to the deterioration of the equipment. The plants were manufactured by the Commonwealth of Independent States (CIS) and with the withdrawal of CIS support, has left the

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Mongolian government without dependable supply channels for much needed replacement equipment and spare parts.

Component II involved coordination between USAID and its Contractor and the Mongolian Ministry of Fuels and Energy (MFE) to develop a list of critical needs for the 1993-1994 heating season. Primarily Component III of the ESP provides for the emergency supply of equipment, spare parts, and consumables for the mines and power plants, but includes much more as well. The scope of work also involves long-range preparation for the 1994-1995 and 1995-1996 heating seasons. It is the intent that emphasis will be shifting from simple renewal of emergency consumables toward replacement of outdated equipment. It is USAID's desire that by August 1995, the Mongolian Energy Sector will be providing its own consumables and there will be a substantial renewal of the critical equipment inventory, especially at the mines.

Also included, upon USAID's approval is training of the Mongolian management, engineering, procurement, and maintenance and operations personnel to move beyond emergency response actions to a point where operation of the mines and plants rely on VE study and prior planning. This should allow the Mongolians to manage and operate a technically and economically sustainable energy sector.

During Components I and II, purchase of emergency supplies was allowed virtually without restriction on the Country of Origin. For the 1993-1994 heating season, purchases will be made from United States suppliers whenever possible. USAID will approve all purchases and expenditures and must sign waivers on equipment, parts or supplies purchased outside the United States.

During the course of Components I and II, the Mongolian Ministry of Fuel and Energy (MFE), with the support of Raytheon Engineers and Constructors (RE&C), formerly United Engineers and Constructors, and MK prepared a list of equipment, parts and supplies needed for the 1993-1994 heating season. Task 1 of Component III involved the application of VE techniques to this list to determine those items most essential and cost

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effective. A priority listing was developed to aid in decisions regarding USAID funding of procurement activities. In addition, recommendations were made for enhancing management systems at the mines and plants.

2.2 VALUE ENGINEERING

Value Engineering/Value Analysis provides a positive course of action to skillfully, deliberately, and systematically analyze and control the cost of a product. The goal of this systematic approach is to isolate the necessary from the unnecessary by developing alternative means of achieving the functions that are needed and desired. Through the VE system, the product is reduced to its essential functions. The most economical means of accomplishing those functions, without diminishing the quality and effectiveness, is sought.

The Value Engineering Systematic Approach is separated into seven phases:

- General Phase
- Information Phase
- Function Phase
- Creation Phase
- Evaluation Phase
- Investigation Phase
- Recommendation Phase

The first six of these phases were conducted during a series of meeting from April 29 through May 1, 1993. The latter phase is the subject of this report. A brief discussion of each phase of the Value Engineering approach follows:

2.2.1 General Phase

This phase is fundamentally the identification of the project or product to be analyzed. As such, many people do not identify it as a distinct phase. During this phase of the analysis, it is important to set the stage for the later phases by developing a receptive attitude to new ideas.

2.2.2 Information Phase

As indicated by the title, this phase is used to gather pertinent information about the project, including the specifications and requirements of the job and the accurate costs of those specifications and requirements.

2.2.3 Function Phase

Determining specifically and precisely what the desired functions of the project are allows the Value Engineering team to address each specific function separately. Emphasis is placed on defining the functions in two-word phrases, one verb and one noun.

2.2.4 Creation Phase

This phase involves maximizing the creative portion of the brain and minimizing the judicial portion so that innovative ideas concerning the project can be brought to the table for discussion. Many ideas are sought, so that the right one or, more likely, a combination of ideas comprising the right one can be recognized in the later phases.

2.2.5 Evaluation Phase

During this phase, the judicial part of the mind is brought back to focus. The ideas tabled during the creative phase are reviewed, costs are applied to the ideas, and some ideas are combined into new ideas. It is important to establish costs, again as accurately as possible, for each idea. The ideas and costs are evaluated by comparison to determine the most cost effective solutions.

2.2.6 Investigation Phase

The techniques of this phase further refine the selected ideas into workable solutions. The use of standard equipment and methods can sometimes provide a tried and proven solution. In other cases, vendor consultations and new or specialized equipment may provide a more cost effective solution. These sources should be consulted for all functions to ensure thorough evaluations of the selected ideas.

2.2.7 Recommendation Phase

This phase is the culmination of all the previous efforts. Despite all the care possible in the earlier efforts, poor preparation and execution of the Recommendation Phase can result in failure of the project. It is important to include factual information and accurate costs in this phase and to motivate positive action by the reviewer.

2.3 VALUE ENGINEERING MEETINGS

The United States Agency for International Development hosted the VE meetings, beginning on the morning of April 29 and ending the afternoon of May 1, 1993 with presentation of the results to Minister Jigjid of MFE and William B. Nance. USAID

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Representative to Mongolia. Attending the meetings were representatives of MFE; RE&C, Contractor for Components I and II, and MK, acting in the dual role of subcontractor for Components I and II and Contractor for Component III. Also represented were the Government of Germany and Burns and Roe Company, a subcontractor to MK.

The meetings began with an introduction of all parties followed by an explanation of the VE systematic approach to problem solving. The group was then split into two separate committees: one for coal mine related matters, the other for power and district heating plants. These separate meetings continued through Friday, April 30. On the morning of May 1, a management committee convened to review the findings of the other two committees. The meetings were completed with a presentation to Minister Jigjid on Saturday afternoon.

2.4 REPORT ORGANIZATION

This report on Task 1, Value Engineering/Value Analysis is presented in five sections as follows:

- Section 1 Executive Summary
- Section 2 Introduction
- Section 3 Mining Operations
- Section 4 Power / Heating Operations
- Section 5 Environmental Assessment

Upon USAID's approval of this report, MK will use it as the basis for developing the plan and schedule for the remainder of the ESP Component III under Task 2 and for preparing equipment, commodity and instrumentation specifications and procurement of the items approved during the VE under Task 5. The goal is to achieve an integrated mine, coal handling and power plant operating plan to provide the most cost-effective schedule of activities for the remainder of the ESP Component III.

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SECTION 3

3.0 MINING OPERATIONS

3.1 INTRODUCTION

The Mongolian coal mining industry is unable to meet the fuel supply requirements of the country's thermal power and steam generation plants. Coal mine production has been severely hindered by numerous problems. Chief among these is the low level of Government investment made in the mining industry over the past several years. Direct results of this budgetary problem are an inefficient equipment fleet and chronic shortage of repair parts and supplies with which the mines must constantly cope. Other problems include low workforce productivity, poor maintenance planning and antiquated mining practices.

Prior to the country's market reforms in 1989, the Mongolian coal mines operated with an annual maintenance and repair budget of approximately $40.0 million. This budget included the cost of replacement parts, spare parts and consumable supplies, but did not include the cost of labor or capital investments for new equipment. In recent years the mines have been forced to operate with far less financial resources and, as a result, are facing sharp reductions in productive capacity.

In order to bring the mines up to a minimum level of sustainable operations, the Value Engineering team ("VE team") analyzed the immediate equipment, spare parts and supplies needs of the mines. Preliminary estimates indicated that an investment of a minimum of $30.8 million was needed this year. This estimate included equipment additions, replacements, rebuilds, spare parts and consumable supplies.

It became clear that only the most essential expenditures could be scheduled, therefore only $13.7 million was identified. This was accomplished through a series of reviews that eliminated all expenditures that were not absolutely critical to the continued operation of the mines this

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coming winter. The limited funds now made available to the mines from USAID must be seen as a short-term lifeline, and not as an investment for continued long-term operations.

The VE team established strict priority classifications for the purchase of spare parts, replacement parts, supplies and new equipment. Significant analysis was required to determine the trade-off between the "high productivity / high cost" of new equipment purchases, and the "lower cost / lower productivity" of simply maintaining the existing fleet.

Major new equipment purchases were not feasible under the budget limitations. Even the purchase of some critical new support vehicles had to be postponed until additional funding becomes available.

The expenditures recommended by the VE team were prioritized into the following categories:

- New equipment additions.
- Replacements of existing equipment.
- Equipment rebuilds.
- Purchase of spare parts and consumable supplies.

The detailed listing of the entire $30.8 million developed in the informational stage is provided in Appendix A-1. Through a strenuous process of elimination, spending priorities were then established for the $13.7 million. These are denoted in Appendix A-2.

One critical area which could not be funded at this time was training for mine site managers and key production personnel; however, training will be provided for in the revised work plan of Task 2 and initiated upon subsequent USAID approval, if found appropriate.

3.2 NEW EQUIPMENT ADDITIONS

The VE team was presented a list of the recommended support equipment additions needed by the coal mines. The list contained only a fraction of the total additional equipment deemed

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necessary for the mines' short- and long-term operations. Current budget limitations severely limited the spending approvals for additional equipment.

Nonetheless, some equipment was found to be necessary to sustain mining operations through the winter of 1993 - 1994. These three fleets were recommended for immediate purchase. The following table describes the equipment needed and the estimated cost.

TABLE 3 - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
NEW EQUIPMENT ADDITIONS

EQUIPMENT ITEM	QUANTITY	ESTIMATED COST	SOURCE
Mobile Coal Feeder-Breaker	1	$ 478,300	USA
Tire - Handling Truck	3	291,975	USA
Motor Grader	3	1,248,960	USA
Total Equipment Additions		**$2,019,235**	

3.2.1 Mobile Coal Feeder - Breaker

During the winter of 1992 - 1993 the random delivery of uncrushed, run-of-mine coal to the power plants was a serious problem. Large blocks of coal and rock (some exceeding one meter in size) were delivered to the plants.

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Incorporated into the plant feed, these large blocks of material will slow and even plug the pulverizer feeder chutes. Delays of material to the pulverizers interrupt the flow of coal into the furnaces and cause reductions in power and heat production. On several occasions, material plugs in the feeder chutes caused extended power outages.

Unplugging the feeder chutes by hand is dangerous and time consuming. Coal deliveries are delayed as the following train loads of coal are halted until the feeder chutes are unplugged. The sources of the oversize coal were determined to be primarily the Baga Nuur and Shivee Ovoo mines.

The Baga Nuur mine produces 70% of the central Mongolian coal supply, or approximately 4,000,000 tonnes annually. Nearly 40% of the coal transported from the mine is not crushed. Most of this uncrushed coal is produced at an outlying pit which does not have access to the primary crushing facilities in the main mine complex. Coal from the satellite pit is hauled to a nearby rail siding and loaded into rail cars uncrushed. This is due to the hauling distance to the primary crushing facility. The Baga Nuur problem was marginally reduced by the installation of steel bars in the coal loadout shovel buckets. This reduces the amount of oversize coal loaded.

The Shivee Ovoo mine, which began operations in 1992, has no crushing or screening facilities; therefore, all shipments from this mine are uncrushed run-of-mine coal. Production for Shivee Ovoo in 1993 is forecast to increase to 800,000 tonnes. The continued delivery of such large quantities of oversized coal is not acceptable.

The purchase of a Stamler Feeder-Breaker was recommended during the VE team meetings. A final decision as to the unit's location (at either the Shivee Ovoo mine or the Baga Nuur mine) has yet to be made. At either mine, the run-of-mine coal will be delivered to the rail load-out point, crushed by the feeder-breaker unit, and then stockpiled along the rail siding for subsequent loading into rail cars. As funds become available in the future, a total of three feeder-breaker units will be required. One unit will be located at each of the major mines.

3.2.2 Tire Handling Trucks

Tire handling trucks, equipped with a hydraulic boom and special attachments for removal and mounting of tires, are an essential support vehicle in mines utilizing large haul truck fleets. Haul truck tires represent a significant operating expense for the mines. Special handling tools are needed to maximize tire life and reliability.

The common practice in Mongolian mines is to change tires manually. This procedure requires five or six workmen and one or two workshifts to accomplish. The hauling hours lost during these extended repair periods represent a significant portion of the total hours available to the haul truck fleet. In addition, the physical effort required to change a tire manually often results in damage to the tire casing or rims. During a VE team site visit to the Sharyn Gol mine, a total of seventeen people were observed attempting to break the bead on a haul truck tire.

A tire handling truck will provide exceptional service and value to the mines. The operating life of the tire handling trucks is anticipated to be more than ten years. The purchase of three tire trucks (one each at the Baga Nuur, Sharyn Gol and Shivee Ovoo mines) has been recommended.

3.2.3 Motor Graders

Properly constructed and maintained haul roads are the foundation for improved mining production. The importance of the haul roads to a mining operation cannot be over-emphasized. The motor grader fleet is an essential component for efficient mining operations. Motor graders are operated continuously, maintaining haul roads, whenever the haul truck fleets are running.

The motor grader should be the first piece of equipment to enter the mine at the start of an operating shift. The motor grader operators inspect the haul roads and prepare the roads prior to the haul trucks entering the mine. At the end of each shift, the last piece of equipment to

leave the mine should be the motor grader, leaving the roads in working condition for the next shift.

The three major coal mines in Mongolia (Baga Nuur, Sharyn Gol and Shivee Ovoo) require large capacity motor graders because of the size of the haul trucks, road compaction problems, lengthy winter season and frost conditions encountered. The VE team recommends a 250-300 horsepower machine with a five-meter blade. The preliminary estimate for the unit cost of the motor grader is $385,000 with an anticipated delivery date of the fleet in three to four months.

To increase the operating efficiency of the mines, larger capacity haul trucks should be considered in the future. As the size of the haul trucks increase, well constructed and maintained haul roads become even more important. Larger haul trucks would not be compatible with the existing haul roads. Haul trucks operating on properly constructed and maintained roads may have a service life of up to twenty years. In Mongolia the average haul truck operating life is only 3 - 5 years. One factor that contributes to this substantially reduced operating life is the poor condition of the haul roads in Mongolia.

During one inspection of the Baga Nuur mine, loaded haul trucks were observed almost tipping over sideways due to poor road construction. Truck speeds had to be reduced to a crawl over one especially bad segment of road, approximately 100 meters in length. The constant damage being done to the trucks operating under these conditions is significant. The motor grader recommended above could have corrected this type of road condition in less than thirty minutes.

Another major problem is tramp steel and mining debris embedded in the road or frozen to the surface of the haul roads during the winter months. Haul truck tires punctured or "staked" in this manner are often irreparable. During one site visit, a piece of spiral drill steel was observed frozen to the surface of a haul road at the Shivee Ovoo mine. The drill steel had a polished appearance indicating that it had been driven over many times. Face cuts were evident on the

tires of the trucks traveling this road. One pass with the motor grader recommended would have removed this tire hazard.

Truck drivers in Mongolia are paid an incentive based on the number of loads hauled during each shift. This incentive works to encourage the truck drivers to travel at speeds that exceed road conditions and to ignore debris on the road.

While the immediate recommendation is to supply one motor grader to each of the primary coal mines, the ultimate requirement is for eight units: Three each at Baga Nuur and Sharyn Gol; and two units at Shivee Ovoo.

3.2.4 Future Equipment Additions

Critical production equipment not included due to lack of funding would include arge rubber-tired loaders (11.5 m^3) and bulldozers (350 hp). Mobility of rubber-tired equipment is most advantageous in such large multiple-pit operations. Support and utility equipment has possibly never been recognized as important; however, these critical pieces allow the major equipment to perform more effectively and efficiently . Support equipment should include personnel transport vehicles, fuel and lube trucks, and mechanic / electrician trucks.

Additionally, serious consideration should be given to the acquisition of Bradford breakers for Sharyn Gol and Baga Nuur mines. This crushing system will scalp off the rocks loaded with the coal to minimize their content in the coal feed to the plants.

Radio communications between the major equipment and the support equipment allows the mine supervisors to assert positive control over the operation. With proper radio communications, changes in priorities can be quickly relayed to operators and maintenance personnel can be notified of equipment breakdowns in a timely manner. In the Mongolian coal mines only the major equipment, such as excavators and locomotives, are equipped with radios. Two-way

radios should be placed in all mining equipment. Support equipment, most of all, should be equipped with radios so it can be summoned as the need arises.

Personnel vehicles allow the equipment operators to be transported to their work locations with a minimal loss of equipment operating time. When equipment operators have no means of transportation to and from their work areas, they will use the mining equipment as taxis. For example, at Sharyn Gol the operators in the mine walk to and from their equipment at the beginning and end of each shift. This walk, done in all weather conditions, can take up to thirty minutes each way. As a result, it is not uncommon to see crawler tractors and haul trucks, with as many as six people in the operators' cab, making the trip to the mine cafeteria. Tractors, especially, should not be used in this manner. The track assemblies are not designed for high speed use over long distances. The result of such misuse is premature track failure and subsequent track assembly replacement.

3.3 EQUIPMENT REPLACEMENTS

All of the major equipment fleets now in operation at the Mongolian mines are necessary to meet production requirements. Budget constraints prevented the VE team from purchasing replacements for even the most inefficient operating units. The only recommended replacements for existing equipment made at this time are for a total of four dragline buckets.

3.3.1 Dragline Bucket Replacements

The draglines at Baga Nuur move more overburden per unit than any other Mongolian excavator. The availability of these machines is reduced by the frequent failure and repair needs of the buckets.

Modern heavy-duty buckets, made in the United States, are expected to have a life of three times the existing buckets. New buckets will be equipped with plastic wear liners and quick-change

teeth. The use of wear liners is a cost effective method of increasing the life of a dragline bucket used to excavate abrasive rock. The quick-change feature minimizes downtime when replacing bucket teeth. The recommended dragline bucket replacements are summarized in the following table.

TABLE 3 - 2
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
DRAGLINE BUCKET REPLACEMENTS

DRAGLINE	UNITS	ESTIMATED COST	SOURCE
ESH 10 / 70	2	$ 71,440	USA
ESH 15 / 90	1	96,360	USA
ESH 20 / 90	1	96,360	USA
TOTAL BUCKETS	4	**$ 264,160**	

These buckets will take approximately four months from the time of order to manufacture and an additional two months to ship. The dragline buckets should arrive six months after the date of order.

3.3.2 Future Equipment Replacements

Additional equipment replacements recommended by the VE team, but not able to be funded, focused on excavator fleets. The Soviet-made shovel fleet is inefficient and subject to low availability. A recommendation for the future is to replace any shovel which might become inoperable with a rubber-tired front-end loader equipped with a 11.5-m^3 bucket.

3.4 EQUIPMENT REBUILDS

The rail-based haulage of waste material currently used at the Mongolian mines can never be as efficient or flexible as a modern truck haulage system, but budgetary constraints make the conversion to a truck haul system impossible in the near-term. The rail system, therefore, must be kept semi-operational until adequate funding is available to retire this outmoded system.

Component I of the Emergency Program funded only two locomotive rebuilds out of the six requested. In order to increase the waste haulage capabilities of the mines, three additional locomotives should be overhauled and rebuilt. The cost of these three rebuilds is estimated to be $270,000, or $90,000 each. The timeframe for the completion of the work is two months per rebuild or six months from time of order to complete the rebuilds.

Should additional funding become available in the future, two strategies aimed at addressing the mines' waste haulage requirements can be implemented. A short-term strategy would be the continued rebuilding of the remaining locomotives at the mines. This strategy would increase the reliability and availability of the locomotive fleet and allow the mines to excavate greater volumes of overburden and thereby increase coal production as well, until alternative systems are employed.

A longer term strategy, which is imperative, would begin the conversion of the mines from the current rail haulage system to a truck-based waste haulage system. Such a conversion would contribute to an overall improvement in mine production and efficiency, and should begin as soon as possible.

3.5 SPARE PARTS

Spare parts purchases for key major equipment fleets were prioritized by the VE committee. Table 3-3 lists the equipment groups and associated costs for Priority Level One status. The fleets categorized as Priority Level Two are presented in Table 3-4.

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TABLE 3 - 3
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LEVEL ONE PRIORITY SPARE PARTS

Spare Part Category	Estimated Cost	Source
Dragline Spare Parts (ESH 20/90 & ESH 15/90)	$ 230,000	CIS
Rail Shifting Car Spare Parts	25,000	CIS
Heating Plant Parts	107,876	CIS
Coal Loading Complex Spare Parts	213,353	CIS
Shovel Parts (EKG-8i & EKG-4y)	350,000	CIS
Support Equipment Parts (Small Engines)	82,412	CIS
T - 130 Tractor Parts	92,474	CIS
Kraz Truck Parts	359,830	CIS
Dump Car Parts (Fabricated in Poland)	350,000	POL
Railroad Communication System	213,070	CIS
Electric Locomotive Parts	122,774	CIS
Diesel Locomotive Parts	173,711	CIS
Total Level One Spare Parts	$ 2,320,500	

TABLE 3 - 4
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LEVEL TWO PRIORITY SPARE PARTS

Spare Part Category	Estimated Cost	SOURCE
YAMZ - 240 Engine Parts	$ 215,288	CIS
Electric Motor Parts	1,508,400	CIS
Dewatering Pump Parts	165,200	CIS
Dragline Spare Parts (ESH 13/50, 10/70 & 6/45)	100,000	CIS
Belaz Truck Parts	556,863	CIS
Komatsu Truck Parts	213,796	JAP
DET - 250 Tractor Parts	165,042	CIS
Repair Parts (Nalaikh Underground Mine)	100,000	CIS
TOTAL LEVEL TWO SPARE PARTS	$ 3,024,589	

3.6 CONSUMABLES

Consumable supplies were also considered by the VE committee for prioritization. Table 3-5 presents those supplies receiving a Level One Priority status, while the Level Two Priority categories are listed in Table 3-6.

TABLE 3 - 5
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LEVEL ONE PRIORITY CONSUMABLES

CONSUMABLE CATEGORY	ESTIMATED COST	SOURCE
Blast Initiation Systems	$ 902,947	USA
Electric Motor Brushes	12,400	CIS
Railroad Materials (Switches, Track, Etc.)	999,986	CIS
Overhead Trolley Lines	116,600	CIS
Conveyor Splice Kits	24,144	USA
Locomotive Batteries	29,784	USA
High Voltage Power Cables (Blasthole Drills)	89,250	CIS
Kraz Truck Tires	113,777	USA
Overhead Transmission Wire	82,260	USA

TOTAL LEVEL ONE CONSUMABLES	$ 2,315,742
USA SOURCED CONSUMABLES	$ 1,152,912
CIS OR OTHER SOURCES	$ 1,162,830

TABLE 3 - 6
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LEVEL TWO PRIORITY CONSUMABLES

CONSUMABLE CATEGORY	ESTIMATED COST	SOURCE
Prilled Ammonium Nitrate	$ 754,000	SWE
Bagged Emulsion Explosives	532,000	SWE
Ammonit Cartridge Explosives (Nalaikh Underground Mine)	10,000	CIS
High Voltage Power Cables	350,200	CIS
Belaz Truck Tires	90,000	CIS
Komatsu Truck Tires	251,520	USA
Batteries (Trucks and Tractors)	75,917	USA
Wire Rope	360,723	USA
Conveyor Belt Supplies	277,550	CIS
Dragline Bucket Wear Parts	264,160	USA

TOTAL LEVEL TWO CONSUMABLES	$ 2,966,070
USA SOURCED CONSUMABLES	$ 627,670
CIS OR OTHER SOURCES	$ 2,338,400

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The highest priority consumable item for the mines was the procurement of modern blast initiation supplies. "Controlled delay blasting" maximizes the energy available in bulk explosives and greatly improves rock fragmentation. The explosive energy of the blast is retained within the rock, where it does the most work.

The use of modern blasting supplies and techniques will allow a very rapid improvement in the productivity of the draglines and shovels. Improved blasting techniques will result in significant reductions in bucket and tooth wear and extend the operating life of the hoist and drag wire ropes. Reduced mechanical breakdowns in these fleets can be expected.

Blasting practices observed in Mongolia generally mirror those practiced in the Western mining industry more than thirty years ago. Subsequent technical advances, such as high speed photography and computer aided analysis, have refined blasting techniques and resulted in much more productive and cost effective operations. Dramatic improvements in blasting practices and initiation systems have been made in the last ten years.

Current blasting practices in the Mongolian mines can be described as "uncontrolled blasting". Fly rock is thrown excessive distances in all directions. This results in constant damage to equipment and power lines, and creates a very dangerous environment for minesite personnel. Fly rock deposited on haul roads creates tire hazards and increases cleanup work.

Even though the energy released into the air from this form of detonation is massive, the fragmentation of the rock is generally poor. This represents a significant waste of explosives, both in energy and cost.

3.7 TRAINING

Even though no funding has been defined in the VE analysis, specifically for formal training programs, a certain amount of training for the Mongolian staff members will occur through their

working relationships with the ex-patriate mine operations and maintenance supervisors. Future funding for specific training programs, however, must become a high priority item for USAID. As part of M-K's Task 2 efforts, such training programs will be defined and initiated upon approval, if deemed appropriate by USAID.

Training programs will contribute to long-term production improvements and cost reductions in the mines of Mongolia. Through training programs, the Mongolian coal industry will begin to apply practical knowledge to improve overall mine efficiency and production. As new technology and equipment is made available to the mines, technical assistance will become a necessity. Overseeing implementation will be critical.

Training in the use of the blast initiation systems was introduced under Component I of the Emergency Funding. In addition to classroom seminars, a trial shipment of the initiation system was supplied for the purpose of demonstration blasting. As a direct result of the training, the Mongolians realized a need for the modern blasting systems.

Another important area of instruction is proper operational procedures such as, but not limited to, haul road construction and maintenance, and the direct relationship between well maintained haul roads and reduced truck repairs. Instructions in the effective use of motor graders will be required.

Seminars on establishing preventive maintenance programs will be conducted. Guidelines will be established for inspection of specific pieces of equipment. Manufacturers' brochures and pamphlets from multiple suppliers will be made available to the Mongolians for study.

In the past, sources of supply and equipment were largely limited to Eastern Bloc manufacturers. Recent economic reforms, however, have opened the country to the worldwide market of industrial goods. Equipment training programs can help establish the Mongolian market for high quality American engineering and mining products.

Emphasis should be applied to management and administrative procedures. Thes should include, but not necessarily be limited to, scheduling, disciplinary policy, budgeting, monitoring, inventory control, safety, and environmental.

Consideration should be given to placing key Mongolian personnel at coal mines in the United States where they can observe professional equipment maintenance programs and engineering technology in practice. In this manner these individuals will gain a thorough understanding of the general performance standards of coal mines outside of Mongolia. The opportunity to visit coal mines in the United States should be extended not only to mine managers, but also to key officials of the Ministry and those individuals supervising maintenance and production departments at the mines.

SECTION 4

4.0 POWER & HEATING OPERATIONS

4.1 INTRODUCTION

The MK Value Engineering team (VE team) responsible for power and heating operations was originally assigned to both the Darkhan Plant and Plant No. 3, located in Ulaanbaatar. Subsequent discussions with Dr. Otto Pflugler, a representative of the German government, revealed the desire of the German funding agency to focus their resources on the Darkhan Plant. The MFE and USAID accepted the German offer and reassigned the MK team solely to the operation of Plant No. 3.

The immediate task facing the VE team is the need to maintain power and heat production at Power Plant # 3. The principal constraint to accomplishing this task is the lack of available replacement parts, supplies and materials. Plant upgrades, while strongly advised, must come later due to the currently limited funding and would likely be accomplished over the next 2-1/2 years. It was stressed to the plant managers that they would have to get by with the minimum parts and materials required for plant operation. It was agreed that this may result in some days during the coming winter when less heat and electricity is available than normal standards of comfort may require; however, the primary objective would be to avoid any emergency situation. The limited financial resources available to the plant require that only the most critical spare parts be purchased at present. As a result, the possibility of future shortfalls in power and heat production can not be ignored. The efforts of the VE team will be directed at preventing or minimizing the possibility of such occurrences.

4.2 PLANT DESCRIPTION & SPECIFICATIONS

Plant No. 3 was designed and built by Soviet engineers in the mid-1960's. Originally configured to serve primarily as a central heating plant, in 1968 the facility initiated operation of its six low-

pressure boilers. In 1976 seven additional high-pressure boilers were installed to increase the plant's power generation capacity. With this expansion, the rated capacity of the plant reached 148 MW. Plant No. 3 also provides up to 35 - 40 % of Ulaanbaatar's heat and hot water requirements.

The plant burns domestically produced, low calorific coal. Average fuel consumption at the plant is approximately 2,500 tonnes per day. Fuel consumption during the peak winter months, however, can rise to 3,000 - 4,000 tonnes per day. In 1992, approximately 900,000 tonnes of coal were consumed at the plant. In the same period, over 200,000 tonnes of ash were removed from the boilers for disposal. Feed water is piped from wells located 18 kilometers from the plant.

The plant employs 1,100 full-time workers. The payroll includes 150 management and engineering positions and 950 technical and support staff members.

4.2.1 Low-Pressure Boilers

The low-pressure boilers (LPBs) currently operate at 70% - 80% of nameplate capacity. The shortfall in production is due to the age of the boilers, the chronic shortage of spare parts and inherent design deficiencies. As a result, both the mechanical availability and reliability of the LPBs is very low. The average availability of the LPBs is estimated to be less than 75%. The power VE committee identified $ 398,775 for needed repairs in the LPBs.

Table 4-1 summarizes the specifications and operating capacities of the low-pressure equipment at the plant.

TABLE 4 - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LOW PRESSURE BOILER SPECIFICATIONS

Steam Flow	75 Tonnes / Hour (165,450 lbs / Hour
Steam Pressure	39 kg / cm3 (554 psig)
Steam Temperature	439 o C (815 o F)
Boiler Blowdown	3% of the steam flow
Combustion Air Temperature	20 o C (68 o F)
Flue Gas Temperature	127 o C (260 o F)
Excess Air	20 %
Air Leakage	7 %
Fuel Characteristics:	
Carbon	34.4 %
Oxygen	8.6 %
Hydrogen	2.2 %
Sulfur	0.35 %
Nitrogen	0.44 %
Moisture Content	31.3 %
Ash	22.7 %
Heating Value	3,003 kCal /kg (5,417 Btu / lb)
Fuel Sources	Sharyn Gol Coal Mine BagaNuurCoalMine

4.2.2 High-Pressure Boilers

The high-pressure boilers (HPBs) are also only able to operate at 70% - 80% of the nameplate design. The reliability and mechanical availability of the HPBs is below that of the LPBs. The average availability of the HPBs is estimated to be less than 55%. Table 4-2 summarizes the specifications and operating capacities of the high-pressure equipment at the plant. A total of $ 1,595,100 was identified by the VE committee for HPB repairs

TABLE 4 - 2
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
HIGH - PRESSURE BOILER SPECIFICATIONS

Steam Flow	**220 Tonnes / Hour** **485,000 lbs / Hour**
Steam Pressure	**100 kg / cm3** **(1,422 psig)**
Steam Temperature	**540 o C** **(1,004 o F)**
Boiler Blowdown	**0.5 % of the steam flow**
Combustion Air Temperature	**20 o C** **(68 o F)**
Flue Gas Temperature	**153 o C** **(307 o F)**
Excess Air	**20 %**
Air Leakage	**7 %**
Fuel Characteristics:	
Carbon	**34.4 %**
Oxygen	**8.6 %**
Hydrogen	**2.2 %**
Sulfur	**0.35 %**
Nitrogen	**0.44 %**
Moisture Content	**31.3 %**
Ash	**22.7 %**
Heating Value	**3,003 kC / kg** **(5,417Btu/lb**

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4.2.3 Coal Handling System

The coal handling system at Plant No. 3 includes of conveyor belts which cause much concern due to extensive wear. Extending over seven separate flights totaling approximately 0.8 kilometer in length, these belts require extensive maintenance, repairs and component replacements. The plant has no replacement belts and, more importantly, no splicing repair kits. $ 36,491 are included in the priority list for repairs of the coal handling system.

4.2.4 Fuel Storage

Under normal or desired operating conditions Plant No. 3 has a 45-day coal storage capacity. During a site visit on May 6, 1993, VE team members learned that coal supplies on that particular day had been drawn down to four hours of plant operation. This situation was due to a snowstorm the previous night which had closed the coal mines and delayed the coal supply train. The plant manager, however, stated that this situation was not unusual. During the winter of 1992 - 1993, the power plant was forced to operate with one-week or less coal supply on several occasions. In comparison, North American power plants normally operate with 45 - 90 days of fuel supply in stockpile.

4.2.5 Coal Quality

Coal quality has complicated power plant operations and planning. Fuel that does not meet boiler specifications is often delivered from Sharyn Gol and Baga Nuur. Higher than specified mineral matter and extraneous material in the coal and inadequate crushing are continuing problems. During the winter of 1992 - 1993, as an example, shipments of fuel to the power plant resulted in uncrushed coal and waste rock being loaded onto the rail cars. Such feedstock causes premature wear and damage to the ball mills and coal handling equipment and can lead to plugged chutes in the pulverizer feed system.

Coal sent to the plant contains metal pieces that may be contributing to ball mill breakdowns. The coal storage area often contains many pieces of re-bar, heavy equipment parts and tires. The six-inch grates about the coal inlet chute prohibits large foreign objects from being sent to the ball mills; however; however, magnets above the conveyors would prevent smaller metal particles from entering the ball mills. These metal objects can do a great deal of damage to the ball mills in a very short time.

Higher than specified abrasive mineral matter in the coal causes increased abrasion to boiler equipment and lowers the operating temperature of the furnaces. The boilers in Plant No. 3 were designed for a fuel with a moisture content of 15% - 18%. The coal supply from the Baga Nuur mine is delivered to the plant with a moisture content of about 30%. High moisture content in the coal feed affects power plant operations in several critical areas:

- Coal feed can be slowed and blocked due to the agglomeration of particles in the ball mills, chutes and coal feed pipes; and
- Moisture reduces the Btu rating of the fuel and lowers the temperature of the burn.
- Unit efficiency decreases through stack losses

The reduction of furnace temperatures requires the injection of more coal in order to achieve the desired combustion temperature. The additional mass of the fuel changes the efficiency of the boilers and reduces the plant's capacity to generate steam. As shown in the following table, the moisture content of the coal supply greatly affects the heating value of the fuel.

TABLE 4 - 3
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
MOISTURE CONTENT vs. HEATING VALUE IN THE PLANT FEED

18 % MOISTURE CONTENT	**3,700 CAL / G**
30 % MOISTURE CONTENT	**3,200 CAL / G**
LOSS IN HEATING VALUE	**13.5 %**

To compensate for the loss in heating value due to poor coal quality, Plant No. 3 has been regularly forced to supplement the coal feed with a petroleum product additive. The use of "masute" ("MACYT"), a liquid fuel similar to US #2 diesel, increases the heating value of the fuel. The cost of this fuel supplent, which comes from Russia, has become prohibitive as a result of market and price reforms, nor is delivery reliable under current economic conditions.

The poor quality of the coal supply and the frequent blockages in the feed system result in poor flame stability and "flameouts" (the flame being extinguished). The presence of flammable gases and particulate matter in the furnaces has caused explosions during reignition. These explosions have caused extensive damage to the boiler refractory, insulation and lagging (referred to by the acronym "Brill"). The stresses caused by these conditions and poor positioning of flames result in premature replacement of the water walls in the boiler.

4.2.6 Pulverized Coal Delivery System

A major topic discussed at the VE team meeting was the damage to the plant caused by dust and dirt. Much of the dust and dirt within the plant is caused by leaks in the pulverized coal ("PC") delivery system. PC from the ball mills is forced to flow upward through a classifier to a cyclone located in the upper elevation of the plant. PC is then pneumatically forced through feeders and pipes to three side-mounted burners, located on opposite side walls.

Severe erosion has taken place in all mills, classifiers, cyclones, primary air fans, PC pipes and all associated parts. The primary cause of the erosion is the highly abrasive mineral matter content of the Baga Nuur coal. Plant No. 3 was originally designed for the higher quality fuel available from the Sharyn Gol mine. Poor mining practices at the Baga Nuur mine have compounded this problem by allowing higher percentages of abrasive particles in the feed.

High ash (highly abrasive) with high moisture content in the PC preparation and delivery system have caused the following operating and maintenance problems:

- Excessive mill liner replacements.
- Two-year replacement of all PC feed pipes.
- Excessive replacement of the mill drives and driven pinion gears (operating life of these components has been reduced to less than 30,000 hours).
- Plugged and damaged PC pipe back-flow dampers.
- Excessive primary air fan-blade wear.

The PC delivery system leaks an excessive amount of coal dust into the plant. This has created a tremendous build-up of dust on the equipment and throughout the facility. Combined with water leaks, this situation has resulted in the deposition of 4-inch deep mud in many areas of the first floor.

The installation of a vacuum system and dust control program would help alleviate the dust problem. A direct benefit of such a system would be increased operating life of the plant equipment, in particular, the electric motors.

4.2.7 Superheaters & Economizers

The VE team identified the superheaters and economizers as being in very poor condition. The practice of using shields to protect boiler tubes is not used in Mongolia. Language translation difficulties prevented a clear understanding of the reasons for the deterioration of these two systems. A number of possibilities, however, were proposed by the team members:

- Temperature fluctuations, due to problems in the fuel supply, may cause deterioration of the tubing.
- The characteristics of the ash may cause excessive corrosion.
- Poor water quality may accelerate corrosion of the tubes.

The VE committee earmarked $ 186,375 for purchase of replacement boiler tubes.

4.2.8. Turbogenerators and Electric Motors

The VE team did not identify any specific reliability problems associated with the turbogenerators. The team investigated reports of vibration and turbine blade corrosion. During one plant tour, the plant manager mentioned moisture causing excessive turbine blade wear. Condensate traps might help to alleviate this problem.

Electric motors in Plant No. 3, however, are a major concern. In general, the plant's electric motors have outlived their serviceable life. The motors have been rebuilt, rewound and reused beyond effective repair. The plant's poor maintenance practices appear to be due to the lack of proper parts and specialized tools needed to rewind the motors. The VE team specified that replacement motors should be purchased immediately.

The committee combined the turogenerators and electric motors into one category and identified $ 972,852 of critical spare parts for purchase.

4.2.9 General Plant Maintenance

Plant building maintenance is another major concern. Poor or broken lighting has resulted in reduced worker safety within the facility; much of the plant operates in an environment of total darkness. As a result, repair work can only be scheduled during daylight hours.

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Approximately 40% of the facility's glass panels in the building has been broken or is missing. During the winter months, the ambient air temperature of the shop facilities has fallen to -30°.

The VE team identified the availability of tools and consumable parts and supplies as major problems in the plant's operation. The reliability of the plant is directly tied to maintenance and equipment servicing. The team agreed that improvements in the tools inventory was essential to improving plant operations. A discussion of this topic, and the recommendations of the VE team, is found in section 4.5. below.

4.3 CRITICAL SPARE PARTS

The VE committee sessions focused on "value purchasing" and the need to maximize the limited financial resources available to the plant. It wass stressed that the spare and replacement parts selected by the team for purchase were to be those critically needed to maintain minimum operating capabilities during the 1993 - 1994 heating year.

Under ideal conditions, spare parts purchased for a power plant should be properly selected, installed and maintained, in order to achieve maximum serviceability. The current situation at the Power Plant # 3 requires that far less be expected. Operating conditions at the plant have deteriorated to such a degree that maximum serviceability is not a feasible target. Many installed parts will not perform for the duration of the operating hours specified by the manufacturer or with the reliability expected of such parts under normal operating conditions. Regardless of this fact, the parts must be purchased and installed into whatever conditions exist at present in order to achieve minimum power and heat generation requirements through the upcoming winter months.

Appendix B-1 presents a detailed list of the critical spare and replacement parts needed to maintain minimum plant operations during the 1993 - 1994 heating season. Because of the age and poor condition of the major equipment in the facility there may be some significant

differences in the final quantity and composition of the spare and replacement parts ordered after funding is finally approved. Additionally, the list in Appendix B-1 is derived, primarily, from the recommendations made by the previous project engineer (RE&C) in regard to parts required, source and number of units. These recommendations will be reassessed on an ongoing basis to ensure the final selection meets present-day plant priorities and satisfies the requirements of donor agencies.

4.4 TOOLS & CONSUMABLES

In order to keep Plant No. 3 operating during the 1993 - 1994 heating season, the VE team reviewed the plant's inventory of spare parts and replacements, as well as its stock of tools and consumables. In general, the VE team decided that first priority must be given to spare parts and replacements. Second priority was placed on tools and consumables. The basic logic behind this decision was that improved tools were unnecessary if spare parts and replacement parts were unavailable; however, in order to perform needed boiler tube replacement, tools valued at $ 19,710 are included in the critical list.

The tool situation at the plant has steadily worsened. The Mongolian maintenance crews have grown accustomed to performing repair work with minimum resources. Workers often bring in tools from home, or borrow tools from other state-owned facilities. This situation can only be remedied through additional investment in needed tools. As future funding is made available, it is estimated that $ 100,000 worth of critically needed tools will need to be scheduled for purchase.

Consumable parts and supplies are also critically needed. The quality and durability of repairs could be vastly improved if good quality welding supplies were made available to maintenance crews. Plant repairs could be quickly expedited if basic supplies, such as nuts, bolts, washers, couplings, adapters, reducers, nipples, hinges, screws, glass plate, etc., could be purchased and maintained in stores at the plant. Ten tonnes of welding rod, valued at $ 36,456, is required to complete the necessary boiler tube repairs.

4.5 PLANT REPAIRS & UPGRADES

The general condition of Plant No. 3 is very poor. The VE team discussed the critical need for lighting improvements within the facility, installation of a central vacuuming system and a centralized compressed air system. The limited financial resources available for plant operations convinced the team to give priority to needed spare parts rather than plant repairs and upgrades. As future funding is made available, however, the following plant repairs and upgrades should be scheduled:

- Installation of central vacuuming system, $217,000.
- Refurbishment and expansion of the plant lighting system, $250,000.
- Installation of a centralized compressed air system, $275,000.
- Window replacements and general building repairs, $125,000.

4.6 TRAINING

Training will prove to be a critical part of the plant's successful operation in the future. The various areas of training needed by the plant's personnel include administration, financial management, technical operations, maintenance, safety and environmental.

Based on site-visits by VE team members, it appears the plant staff has attained the minimum skill level needed for proper operations and maintenance. There appear to be no formal training programs in place. Basic skills are transmitted to new staff members simply by observation of co-workers and on-the-job work experience.

Extensive administrative policies and procedures have been established, but it is not evident that they are followed by all departments. There seems to be a lack of written technical manuals

available for the engineering and operating staffs. Technical procedures covering such basic operating activities as maintenance, water treatment, calibration and test equipment operation must be developed and published for distribution to the plant personnel.

The technical language currently in use at the plant is both Russian and Mongolian with drawings and technical specifications including both languages. The Ministry has also indicated an interest in increasing the technical usage of the Mongolian language within the country; however, the vast majority of training materials that will be made available to the plant staff will be based in the English language. Significant resources will be required to translate training and technical materials into the Russian or Mongolian languages.

Depending upon the availability of financial resources, immediate emphasis should be placed on technical and financial training for key plant managers. The scheduling of training programs should be initiated as quickly as possible.

The VE team recommended the following training program:

- Basic management and financial training for key power plant and Ministry personnel.
- Development of uniform administrative procedures for preventive maintenance, overhaul maintenance and operational record keeping.
- Development of technical procedures for calibration and testing; preventive and routine maintenance for all plant systems; welding; and specific maintenance, repair and operating practices.
- Development of management skills aimed at improving the effectiveness of the maintenance programs.
- In-plant technical training, conducted by Mongolian teachers and managers, covering the subjects of calibration and testing; preventive and routine maintenance for all plant systems; welding; and specific maintenance, repair and efficient operating practices. MK technical experts would be available for back-up and assistance as needed.

A tentative schedule for this training program is recommended as follows:

- Informal training by MK personnel should begin immediately in the areas of maintenance, safety and efficient operating practices.

- MK should begin plant management training seminars in the summer of 1993. These seminars will include segments covering maintenance, operating procedures, tools and techniques.

- The critical training programs for senior plant and Ministry managers will form the foundation for future operating improvements at the plant. They will need to be instituted later due to current funding level limitations.

All training program materials will be thoroughly documented. These materials can then be translated, reproduced and then used by Mongolian staff members for subsequent training programs and operations.

4.7 POWER PLANT #3 TOP PRIORITIES

The following are the top priorities for Power Plant #3 formulated by the VE team.

- Assist in procurement specifications and installation support concerning the power plant materials and parts already in the pipeline (i.e., ordered by UE&C and in transit/storage or ready for shipment by vendors) or new items (provided that a procurement budget is approved) identified as being of critical importance for the uninterrupted winter operation of Power Plant No. 3.

- Improve burner controls and operation; the problem of burner flame outs and detonations needs to be corrected. Major detonations stress tubes, cracks BRILL, and in general cause great damage. Burner design and controls and current limitations of total system (from bunker to burners) relative to the fuel intended for the plant need to be closely examined to identify possible operational fixes.

- Replace boiler tubes; the plant claims that they need to replace a large number of tubes each year (waterwall and superheater sections). The reasons behind this need to be ascertained; e.g., water quality, poor materials, poor installation, improper centering of flame in furnace, etc., and the situation corrected. This will avoid/minimize the need of funds for large purchase of tubes every year.

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- Achieve furnace envelope integrity; the furnace envelope (boiler refractory, insulation and lagging) of the various units show anywhere from small to large holes in several places. Patching work is being done with asbestos/clay and asbestos/inorganic compounds. These practices are questionable for various reasons and need to be corrected to achieve longer term furnace integrity and safety.

- Install effective soot blowing; the existing soot cleaning systems are ineffective causing frequent detonations in the pulverizing/conveyance systems. The need for new equipment and parts is fairly evident in this area.

- Improve pulverizing system operation; coal ash related erosion is clearly evident in PC pipes, mills and associated equipment. The plant also described frequent detonations in the pulverizing/conveyance system. The need for new equipment and parts is fairly evident in this area.

- Correct ash handling pluggage; the plant staff mentions frequent downtime pluggage of the venturi/scrubber system they use for particle collection. The system design specifications and current operating practices need to be closely examined to hopefully achieve an operational fix (rather than major equipment replacement).

- Water quality monitoring and treatment; poor water walls, superheater and economizer tubing show corrosion. Premature replacement could be eliminated with proper water treatment.

- Non-Destructive Evaluation (NDE); the large investment in plant rehabilitation will require the application of NDE techniques to selected plant components to determine their residual or expected service life.

Other problems areas and high priority topic (outlined in the UE&C report) will probably need to be addressed right after or in concert with those mentioned above. Also, new problems might be uncovered which will require early action and will need to be brought for discussion and assessment as early as they are uncovered.

SECTION 5

5.0 ENVIRONMENTAL ASSESSMENT

5.1 INTRODUCTION

This Environmental Assessment Section addresses principally the two mines and one power plant discussed in Sections 2 and 3: Sharyn Gol and Baga Nuur Coal Mines, and Power Plant No. 3. It addresses existing conditions, identifies the current highest risk situations and proposes short-term actions where warranted and potentially productive. An Environmental Assessment Plan (EAP) is included (Energy Sector Project, Component III, Task 3) for review and approval by U.S.A.I.D. and the Mongolian Ministry of Fuel and Energy (MFE) and implementation later in the project. This EAP is designed to provide a basis for allocation of limited resources to the significant potential consequences of these A.I.D.-financed activities.

Morrison Knudsen's Mongolian Energy Sector Project (ESP) - Component III Technical Proposal stated that first priority must be given to improving the Sharyn Gol and Baga Nuur Coal Mines and second priority must be given to solving system availability problems that occur in the power and heat generation systems. These two priority tasks are critical, not only to the comfort of Mongolians served by these mines and power plants, but to the very survival of people living in Ulaanbaatar during the next one or two winters. Given the serious nature of the situation, it is imperative that resources be allocated to the greatest need.

Raytheon Engineers & Constructors (RE&C, formerly United Engineers & Constructors) prepared an Environmental Master Plan for the MFE as one of five volumes funded by a U.S. Trade and Development Program grant. This document identified water resources, quantity and quality, as the greatest environmental problem in Mongolia today. Water is ranked so high because of the dry climate of Mongolia and the misuse of what little

resource there is. Poor air quality is probably the second most important environmental problem, particularly in the cities, caused by exhaust from cars, smoke from home cooking and space heating and emissions from power/thermal plants which utilize generally poorly maintained, outdated pollution control technology.

Given this background and the current state of mine and power/thermal plant disrepair, the ESP would do well to heed the advice of the Hippocratic Oath which admonishes doctors to first do no harm. Whatever is recommended and implemented in the VE stage of the ESP should at least not exacerbate any environmental problem. Where possible, equipment or processes proposed for change during ESP Component III should be chosen to relieve the pollutant burden in Mongolia.

Equal in importance to the overall pollutant burden is the health and safety of mine and power/thermal plant workers. Tours of the subject facilities revealed that in many cases simple rules of safety and health are not observed. For example, it was not uncommon to see manholes gaping open for want of a cover, fine particulate matter thickly coating surfaces, lighting poor to non-existent and few employees wearing hard hats.

5.2 MINING OPERATIONS

5.2.1 Safety

The most noticeable safety shortcomings were lack of observance of haul road safety, lack of hard hats and poorly protected electrical distribution. As is pointed out in Section 3, haul roads are poorly maintained because of a lack of proper equipment. Because of this poor maintenance, vehicles violate lane travel to avoid pot holes, rocks and debris. The safety hazard thus created is obvious.

Lack of hard hats is dangerous in the best of situations. Under current conditions typified by poor lighting inside large equipment and maintenance shops, improper tools and poorly maintained equipment, the need for protection provided by hard hats is significant.

Electrical systems were not grounded, splices were uninsulated and cables had obviously been stretched. Employees had no high voltage rubber gloves with leather protectors nor other protective devices for working with high voltage electrical equipment, e.g., substations and cable.

5.2.2 Water Quality

The most likely threats to water quality from open pit coal mines are high concentrations of suspended solids, low Ph values and high heavy metals concentrations in runoff from spoil and pit dewatering. During visits to Sharyn Gol and Baga Nuur, there was little sign of overland mine drainage to streams. The large open pits at both mines provide sediment control for most of the disturbed ground. Waste piles are not revegetated, so they are a potential source of suspended solids, low Ph values and heavy metal concentrations. However, during the mine visits little erosion of these piles was observed, probably the result of the arid climate. Overburden at both mines exhibited a sharp break in color from tan to grey at approximately 10-20 m indicating an oxidation/reduction boundary. However, there were no observed signs of pyrite oxidation such as odor or yellow or red precipitates. Some areas in the spoil and overburden appeared to have held water temporarily as evidenced by a white encrustation indicating high salt content of the soil/overburden, a situation not unlikely in the arid climate.

Dewatering/depressurization ahead of mining is a potential source of pollutants, particularly dissolved solids. At Sharyn Gol, there is no depressurization. Disposal of water from precipitation and highwall seepage is accomplished by a system of lateral tunnels dug beneath the coal seam. Water flows via these laterals to a collection tunnel which directs water to a sump. The water is then pumped to the surface and discharged into the Sharyn Gol River. Because one of the laterals was destroyed by a fault and explosion, water is currently pumped to a lateral tunnel. A new tunnel leading into the mined out main pit will, when complete, carry water by gravity from the pit floor. When we observed the discharge to the Sharyn Gol River, there was no suspended sediment visible nor was there any discoloration of the water or substrate. However, without analysis it is impossible to

reach supportable conclusions regarding quality of discharged water. A break in the discharge pipe had eroded the river bank and will continue to do so unless repaired.

Depressurization is accomplished at Baga Nuur by two well fields ahead of the advancing high wall. The nearest field comprises thirty brick buildings each of which encloses a pump which is depressurizing an aquifer at an undetermined (during the tour) depth. Further in advance of the pit is a second line of fewer brick structures which house depressurization pumps. The number of such structures was not determined. Water from this process is not discharged but is used as make-up to the thermal plant.

5.2.3 Air Quality

The biggest air quality problem at the mines visited was fugitive dust. Because of the arid conditions most roads were naturally dry. Some roads, primarily in-pit haul roads, were wet or observed being watered by a water truck. Dusty conditions are a health hazard causing respiratory discomfort and the potential for long-term chronic conditions and they also create a safety hazard if airborne particulate concentrations interfere with visibility.

5.2.4 Recommendations

Following are recommendations for mining operations:

- Safety
  - Initiate haul road maintenance program and enforce haul road safety rules
  - Purchase, provide and require use of hard hats by all employees in designated areas[1]
  - Train employees in safe electrical wiring, provide necessary tools and supplies and require their use.

[1]Not directly related to A.I.D.-financed activities but considered important

- o Water Quality
- Initiate revegetation on spoils for which grading is complete[1]

- o Air Quality
- Schedule and implement a more effective road watering program (water should be available at both mines from dewatering/depressurization)[1]

- o Training
- The training program to be implemented during the ESP should include safety along with the technical training. Such safety training would best be delivered when covered along with the technical item being discussed, e.g., during discussion of haul road maintenance, haul road driving rules could be presented; or, when blast training is being done, all safety aspects of blasting from location and protection of supplies to protecting workers from fly rock impact could be presented.

5.3 POWER GROUP

5.3.1 Safety

The most notable safety problem observed during visits to power/thermal plants was the ack of cleanliness. The thick coating of coal dust, damaged and discarded insulation probably asbestos), and leaking water obviously threaten the health and safety of vorkers. The VE study recommended, as a second priority, the installation of a central vacuum system. This would facilitate keeping the areas clean.

n addition, physical safety hazards such as little or no lighting, open manholes, poorly naintained stairs and open floor channels continually threaten workers. A third safety iazard is the presence of rocks and uncrushed coal delivered from the mines. Poor quality

control at the mines creates this situation which endangers the power plant workers who must manually clear the feed chutes of these large objects.

5.3.2 Water Quality

The full potential of water quality problems at the power/thermal plants was not determined as part of this VE study nor will they be included in Component III as currently proposed. The reason this is not included in this EA scope is that U.S.A.I.D. regulations at 22 CFR Part 216 limit such environmental assessment to only A.I.D-financed activities. There are many potential discharges from these plants, e.g., cooling tower blowdown, boiler water deionization blowdown, hot water blowdown, ash pond supernatant, boiler washes and sanitary sewage.

At Baga Nuur, there is no apparent discharge from the thermal plant ash disposal pond. Apparently, evaporation and possibly seepage provide sufficient water loss. Ash disposal was not observed at Sharyn Gol. At Power Plant No. 3, supernatant from the bottom/fly ash pond is discharged directly to the River Tuul. A new pond is under construction which will be lined with a synthetic liner and the water recirculated through the ash sluicing system. Ash disposal ponds for Power Plant No. 3 are within the reach of a short discharge pipe to the River Tuul channel. Other than the ash pond water systems, no observations were made of the potential power/thermal plant discharges.

5.3.3 Air Quality

The most obvious pollutant contribution from the power/thermal plants is particulate matter (ash) which comes from the boilers through the stacks. In most plants observed, bottom ash is collected and handled wet. No fly ash is collected at Sharyn Gol, and cyclone scrubbers collect fly ash at Baga Nuur and Power Plant No. 3. Even though particulate control devices are in place at the majority of the plants visited, fly ash collection is far from optimum. In the case of the cyclone scrubbers, they are inherently

less efficient than other technologies and, in addition, are probably suffering from the same lack of spare parts and maintenance that other parts of the plants exhibit.

5.3.4 Recommendations

- o Safety
- Teach and enforce basic safety rules.
- Purchase, provide and require use of hard hats by all employees in designated areas[1]
- Replace and repair safety-related items such as manhole covers and lighting[1]
- Remove layers of particulate matter from all surfaces.
- Provide masks and wet down any material suspected of being asbestos. Dispose of in plastic bags, if available[1]
- Train employees in safe electrical wiring, provide necessary tools and supplies and require their use.

- o Air Quality
- At the very least, existing particulate control equipment should be maintained in working order so that it operates at its highest efficiency. After critical parts needs are filled to ensure provision of necessary heat and electricity, parts necessary to the operation of the particulate control devices should be purchased and installed. Any new boilers should be equipped with proper particulate controls.

5.4 ENVIRONMENTAL ASSESSMENT PLAN

5.4.1 Background

This EAP addresses Component III which was designed to provide technical, engineering, procurement, installation and training assistance identified during Component II for the

1993/94 and 1994/95 heating seasons. The purpose of Component III is to procure more spare parts to relieve the emergency problems which result in critical reductions in residential heating and electric power supply and to provide technical and engineering assistance to modify existing operating practices and systems for more efficient performance.

According to the Request for Proposal, the focus of Component III would be to assist the Mongolians to manage, maintain and operate a technically and economically sustainable energy sector. First priority would be given to improving operating efficiency of Sharyn Gol and Baga Nuur coal mines. Second priority would be given to providing adequate spare parts, repairs, and technical assistance to improve efficiency at the Darkhan power plant. Third priority would be given to providing limited spare parts to Power Plant Number 3 in Ulaanbaatar. Since the Request for Proposal was sent out, the German Government has taken on repair of the Darkhan Power Plant, so MK's second priority will be Power Plant No. 3. It is A.I.D.'s intent that, by August 1995, the Mongolian Energy System will be providing its own consumables and there will have been a substantial renewal of the critical equipment inventory, particularly in the coal mines.

Task 3 of the Statement of Work required that the contractor

> "...prepare an Environmental Assessment (EA) of activities under the ESP. As part of the planning under Task 1, prepare the scope for an EA for the approval of the A.I.D. Mongolian Representative and the Asia Bureau Environmental Coordinator. In the EA, examine potential environmental impacts and propose mitigating measures for all activities having significant impacts, in accordance with A.I.D. Regulation 216 (22 CFR Part 216). Report findings and recommendations together with the plan under the previous task to the Mongolian Ministry of Fuels and the A.I.D. Representative in Mongolia."

Section 216.1(b)(1) of 22 CFR states that it is A.I.D. policy to: ensure that the environmental consequences of A.I.D.-financed activities are identified and considered by A.I.D. and the host country prior to a final decision to proceed and that appropriate

environmental safeguards are adopted. In accordance with these regulations, MK proposed Task 3 - Environmental Assessment as one of the tasks in its (ESP) - Component III Technical Proposal.

This EAP is based on U.S.A.I.D. regulatory requirements presented above and personal site visits to Sharyn Gol and Baga Nuur Coal Mines and Power Plant No. 3. Some measures for improving employee safety and health and environmental conditions at these facilities were recommended above in Section 5.4.2 and 5.4.3.

The purpose of this EAP is to assess significant environmental impacts expected as a result of implementation of ESP Component III. Such actions include equipment repair, equipment replacement, new equipment or changes in procedures. The regulations do not require nor is it the intent of this EAP to address all environmental aspects of the targeted operations.

5.4.2 Coal Mines

Current Conditions

The ESP Component III scope includes two coal mines, Sharyn Gol and Baga Nuur. At Sharyn Gol, there is no surface water control in place. However, the large pit serves to collect precipitation which falls in the pit and runoff from adjacent highwalls, lowwalls and spoils. Pit water, whether from precipitation or groundwater, is collected by two lateral tunnels dug in the bottom of the Main Pit beneath the coal seam which direct the water to a collection tunnel which, in turn, directs the water to a sump. The water is then pumped to the surface and discharged into the Sharyn Gol. Because one of the laterals was destroyed by a fault and explosion, water is currently pumped rather than gravity fed to a lateral tunnel, while a new tunnel is under construction.

At Baga Nuur, a well field is installed ahead of mining for depressurization. Water from this process provides makeup to the thermal plant.

Planned Changes

Section 3 of this report provides the results of the Task 1, Value Engineering phase of Component III for coal mines. During this phase, MK recommended implementation of the highest value items from a prioritized list developed by RE&C with assistance from the MFE. These items were, in part:

- 1 mobile coal feeder-breaker
- 3 tire handling trucks
- 3 motor graders
- 4 dragline bucket replacements
- 3 locomotive rebuilds
- assorted spare parts
- consummables, such as blast initiation systems, conveyor splice kits, locomotive batteries, power cables, tires, transmission wire, etc.
- training (funding upon subsequent approval of U.S.A.I.D.)
  - blast initiation systems
  - proper haul road construction and maintenance
  - preventative maintenance programs
  - visits to US coal mines

As mentioned above in Section 5.1, employee health and safety must be the initial secondary concern of the VE process. The coal feeder listed at the top will reduce screen jams at power plants and reduce need for employees to endanger themselves removing the screen blockages. Tire handling trucks will reduce danger of injury during tire changes. Motor graders will improve roads, improving safety on haul roads.

The efficacy of each of these safety-related improvements could be measured by documenting pre-implementation rates of injury or times to complete certain tasks, collecting post-implementation data and comparing the two. This information should be developed as part of the ongoing support provided by the ESP to the mines. Interviews with appropriate mine personnel to determine current record keeping practices for injury

rates and productivity should be held early in the project (summer/fall 1993). Where current practices are insufficient to provide baselines for comparison, the ESP should provide procedures and forms and institute regular reporting so that eventually data collected in this process can be evaluated and analyzed through time together with implemented changes in equipment, procedures and training. This process will serve two purposes. First it will provide documentation of the efficacy of the AID-financed activities, and second it will fulfill responsibilities under Section 216 for Environmental Assessment of these same activities.

There are three activities proposed to accomplish the environmental assessment process for the coal mines. The first is Procedure/Form Development. During this activity, appropriate record keeping processes together with forms for recording data will be developed. Since these records will be kept by Mongolians or ESP staff in Mongolia, it will be important to develop a process which takes as little time as possible while providing useful data.

The second activity will be implementation, i.e., keeping pre- and post-implementation records of injury rates and productivity. As stated above, it is very important that this process not take any more time than necessary from the primary objective of improving coal quality to the power plants.

The third activity, Data Evaluation and Analysis, will be accomplished in Mongolia and will include evaluating and analyzing data collected during the implementation phase. These results will be included in the Task 3, Environmental Assessment Report.

The schedule for these activities is discussed following the Power Plant environmental assessment activities.

The cost for the data collection can be borne, at least in part, by the engineering/operations support efforts. The development of forms for data collection, evaluation and analysis of data and reporting is properly subsumed by the Task 3 budget. An estimate of these costs is provided in Table 5-1.

TABLE 5 - 1

MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III

TASK 1, VALUE ENGINEERING / VALUE ANALYSIS

COAL MINE ENVIRONMENTAL ASSESSMENT ESTIMATED COSTS

ACTIVITY	MAN-HOURS	ESTIMATED COST
PROCEDURE/FORM DEVELOPMENT[2]	40	2120
IMPLEMENTATION[3]	120	7340
DATA EVALUATION AND ANALYSIS[3]	80	4890
TOTAL	240	14,350

[2]In MK US Office

[3]In Mongolia

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5.4.3 Power Plants

Current Conditions

At Power Plant No.3, flyash and bottom ash are collected and sluiced to settling ponds. The third of four landfill cells is being filled and the fourth will be filled by August of 1994. Cell three discharges to the River Tuul. We observed two discharge pipes, both of which were contributing suspended material to the river. The Ministry for Nature and the Environment (MNE) has told Power Plant No. 3 management that they must discontinue discharging to the river because such discharges are reducing water quality. As a result, they are installing a recirculation system to reuse the water. A new cell which will include a plastic liner is currently under construction at a projected cost of 570 million tugruk. The liner is being installed by the Social Construction Company. Ponds 1-4 are clay lined.

Planned Changes

Section 4 of this report provides the results of the Task 1, Value Engineering phase of Component III for Power Plant No. 3. During this phase, MK recommended implementation of the highest value items from a prioritized list developed by RE&C with assistance from the MFE. These items were:

- Critical spare parts
- Plant repairs and upgrades (no funding proposed)
  - installation of central vacuuming system
  - refurbishment and expansion of the plant lighting system
  - installation of a centralized compressed air system
  - window replacements and general building repairs
- Tools and consumables (no funding proposed)
- Training (supplied by direct sssociation with MK, team with supplemental training provided upon approval of U.S.A.I.D.)

- Informal training by MK personnel will be accomplished in the areas of maintenance, safety and efficient operating practices
- MK will initiate plant management training seminars. These seminars will include segments covering maintenance, operating procedures, tools and techniques. This critical training program for senior plant and Ministry managers will form the foundation for future operating improvements at the plant.

The planned critical spare parts purchases and improvements in maintenance will improve the efficiency of the power plant. To the extent that efficiency is improved lower emissions per kilocalorie will be realized. Emissions which are not reduced by ESP Component III activities will hopefully be reduced by future plant renovation or new equipment installation.

Any repairs of boiler tubes and steam lines will likely involve removal and replacement of insulation, much of which is probably asbestos. Prior to this removal and prior to any major clean up, indoor particulate levels should be measured. Samples should be analyzed for asbestos fibers as well as particulate concentrations. Post-implementation sampling should be performed to measure the efficacy of such activities.

If money is provided for additional lighting, light levels should be measured pre- and post-implementation.

Inside temperatures should be monitored whether or not broken windows are replaced.

As coal quality improves, detonation frequency should be reduced. This frequency should be monitored and compared pre- and post-implementation.

There are three activities proposed for each of the assessment items in the first priority activities pre- and post-implementation, particulate concentration determination and detonation frequency. In the case of particulate matter concentration, first a monitor will

be purchased then used to sample particulate matter concentrations in the power plant, particularly the building housing the boilers. These samples will be analyzed for concentration of dust and asbestos fibers per cubic meter. The resulting data will be evaluated and analyzed in Mongolia and included in the Task 3, Environmental Assessment Report.

For monitoring detonation frequency, procedures and forms will be developed in the U.S. As in the coal mine process, it will be important to develop a process which will collect the necessary information while not burdening Mongolian and MK employees with excessive record keeping.

Implementation will be by Mongolian and MK employees as part of their day-to-day activities. Data will be evaluated and analyzed in Mongolia and will be included in the Task 3, Environmental Assessment Report.

Costs for these activities are estimated below. If lighting improvements and window replacement are implemented, costs of evaluating the impact of these activities would have to be provided to U.S.A.I.D. for approval.

TABLE 5 - 1

MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III

TASK 1, VALUE ENGINEERING / VALUE ANALYSIS

POWER PLANT ENVIRONMENTAL ASSESSMENT ESTIMATED COSTS

ACTIVITY	MAN HOURS	ESTIMATED COST
MONITOR PARTICULATE CONCENTRATIONS[3,4]	40	9450
ANALYZE SAMPLES[5]	----	5000
ANALYZE DATA[2]	80	4230
PROCEDURE/FORM DEVELOPMENT[2]	20	1060
IMPLEMENTATION[3]	40	2450
DATA EVALUATION AND ANALYSIS[3]	80	4890
TOTAL	260	27080

[4]Includes estimated cost of particulate matter sampler

[5]Sample analysis will be done by an outside lab

5.5 SCHEDULE FOR ENVIRONMENTAL ASSESSMENT

Procedures and forms for coal mine and power plant environmental assessment activities will be developed in MK U.S. offices during the summer of 1993. During the fall of 1993, Mr. Monta Zengerle will return to Mongolia to initiate record keeping procedures and collect pre-implementation indoor particulate matter data at Power Plant No. 3. Then, once Component III activities have accomplished proposed changes, Mr. Zengerle will return to Mongolia to collect post-implementation samples at Power Plant No. 3 and evaluate and analyze data for both coal mines and the power plant.

APPENDIX A - 1

APPENDIX A - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LIST OF REQUESTED SPARE PARTS

SUMMARY

	Section	Cost
I.	Equipment Purchases	$17,032,833
II.	Consumables Produced USA vs CIS	$ 2,215,225
III.	Explosives	$ 2,528,947
IV.	Parts and supplies from CIS	$ 8,698,130
	T O T A L	$30,788,857

APPENDIX A - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LIST OF REQUESTED SPARE PARTS

NEW EQUIPMENT

I. EQUIPMENT DESCRIPTION	QTY	UNIT COST	TOTAL COST
Cat 16G Motor Grader	3	416,320	1,248,960
Cat D10-size Bulldozer	3	674,280	2,022,840
ANFO Mix Trucks	2	154,845	309,690
Fuel & Lube Trucks	3	107,675	323,025
Tire Handling Trucks	3	97,325	291,975
85 Ton Haul Trucks	10	774,350	7,742,500
Cat 992C Front End Loader	3	1,058,872	3,176,616
Personnel Transport Vehicles	2	57,650	115,300
20/90 Dragline Bucket,Complete	1	234,300	234,300
15/90 Dragline Bucket,Complete	1	190,296	190,296
13/50 Dragline Bucket,Complete	1	190,296	190,296
10/70 Dragline Bucket,Complete	2	121,008	242,016
EKG 4.6B Shovel Bucket	2	87,892	175,784
EKG 4.6 Bucket Wear Parts	1 set	26,775	26,775
10/70 Drag Bucket Wear Parts	2 sets	35,720	71,440
13/50,15/90,20/90 Dragline Bucket Wear Parts	3 sets	192,720	192,720
Coal Crusher - Feeder Breaker	1	487,300	487,300
TOTAL			$17,032,833

APPENDIX A - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LIST OF REQUESTED SPARE PARTS

CONSUMABLES PRODUCED USA vs CIS

Wire Rope — Various sizes with a total weight of 193 tonnes
CIS $231,000
USA $354,849

Conveyor Belt — Various sizes with a total length of 7,575 meters
CIS $550,500
USA $1,230,156

Conveyor Zipper Splices — Various sizes from 800mm to 1600mm
CIS no quote
USA $24,144

Electric Motor Brushes — Various sizes 12,400 Brushes
CIS $12,400
USA Incomplete for all brushes but appears to be four (4) times more per brush

Haul Truck Tires - Of sizes requested only 2 sizes available in USA
USA 12x20x16 ply/with tubes - 200 of $ 73,480
18x33x32 ply - 120 of $251,520
Total $325,000
CIS no quotes received

Batteries — 3 Types are to be supplied
CIS No quotes
USA $127,158

Aluminum Overhead Electric Transmission Wire - 15 tonnes
CIS No quotes
USA $ 81,268

Copper Rewind Wire for Electric Motors - 17,214 kg
CIS $ 60,250
USA $101,969

TOTAL $2,215,225

APPENDIX A - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LIST OF REQUESTED SPARE PARTS

EXPLOSIVES

DESCRIPTION	QTY	UNIT COST	TOTAL COST
12 oz Cast Primers	160,000	1.95	311,200
Primadets #12/30 ft.	100,000	2.06	205,893
Primadets #12/12 ft.	42,000	1.80	75,684
MS-65 Surface Delays	20,000	2.65	53,040
25 Grain Detonating Cord	650	287.72	187,018
EZ Det 25-350/18m	15,000	4.49	67,390
EZ Trunk Lines 17ms/9m	900	3.02	2,722
Subtotal			$ 902,947
AN Blasting Prill	2,600	390.00	1,014,000
Bagged Emulsion, 130mm dia.	700	760.00	602,000
Amonit Cartridges 20mm dia.	20	500.00	10,000
		Subtotal	$1,626,000
		TOTAL	$2,528,947

APPENDIX A - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LIST OF REQUESTED SPARE PARTS

PARTS AND SUPPLIES FROM CIS

Group 1.		
Railway Materials 6-8 mo.		
Track Y Sections, Switches, (etc)		$2,034,150
20 Item Descriptions		
Electric Locomotive Parts	8-10 mo.	
17 Item Descriptions		$ 122,774
Diesel Locomotive Parts 6-8 mo.		
28 Item Descriptions		$ 173,712
CIS/Poland Dumpcar Parts	8 mos.	
49 Item Descriptions		$ 109,784
Railway Communication Parts	8-10 mo.	
24 Item Descriptions		$ 213,070
Overhead Trolley Line	8-10 mo.	
Electric Locomotives (Baganuur)		
24 Item Descriptions		$ 116,600
Rail Shifting Car Spare Parts		
(from Nuurs Summary)		$ 25,000
	Group 1 Total	$2,795,090
Group 2.		
Dragline Parts 20/90 & 15/90	9 mo.	
32 Item Descriptions		$ 250,000
(from NUURS Summary)		
Dragline Parts 13/50,10/70,6/45		
107 Item Descriptions		$ 100,000
(from NUURS Sunmary)		
Shovel Parts EKG 8i and EKG 4y		
95 Item Descriptions		$ 370,000
(from NUURS Summary)		
	Group 2. Total	$ 720,000

APPENDIX A - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LIST OF REQUESTED SPARE PARTS

PARTS AND SUPPLIES FROM CIS
(Cont'd.)

Group 3.		
BELAZ Dumptruck Parts		
Baganuur	78 Item Descriptions	$ 501,098
Sharyn Gol	111 Item Descriptions	$ 502,774
KRAZ Dumptruck Parts		
128 Item Descriptions		$ 613,479
Komatsu Dumptruck Parts	2 mos.	
(from NUURS Summary)		$ 200,000
Haul Truck Tires		
21.00x33 (BELAZ) - 100 tires		$ 90,000
	Group 3 Total	$1,907,351

Group 4.		
Coal Loading Complex Spare Parts		
Baganuur	- Coal Loading Complex	
	19 Item Descriptions	$ 107,138
	- Coal Crusher	
	5 Item Descriptions	$ 1,332
		$ 108,470
Sharyn Gol	- Coal Loading Complex	
	7 Item Descriptions	$ 104,883
Heating Plant Parts		
29 Item Descriptions		$ 107,893
Water Pump Parts		
21 Item Descriptions		$ 165,200
Compressor Parts		
(from Nuurs Summary)		$ 45,000
	Group 4 Total	$ 531,446

APPENDIX A - 1
MONGOLIAN ENERGY SECTOR PROJECT, COMPONENT III
TASK 1, VALUE ENGINEERING / VALUE ANALYSIS
LIST OF REQUESTED SPARE PARTS

PARTS AND SUPPLIES FROM CIS
(Cont'd.)

Group 5.		
Electric Motors		
Dragline 20/90 - 4 Items		$ 231,200
Dragline 10/70 - 13/50		$ 605,000
Shovels EKG 8i and EKG 4y		$ 151,250
Misc. Electric Motors		$ 194,450
Electric Motor Equipment		$ 320,100
	Subtotal	$1,502,000
High Voltage Electric Cables		
33 Item Descriptions		$ 439,450
	Group 5 Total	$1,941,450
Group 6.		
Small Engine Parts		
42 Item Descriptions		$ 82,417
DET-250 Bulldozer Parts		
SG-16 Item Descriptions		$ 132,206
BN-54 Item Descriptions		$ 165,682
SO- 4 Item Descriptions		$ 1,776
AD-10 Item Descriptions		$ 12,968
	Subtotal	$ 312,632
T-130 Bulldozer Parts		
36 Item Descriptions		$ 92,480
YM-2 Engine Spare Parts		
28 Item Descriptions		$ 215,264
	Group 6 Total	$ 702,793
Group 7.		
Nalaikh Underground Mine Parts		
129 Item Descriptions		$ 700,000
(from NUURS Summary)		

PARTS AND SUPPLIES FROM CIS TOTAL $8,698,130

APPENDIX A - 2

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR NO	No	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN LEA TIME	COMMENTS
1 1	1	EXPLOSIVES	0 75lb CAST PRIMERS		EA	130000	BA	1 75	227 500	25 350	252 850	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	2	EXPLOSIVES	0 75lb CAST PRIMERS		EA	30000	SG	1 75	52 500	5 850	58 350	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	3	EXPLOSIVES	PRIMADETS #12/30 FT		EA	100000	BA	2 00	200 000	5 893	205 893	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	4	EXPLOSIVES	PRIMADETS #12/12 FT		EA	30000	BA	1 75	52 500	1 560	54 060	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	5	EXPLOSIVES	PRIMADETS #12/12 FT		EA	12000	SG	1 75	21 000	624	21 624	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	6	EXPLOSIVES	MS-65 SURFACE DELAYS		EA	13000	BA	2 60	33 800	676	34 476	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	7	EXPLOSIVES	MS-65 SURFACE DELAYS		EA	7000	SG	2 60	18 200	364	18 564	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	8	EXPLOSIVES	25 GRAIN DETONATING CORD		KM	450	BA	280 00	126 000	3 474	129 474	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	9	EXPLOSIVES	25 GRAIN DETONATING CORD		KM	200	SG	280 00	56 000	1 544	57 544	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	10	EXPLOSIVES	EZ DET 25-350/18 M		EA	15000	SG	4 38	65 700	1 690	67 390	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	11	EXPLOSIVES	EZ TRUNK LINES 17MS/9M		EA	900	SG	2 95	2 655	67	2 722	USA	SPLIT	1MO	50%1SEP93, 50%1JAN94
1 1	12	EXPLOSIVES	TOTAL COST - US DOLLARS						855 855	47 092	902 947				
1 2	1	DRAG PTS 20/90	LINKS	1060 01 07	SET	10	BA	206 00	2 060		2 060	CIS	1-SEP-93		
1 2	2	DRAG PTS 20/90	LINKS	1060 61 08	SET	12	BA	608 00	7 296		7 296	CIS	1-SEP-93		
1 2	3	DRAG PTS 20/90	CRAMP	1060 61 594	EA	6	BA	369 00	2 214		2 214	CIS	1-SEP-93		
1 2	4	DRAG PTS 20/90	CRAMP	1060 62 300	EA	20	BA					CIS	1-SEP-93		
1 2	5	DRAG PTS 20/90	COMPRESSOR STATION ZIF - 516		EA	1	BA					CIS	1-SEP-93		
1 2	6	DRAG PTS 20/90	FILTER	92-000	EA	2	BA					CIS	1-SEP-93		
1 2	7	DRAG PTS 20/90	PUMP	4K-8	EA	2	BA	1000 00	2 000		2 000	CIS	1-SEP-93		
1 2	8	DRAG PTS 20/90	SAFETY VALVE	1055 24 450	EA	1	BA					CIS	1-SEP-93		
1 2	9	DRAG PTS 20/90	OUTLET VALVES SET	1060 23 286	EA	2	BA					CIS	1-SEP-93		
1 2	10	DRAG PTS 20/90	RING	1060 29 286	EA	2	BA	8 00	16		16	CIS	1-SEP-93		
1 2	11	DRAG PTS 20/90	RING	KO 900 950-2	EA	2	BA	8 00	16		16	CIS	1-SEP-93		
1 2	12	DRAG PTS 20/90	RING	KH 900 950-2	EA	2	BA	8 00	16		16	CIS	1-SEP-93		
1 2	13	DRAG PTS 20/90	JOINT	M900 950 2	EA	12	BA	8 00	96		96	CIS	1-SEP-93		
1 2	14	DRAG PTS 20/90	RAIL OF ROLLERS LOWER	1040 05 00	SET	6	BA	4400 00	26 400		26 400	CIS	1-SEP-93		
1 2	15	DRAG PTS 20/90	RAIL OF ROLLERS UPPER	1040 06 00 01	SET	12	BA	4400 00	52 800		52 800	CIS	1-SEP-93		
1 2	16	DRAG PTS 20/90	PIN	1040 13 15	SET	40	BA	25 00	1 000		1 000	CIS	1-SEP-93		
1 2	17	DRAG PTS 20/90	EL MOTORS	A02-72-4Y2 30KWT	EA	4	BA	800 00	3 200		3 200	CIS	1-SEP-93		
1 2	18	DRAG PTS 20/90	EL MOTORS	A02-72-4Y2 22KWT	EA	4	BA	800 00	3 200		3 200	CIS	1-SEP-93		
1 2	19	DRAG PTS 20/90	EL MOTORS	MPE-1000-630 YXLZ	EA	1	BA	8000 00	8 000		8 000	CIS	1-SEP-93		
1 2	20	DRAG PTS 20/90	EL BRUSH	EG-41 25x32x40	EA	1000	BA	1 00	1 000		1 000	CIS	1-SEP-93		
1 2	21	DRAG PTS 20/90	EL BRUSH	EG-71 25x32x40	EA	1000	BA					CIS	1-SEP-93		
1 2	22	DRAG PTS 20/90	EL BRUSH	EG-14 25x32x40	EA	1000	BA					CIS	1-SEP-93		
1 2	23	DRAG PTS 20/90	SUBTOTAL COST - US DOLLARS												
1 2	1	DRAG PTS 15/90	CRAMP	1005 30 159-2	SET	4	BA	150 00	600		600	CIS	1-SEP-93		
1 2	2	DRAG PTS 15/90	CRAMP	1005 30 161	SET	4	BA	150 00	600		600	CIS	1-SEP-93		
1 2	3	DRAG PTS 15/90	CRAMP	1005 30 171-2	SET	4	BA	150 00	600		600	CIS	1-SEP-93		
1 2	4	DRAG PTS 15/90	CON LINK	1058 61 402	EA	10	BA	206 00	2 060		2 060	CIS	1-SEP-93		
1 2	5	DRAG PTS 15/90	BALANCER	1058 61 208	EA	1	BA					CIS	1-SEP-93		
1 2	6	DRAG PTS 15/90	SAFETY VALVE	1055 24 450	EA	1	BA					CIS	1-SEP-93		
1 2	7	DRAG PTS 15/90		U2-000	EA	2	BA					CIS	1-SEP-93		
1 2	8	DRAG PTS 15/90	PUMP	4K-8	EA	1	BA					CIS	1-SEP-93		
1 2	9	DRAG PTS 15/90	PINTON GEAR m=10, z=56	1040 18 14	EA	2	BA					CIS	1-SEP-93		
1 2	10	DRAG PTS 15/90	PIN	1040 13 15	SET	30	BA					CIS	1-SEP-93		
1 2	11	DRAG PTS 15/90	SUBTOTAL COST - US DOLLARS												
1 2	12	DRAG PTS	TOTAL COST - US DOLLARS								230,000	CIS	1-SEP-93		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

J MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR NO	No	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN. LEA TIME	COMMENTS
13	1	ELEC BRUSH	EG-4 25x32x40		EA	500		1 00	500		500	CIS	1-SEP-93		
13	2	ELEC BRUSH	EG-4 2/12 25x32x40		EA	1000		1 00	1,000		1,000	CIS	1-SEP-93		
13	3	ELEC BRUSH	EG-4 16x25x40		EA	200		1 00	200		200	CIS	1-SEP-93		
13	4	ELEC BRUSH	EG-4 25x50x64		EA	300		1 00	300		300	CIS	1-SEP-93		
13	5	ELEC BRUSH	EG-4 25x32x40		EA	200		1 00	200		200	CIS	1-SEP-93		
13	6	ELEC BRUSH	EG-4 16x32x40		EA	200		1 00	200		200	CIS	1-SEP-93		
13	7	ELEC BRUSH	EG-4 25x32x64		EA	1000		1 00	1,000		1,000	CIS	1-SEP-93		
13	8	ELEC BRUSH	EG-4 16x25x40		EA	100		1 00	100		100	CIS	1-SEP-93		
13	9	ELEC BRUSH	EG-4 30x25x40		EA	100		1 00	100		100	CIS	1-SEP-93		
13	10	ELEC BRUSH	EG-4 8x10x25		EA	200		1 00	200		200	CIS	1-SEP-93		
13	11	ELEC BRUSH	EG-74 2/12 5x32x40		EA	300		1 00	300		300	CIS	1-SEP-93		
13	12	ELEC BRUSH	EG-74 2/12 25x32x40		EA	1000		1 00	1,000		1,000	CIS	1-SEP-93		
13	13	ELEC BRUSH	EG-74 2/12 5x32x64		EA	200		1 00	200		200	CIS	1-SEP-93		
13	14	ELEC BRUSH	EG-74 5x44x40		EA	200		1 00	200		200	CIS	1-SEP-93		
13	15	ELEC BRUSH	EG-74 2/20x32x40		EA	100		1 00	100		100	CIS	1-SEP-93		
13	16	ELEC BRUSH	EG-74 2/25x30x64		EA	100		1 00	100		100	CIS	1-SEP-93		
13	17	ELEC BRUSH	EG-14 16x32x40		EA	400		1 00	400		400	CIS	1-SEP-93		
13	18	ELEC BRUSH	EG-14 25x50x64		EA	1500		1 00	1,500		1,500	CIS	1-SEP-93		
13	19	ELEC BRUSH	EG-14 12 5x16x25		EA	200		1 00	200		200	CIS	1-SEP-93		
13	20	ELEC BRUSH	EG-14 12 5x32x40		EA	2000		1 00	2,000		2,000	CIS	1-SEP-93		
13	21	ELEC BRUSH	EG-14 20x32x32		EA	200		1 00	200		200	CIS	1-SEP-93		
13	22	ELEC BRUSH	EG-14 25x50x60		EA	200		1 00	200		200	CIS	1-SEP-93		
13	23	ELEC BRUSH	EG-74 20x52x40		EA	100		1 00	100		100	CIS	1-SEP-93		
13	24	ELEC BRUSH	EG-74 25x30x64		EA	100		1 00	100		100	CIS	1-SEP-93		
13	25	ELEC BRUSH	EG-74 12 5x32x65		EA	200		1 00	200		200	CIS	1-SEP-93		
13	26	ELEC BRUSH	EG-2A 2/12 5x40x60		EA	100		1 00	100		100	CIS	1-SEP-93		
13	27	ELEC BRUSH	EG-2A 5x9x17 5		EA	100		1 00	100		100	CIS	1-SEP-93		
13	28	ELEC BRUSH	EG-2A 8x10x25		EA	100		1 00	100		100	CIS	1-SEP-93		
13	29	ELEC BRUSH	EG-2A 16x32x40		EA	400		1 00	400		400	CIS	1-SEP-93		
13	30	ELEC BRUSH	EG-2A 16x40x60		EA	100		1 00	100		100	CIS	1-SEP-93		
13	31	ELEC BRUSH	EG-61 2/10x40x52		EA	400		1 00	400		400	CIS	1-SEP-93		
13	32	ELEC BRUSH	EG-61 2/8x32x50		EA	400		1 00	400		400	CIS	1-SEP-93		
13	33	ELEC BRUSH	EG-61 2/8x32x52		EA	100		1 00	100		100	CIS	1-SEP-93		
13	34	ELEC BRUSH	EG-61 2/12 5x40x52		EA	100		1 00	100		100	CIS	1-SEP-93		
13	35	ELEC. BRUSH	TOTAL COST - US DOLLARS						12,400		12,400	CIS	1-SEP-93		
14	1	RAIL SHIFT CAR PTS	DIESEL ENGINE	D-144-66	EA	3		1493 00	4,479		4,479	CIS	1-SEP-93		
14	2	RAIL SHIFT CAR PTS	GEAR BOX		EA	4		253 00	1,012		1,012	CIS	1-SEP-93		
14	3	RAIL SHIFT CAR PTS	DISC OF COUPLING	53-1601090	SET	4		44 00	176		176	CIS	1-SEP-93		
14	4	RAIL SHIFT CAR PTS	DRIVING DISC OF COUPL		EA	4		3 00	12		12	CIS	1-SEP-93		
14	5	RAIL SHIFT CAR PTS		11-1561-A2	EA	10		17 00	170		170	CIS	1-SEP-93		
14	6	RAIL SHIFT CAR PTS	DISC	76 002 05 10 010	EA	4		8 00	32		32	CIS	1-SEP-93		
14	7	RAIL SHIFT CAR PTS	HYD DISTRIBUTOR	B102-A44-A220-5	EA	2		82 00	164		164	CIS	1-SEP-93		
14	8	RAIL SHIFT CAR PTS	GENERATOR	G306 B/462 3701 11	EA	3		94 00	282		282	CIS	1-SEP-93		
14	9	RAIL SHIFT. CAR PTS	SYN GENERATOR	OS-52-Y2	EA	3		83 00	249		249	CIS	1-SEP-93		
14	10	RAIL SHIFT CAR PTS	FUEL FILTER		EA	20		2 00	40		40	CIS	1-SEP-93		
14	11	RAIL SHIFT CAR PTS	STARTER	GOST-994477	EA	6		122 00	732		732	CIS	1-SEP-93		
14	12	RAIL SHIFT. CAR PTS	FUEL PUMP	ND 41 14	EA	4		653 00	2,612		2,612	CIS	1-SEP-93		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO.	No.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN. LEA TIME	COMMENTS
1.4	13	RAIL SHIFT. CAR PTS	FUEL PUMP	661.74.000-2	EA	3		200.	6,000		6,000	CIS	1-SEP-93		
1.4	14	RAIL SHIFT. CAR PTS	TURBO COMPRESSOR	272.78.000	EA	3		1353.00	4,059		4,059	CIS	1-SEP-93		
1.4	15	RAIL SHIFT. CAR PTS	FUEL FILTER	3TF-3	EA	30		3.00	90		90	CIS	1-SEP-93		
1.4	16	RAIL SHIFT. CAR PTS	FUEL FILTER	2TF-3	EA	30		3.00	90		90	CIS	1-SEP-93		
1.4	17	RAIL SHIFT. CAR PTS	CHARG. GENERATOR	GSK-1500	EA	3		152.00	456		456	CIS	1-SEP-93		
1.4	18	RAIL SHIFT. CAR PTS	TEMPERATURE GAUGE	TPP2-V, TKP-60/31	EA	5		52.00	260		260	CIS	1-SEP-93		
1.4	19	RAIL SHIFT. CAR PTS	PRESSURE GAUGE	MTS-16Y	EA	5		43.00	215		215	CIS	1-SEP-93		
1.4	20	RAIL SHIFT. CAR PTS	PRESSURE GAUGE	MTP-6-OS1	EA	3		43.00	129		129	CIS	1-SEP-93		
1.4	21	RAIL SHIFT. CAR PTS	HOUSING	756.57.001	EA	5		32.00	160		160	CIS	1-SEP-93		
1.4	22	RAIL SHIFT. CAR PTS	RELAY REGULATOR	PL-2M-1	EA	2		252.00	504		504	CIS	1-SEP-93		
1.4	23	RAIL SHIFT. CAR PTS	STARTER	551-3708	EA	4		103.00	412		412	CIS	1-SEP-93		
1.4	24	RAIL SHIFT. CAR PTS	OIL PUMP	104.10.000	EA	3		303.00	909		909	CIS	1-SEP-93		
1.4	25	RAIL SHIFT. CAR PTS	WATER PUMP	172-11-000	EA	3		252.00	756		756	CIS	1-SEP-93		
1.4	26	RAIL SHIFT. CAR PTS	CRANE BOOM 25M	KDE-253	EA	1		1000.00	1,000		1,000	CIS	1-SEP-93		
1.4	27	RAIL SHIFT. CAR PTS	TOTAL COST - US DOLLARS						25,000		25,000	CIS	1-SEP-93		
1.5	1	RAIL MAT	RAIL TYPE P-50	GOST 7174-75	TONNE	945	BA	522.50	493,763		493,763	CIS	1-SEP-93	8MO	
1.5	2	RAIL MAT	RAIL TYPE P65	GOST 7174-75	TONNE	460	BA	522.50	240,350		240,350	CIS	1-SEP-93	8MO	
1.5	3	RAIL MAT	BEDING PLATE P-50	12135-75	TONNE	54	BA	380.00	20,520		20,520	CIS	1-SEP-93	8MO	
1.5	4	RAIL MAT	BEDING PLATE P-65	12135-75	TONNE	54	BA	380.00	20,520		20,520	CIS	1-SEP-93	8MO	
1.5	5	RAIL MAT	CONN. PLATE P-50	4133.54	TONNE	45	BA	760.00	34,200		34,200	CIS	1-SEP-93	8MO	
1.5	6	RAIL MAT	CONN. PLATE P-65	4133.54	TONNE	45	BA	760.00	34,200		34,200	CIS	1-SEP-93	8MO	
1.5	7	RAIL MAT	RR SPIKE P-50 15x15x165		TONNE	36	BA	855.00	30,780		30,780	CIS	1-SEP-93	8MO	
1.5	8	RAIL MAT	RAIL PLANGE P-50	2953-51	TONNE	10	BA	380.00	3,800		3,800	CIS	1-SEP-93	8MO	
1.5	9	RAIL MAT	RAIL PLANGE P-65	2953-51	TONNE	9	BA	380.00	3,420		3,420	CIS	1-SEP-93	8MO	
1.5	10	RAIL MAT	BOLTS & NUTS P-50	11530-76	TONNE	9	BA	665.00	5,985		5,985	CIS	1-SEP-93	8MO	
1.5	11	RAIL MAT	BOLTS & NUTS	11530-76	TONNE	4.5	BA	665.00	2,993		2,993	CIS	1-SEP-93	8MO	
1.5	12	RAIL MAT	LOCK WASHER P-50	19115	TONNE	3.6	BA	665.00	2,394		2,394	CIS	1-SEP-93	8MO	
1.5	13	RAIL MAT	TRACK SWITCH P-50 RT		SET	3	BA	8312.50	24,938		24,938	CIS	1-SEP-93	8MO	
1.5	14	RAIL MAT	TRACK SWITCH P-50 LEFT		SET	3	BA	8312.50	24,938		24,938	CIS	1-SEP-93	8MO	
1.5	15	RAIL MAT	Y-RAIL P-50-DIRECT LEFT		EA	2.5	BA	66.50	166		166	CIS	1-SEP-93	8MO	
1.5	16	RAIL MAT	Y-RAIL P-50-DIRECT RT		EA	1.5	BA	66.50	100		100	CIS	1-SEP-93	8MO	
1.5	17	RAIL MAT	RAIL INSOLATOR P-50		SET	182	BA	19.00	3,458		3,458	CIS	1-SEP-93	8MO	
1.5	18	RAIL MAT	RAIL INSOLATOR P-65		SET	173	BA	19.00	3,287		3,287	CIS	1-SEP-93	8MO	
1.5	19	RAIL MAT	CRESOTA SLEEPER		TONNE	4	BA	19.00	76		76	CIS	1-SEP-93	8MO	
1.5	20	RAIL MAT	Y-RAIL P-50 BENDED RT		EA	1.5	BA	66.50	100		100	CIS	1-SEP-93	8MO	
1.5	21	RAIL MAT.	TOTAL COST - US DOLLARS						949,986		949,986	CIS	1-SEP-93	8MO	
1.6	1	HEAT PLT PTS	CHAIN	9.08.000	EA	250	SG	30.00	7,500		7,500	CIS	1-SEP-93		
1.6	2	HEAT PLT PTS	HOLDER	9.05.002	EA	200	SG	11.90	2,380		2,380	CIS	1-SEP-93		
1.6	3	HEAT PLT PTS	HOLDER	9.05.001	EA	200	SG	11.90	2,380		2,380	CIS	1-SEP-93		
1.6	4	HEAT PLT PTS	HOLDER	6.30.25	EA	1000	SG	6.80	6,800		6,800	CIS	1-SEP-93		
1.6	5	HEAT PLT PTS	ROLLER	6.30.25	EA	600	SG	21.50	12,900		12,900	CIS	1-SEP-93		
1.6	6	HEAT PLT PTS	FRONT PACKING	T197.01.001	EA	10	SG	6.60	66		66	CIS	1-SEP-93		
1.6	7	HEAT PLT PTS	MIDDLE PACKING	T197.01.002	EA	10	SG	6.60	66		66	CIS	1-SEP-93		
1.6	8	HEAT PLT PTS	END LEFT PACKING	T82.01.001	EA	10	SG	6.60	66		66	CIS	1-SEP-93		
1.6	9	HEAT PLT PTS	RIGHT PACKING	T82.01.002	EA	10	SG	6.60	66		66	CIS	1-SEP-93		
1.6	10	HEAT PLT PTS	MIDDLE PACKING	T82.01.003	EA	10	SG	6.60	66		66	CIS	1-SEP-93		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO	No.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN LEA TIME	COMMENTS
1 6	11	HEAT PLT PTS		T82.00 016	EA	20	SG	33 00	660		660	CIS	1-SEP-93		
1.6	12	HEAT PLT PTS		T82 00 017	EA	10	SG	33 00	330		330	CIS	1-SEP-93		
1 6	13	HEAT PLT PTS	CONNECTING LINK	T82 00 018	EA	600	SG	10 00	6.000		6.000	CIS	1-SEP-93		
1 6	14	HEAT PLT PTS	SHAFT	6 30 9	EA	600	SG	22 25	13.350		13,350	CIS	1-SEP-93		
1.6	15	HEAT PLT PTS	WASHER	T82 03.005	EA	0 2	SG	0 90	0 18		0	CIS	1-SEP-93		
1 6	16	HEAT PLT PTS	WASHER	12-10906-66	EA	0 2	SG	0 90	0 18		0	CIS	1-SEP-93		
1 6	17	HEAT PLT PTS	WASHER	16-10906-66	EA	0 2	SG	0 90	0 18		0	CIS	1-SEP-93		
1 6	18	HEAT PLT PTS	WASHER	20-11371-66	EA	0 2	SG	0 90	0 18		0	CIS	1-SEP-93		
1 6	19	HEAT PLT PTS	COTTER PIN	3 2x25 397-66	EA	0 2	SG	0 90	0 18		0	CIS	1-SEP-93		
1 6	20	HEAT PLT PTS	COTTER PIN	5X28X 397-66	EA	0 5	SG	0 90	0.45		0	CIS	1-SEP-93		
1.6	21	HEAT PLT PTS	COTTER PIN	5X50 397-66	EA	0 5	SG	0 90	0.45		0	CIS	1-SEP-93		
1 6	22	HEAT PLT PTS	CHAIN	9x27 2319-70	EA	200	SG	30 00	6,000		6,000	CIS	1-SEP-93		
1 6	23	HEAT PLT PTS	FT SHFT W/HALF COUP	T82 03 000	EA	1	SG	1700 00	1,700		1,700	CIS	1-SEP-93		
1 6	24	HEAT PLT PTS	END SHFT	T82 07 000	EA	1	SG	1532.00	1,532		1,532	CIS	1-SEP-93		
1 6	25	HEAT PLT PTS	SOCKSHING PAN	DN-17	EA	2	SG	600.00	1,200		1,200	CIS	1-SEP-93		
1 6	26	HEAT PLT PTS	STEAM BOILER PTS	1.08 06	EA	200	SG	3 98	796		796	CIS	1-SEP-93		
1 6	27	HEAT PLT PTS	STEAM BOILER PTS	1.08.05	EA	1200	SG	3.98	4,776		4,776	CIS	1-SEP-93		
1.6	28	HEAT PLT PTS	STEAM BOILER PTS	3P-800	EA	4	SG	3310 00	13,240		13,240	CIS	1-SEP-93		
1 6	29	HEAT PLT PTS	BOILER CONVEC SEC	KVTC-20-150	EA	2	SG	13000 00	26,000		26,000	CIS	1-SEP-93		
1.6	30	HEAT PLT PTS	TOTAL COST US DOLLARS						107,876		107,876	CIS	1-SEP-93		
1.7	1	COAL LOAD	PUMP STATION	CMJ V3A00 OCY-2	EA	1	BA	6000.00	6,000		6,000	CIS	1-SEP-93		
1 7	2	COAL LOAD	PULLEY HOIST	3460 03 03600/3430.11.200	EA	4	BA	520 00	2,080		2,080	CIS	1-SEP-93		
1.7	3	COAL LOAD	PULLEY IDLER	3460 03 03600/3430.11 00	EA	20	BA	520 00	10,400		10,400	CIS	1-SEP-93		
1 7	4	COAL LOAD	BELTS 1400 WIDTH		EA	20	BA	13 00	260		260	CIS	1-SEP-93		
1 7	5	COAL LOAD	FRONT PLATE	3460 00 005 02	EA	1	BA	11250 00	11,250		11,250	CIS	1-SEP-93		
1 7	6	COAL LOAD	VIBRATOR SCREEN	7204 0001	EA	2	BA	600 00	1,200		1,200	CIS	1-SEP-93		
1.7	7	COAL LOAD	SCREEN SPRINGS	1RO-72	EA	6	BA	96 00	576		576	CIS	1-SEP-93		
1.7	8	COAL LOAD	REDUCTION GEAR BOX	MY25AM01.03.160	EA	1	BA	8000 00	8,000		8,000	CIS	1-SEP-93		
1.7	9	COAL LOAD	ROLLARS	200001.01.00.04	EA	1000	BA	25 00	25,000		25,000	CIS	1-SEP-93		
1 7	10	COAL LOAD	ROLLARS	200022.01.00 04	EA	1000	BA	25 00	25,000		25,000	CIS	1-SEP-93		
1 7	11	COAL LOAD	ROLARS	1E4 952.306	EA	100	BA	25 00	2,500		2,500	CIS	1-SEP-93		
1.7	12	COAL LOAD	ROLLARS	1E4 992.110B	EA	60	BA	25 00	1,500		1,500	CIS	1-SEP-93		
1 7	13	COAL LOAD	ROLLARS	1E4 954.30B	EA	30	BA	25 00	750		750	CIS	1-SEP-93		
1.7	14	COAL LOAD	REDUCTION GEAR BOX	KS1-300	EA	1	BA	8000.00	8,000		8,000	CIS	1-SEP-93		
1.7	15	COAL LOAD	CONVEYOR DR MOTORS	4A3556Y3 160	EA	1	BA	2100 00	2,100		2,100	CIS	1-SEP-93		
1.7	16	COAL LOAD	CONVEYOR DR MOTORS	4AM200M6Y322	EA	2	BA	286 00	572		572	CIS	1-SEP-93		
1.7	17	COAL LOAD	CONVEYOR DR MOTORS	A0102-6-6-424/37	EA	1	BA	975 00	975		975	CIS	1-SEP-93		
1.7	18	COAL LOAD	CONVEYOR DR MOTORS	A0102 12-B-3-4 24/35	EA	1	BA	975.00	975		975	CIS	1-SEP-93		
1.7	19	COAL LOAD	SUBTOTAL COST - US DOLLARS				BA		107,138		107,138	CIS	1-SEP-93		
1 7	1	COAL CRUSHER	CRUSHER SPRING	5460 00.004.60	EA	4	BA	245 00	980		980	CIS	1-SEP-93		
1 7	2	COAL CRUSHER	CR COLLAR 11x530x580-1	8752-79	EA	4	BA	3 00	12		12	CIS	1-SEP-93		
1 7	3	COAL CRUSHER	CR COLLAR 11x750x810-1	8752-79	EA	4	BA	25.00	100		100	CIS	1-SEP-93		
1 7	4	COAL CRUSHER	CRUSHER SHRIM	3450-01.011.0	EA	2	BA	60 00	120		120	CIS	1-SEP-93		
1 7	5	COAL CRUSHER	CRUSHER BEARING	5721-75	EA	2	BA	60 00	120		120	CIS	1-SEP-93		
1.7	6	COAL CRUSHER	SUBTOTAL COST - US DOLLARS		EA		BA		1,332		1,332	CIS	1-SEP-93		
1 7	1	COAL LOAD	BUSHING	3400.00.005 02	EA	4	SG	2125.00	8,500		8,500	CIS	1-SEP-93		
1 7	2	COAL LOAD	FRONT PLATE	3430 04.200 7	EA	8	SG	11250 00	90,000		90,000	CIS	1-SEP-93		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO.	No.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN. LEA TIME	COMMENTS
1.7	3	COAL LOAD	DISC	3430.11.200 00	EA	8	SG	320 00	2,560		2,560	CIS	1-SEP-93		
1.7	4	COAL LOAD	DISC	343011 007 00	EA	8	SG	320.00	2,560		2,560	CIS	1-SEP-93		
1.7	5	COAL LCAD	DRIVE UNIT - LEFT SIDE	7415 53 050 00	EA	1	SG	63 00	63		63	CIS	1-SEP-93		
1.7	6	COAL LOAD	VIBRATOR LEFT	GICL-72 00	EA	1	SG	600 00	600		600	CIS	1-SEP-93		
1.7	7	COAL LOAD	VIBRATOR RIGHT	GICL-72 00	EA	1	SG	600 00	600		600	CIS	1-SEP-93		
1.7	8	COAL LOAD	SUBTOTAL COST - US DOLLARS				SG		104,883		104,883	CIS	1-SEP-93		
1.7	9	COAL LOAD	TOTAL COST - US DOLLARS						213,353		213,353				
1 8	1	SHOV PTS, EKG 8i & 4y	PACKING	3502 07 00.000	EA	20	SG					CIS	1-SEP-93		
1 8	2	SHOV PTS, EKG 8i & 4y		3519 03 06.008	EA	40	SG					CIS	1-SEP-93		
1 8	3	SHOV PTS, EKG 8i & 4y	BEARING	3519 03 06 000	EA	1	SG	13700 00	13,700		13,700	CIS	1-SEP-93		
1 8	4	SHOV PTS, EKG 8i & 4y	BUSHING	3519 05 00 012	EA	4	SG	3228 00	12,912		12,912	CIS	1-SEP-93		
1 8	5	SHOV PTS, EKG 8i & 4y	BUSHING	3519 05 02 102	EA	20	SG	1046 00	20,920		20,920	CIS	1-SEP-93		
1 8	6	SHOV PTS, EKG 8i & 4y	BUSHING	3519 05 02 035	EA	20	SG	890 00	17,800		17,800	CIS	1-SEP-93		
1 8	7	SHOV PTS, EKG 8i & 4y	BUSHING	3519 05 02 302	EA	10	SG	1042 00	10,420		10,420	CIS	1-SEP-93		
1 8	8	SHOV PTS, EKG 8i & 4y	FIRST GEAR Z=23, m=10	2006-2402106	EA	12	SG	169 00	2,028		2,028	CIS	1-SEP-93		
1 8	9	SHOV PTS, EKG 8i & 4y	FIRST GEAR Z=13, m=6 25	205-24021010	EA	2	SG	181 00	362		362	CIS	1-SEP-93		
1 8	10	SHOV PTS, EKG 8i & 4y		3519 11 02 214	EA	10	SG					CIS	1-SEP-93		
1 8	11	SHOV PTS, EKG 8i & 4y		3502 03 04 302	EA	80	SG	85 00	6,800		6,800	CIS	1-SEP-93		
1 8	12	SHOV PTS, EKG 8i & 4y	COMPRESSOR VV-07/8	3519 14 01.000	EA	2	SG	1350 00	2,700		2,700	CIS	1-SEP-93		
1 8	13	SHOV PTS, EKG 8i & 4y	PISTON VV-07/8	VV-07 8 03.011	EA	10	SG	32 00	320		320	CIS	1-SEP-93		
1 8	14	SHOV PTS, EKG 8i & 4y	COMPRESSOR RING	EK-4.03.012	EA	80	SG	4 28	342		342	CIS	1-SEP-93		
1 8	15	SHOV PTS, EKG 8i & 4y	OIL RING	EK-4.03 013	EA	80	SG					CIS	1-SEP-93		
1 8	16	SHOV PTS, EKG 8i & 4y	PISTON RING	EK-4 03 014	EA	20	SG					CIS	1-SEP-93		
1 8	17	SHOV PTS, EKG 8i & 4y	BUSHING	EK-4.03.019.3	EA	20	SG					CIS	1-SEP-93		
1 8	18	SHOV PTS, EKG 8i & 4y	VALVE PLATE	EK-7A 04 014	EA	300	SG	0 20	60		60	CIS	1-SEP-93		
1 8	19	SHOV PTS, EKG 8i & 4y	CON ROD VV-07/8	EK-4 03	EA	20	SG	20.00	400		400	CIS	1-SEP-93		
1 8	20	SHOV PTS, EKG 8i & 4y		3519 21.00.000	EA	4	SG	464 00	1,856		1,856	CIS	1-SEP-93		
1 8	21	SHOV PTS, EKG 8i & 4y	JOINT 1-80x105-3	8752-70	EA	10	SG					CIS	1-SEP-93		
1 8	22	SHOV PTS, EKG 8i & 4y	AIR CYLINDER	3519 09 02 400	EA	5	SG					CIS	1-SEP-93		
1 8	23	SHOV PTS, EKG 8i & 4y	DISTRIBUTOR	3519 14.01.200	EA	15	SG	193 00	2,895		2,895	CIS	1-SEP-93		
1 8	24	SHOV PTS, EKG 8i & 4y	VALVE (BACK)	E-155A	EA	8	SG					CIS	1-SEP-93		
1 8	25	SHOV PTS, EKG 8i & 4y	RECULATOR		EA	4	SG	19 00	76		76	CIS	1-SEP-93		
1 8	26	SHOV PTS, EKG 8i & 4y	PUMP	BG-11-22A	SET	4	SG	98 00	392		392	CIS	1-SEP-93		
1 8	27	SHOV PTS, EKG 8i & 4y	JOINT 1-360x400-3	8752-79	EA	24	SG	3 20	77		77	CIS	1-SEP-93		
1 8	28	SHOV PTS, EKG 8i & 4y	JOINT 1-120x150-3	8752-70	EA	30	SG	2 20	66		66	CIS	1-SEP-93		
1 8	29	SHOV PTS, EKG 8i & 4y	SEAL	200-240 2052B2	EA	10	SG					CIS	1-SEP-93		
1 8	30	SHOV PTS, EKG 8i & 4y	JOINT 50	GOST 6678-58	EA	12	SG	0 70	8		8	CIS	1-SEP-93		
1 8	31	SHOV PTS, EKG 8i & 4y	JOINT T 300	3502 11 02.215	EA	10	SG	3 50	35		35	CIS	1-SEP-93		
1 8	32	SHOV PTS, EKG 8i & 4y	RING 252x16	12724.011	EA	20	SG	3 30	66		66	CIS	1-SEP-93		
1 8	33	SHOV PTS, EKG 8i & 4y	JOINT 100	GOST 6678-58	EA	40	SG	0 90	36		36	CIS	1-SEP-93		
1 8	34	SHOV PTS, EKG 8i & 4y	RING 180x35 19.05.0.078		EA	16	SG	1 80	29		29	CIS	1-SEP-93		
1 8	35	SHOV PTS, EKG 8i & 4y		3503.29 02.002	EA	6	SG	1932 00	11,592		11,592	CIS	1-SEP-93		
1 8	36	SHOV PTS, EKG 8i & 4y	PACKING RING F50-60	3502 11.12 002	EA	20	SG	0 80	16		16	CIS	1-SEP-93		
1 8	37	SHOV PTS, EKG 8i & 4y	MOTOR MOTOR		EA	4	SG					CIS	1-SEP-93		
1 8	38	SHOV PTS, EKG 8i & 4y	ALTERNATOR	STD 524.162	EA	72	SG					CIS	1-SEP-93		
1 8	39	SHOV PTS, EKG 8i & 4y	BRUSH HOLDER 25x50		EA	600	SG					CIS	1-SEP-93		
1 8	40	SHOV PTS, EKG 8i & 4y	EL. BRUSH EG-14	25x50x64	EA	1000	SG	1.00	1,000		1,000	CIS	1-SEP-93		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO.	No.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN. LEA TIME	COMMENTS
1.8	41	SHOV PTS, EKG 8i & 4y	EL. BRUSH EG-14	16x32x40	EA	800	SG	1.00	800		800	CIS	1-SEP-93		
1.8	42	SHOV PTS, EKG 8i & 4y	EL. BRUSH EG-14	16x25x52	EA	800	SG	1.00	800		800	CIS	1-SEP-93		
1.8	43	SHOV PTS, EKG 8i & 4y	EL. BRUSH EG-14	20x32x40	EA	1000	SG	1.00	1,000		1,000	CIS	1-SEP-93		
1.8	44	SHOV PTS, EKG 8i & 4y	EL. BRUSH EG-14	25x32x40	EA	2000	SG	1.00	2,000		2,000	CIS	1-SEP-93		
1.8	45	SHOV PTS, EKG 8i & 4y	EL. BRUSH EG-14	25x30x40	EA	1000	SG	1.00	1,000		1,000	CIS	1-SEP-93		
1.8	46	SHOV PTS, EKG 8i & 4y	MOTOR ROTOR		EA	3	SG					CIS	1-SEP-93		
1.8	47	SHOV PTS, EKG 8i & 4y	RESISTOR UNIT NF-11A	2TD 754.065.20	EA	2	SG					CIS	1-SEP-93		
1.8	48	SHOV PTS, EKG 8i & 4y	RESISTOR UNIT NF-11A	2TD 750 020.45	EA	2	SG					CIS	1-SEP-93		
1.8	49	SHOV PTS, EKG 8i & 4y	RESISTOR UNIT NF-11A	2TD 754.065.19	EA	2	SG					CIS	1-SEP-93		
1.8	50	SHOV PTS, EKG 8i & 4y	RESISTOR UNIT NF-11A	2TD 754.054.27	EA	2	SG					CIS	1-SEP-93		
1.8	51	SHOV PTS, EKG 8i & 4y	OIL BREAKER		EA	2	SG					CIS	1-SEP-93		
1.8	52	SHOV PTS, EKG 8i & 4y	CONTROL UNIT	KA-4658-6	EA	6	SG					CIS	1-SEP-93		
1.8	53	SHOV PTS, EKG 8i & 4y	CONTROL UNIT	EK-8209	EA	1	SG					CIS	1-SEP-93		
1.8	54	SHOV PTS, EKG 8i & 4y	CONTROL UNIT	EK-8203	EA	1	SG					CIS	1-SEP-93		
1.8	55	SHOV PTS, EKG 8i & 4y	CONTROL UNIT	EK-8252	EA	2	SG					CIS	1-SEP-93		
1.8	56	SHOV PTS, EKG 8i & 4y	MAGNET BOOSTER	BD511 13.43	EA	4	SG					CIS	1-SEP-93		
1.8	57	SHOV PTS, EKG 8i & 4y	MAGN AMPLIFIER	YMZP-1,6-127/5DYZ	EA	2	SG					CIS	1-SEP-93		
1.8	58	SHOV PTS, EKG 8i & 4y	MAGN AMPLIFIER	YMZP-1,6-127/50DYZ	EA	2	SG					CIS	1-SEP-93		
1.8	59	SHOV PTS, EKG 8i & 4y	MOTOR ROTOR	5TD 674.023	EA	2	SG					CIS	1-SEP-93		
1.8	60	SHOV PTS, EKG 8i & 4y	ROTOR SET (REWIND)	5TD 524.125	EA	72	SG					CIS	1-SEP-93		
1.8	61	SHOV PTS, EKG 8i & 4y	BRUSH HOLDER 20x32	5TD 112.005	EA	100	SG					CIS	1-SEP-93		
1.8	62	SHOV PTS EKG 8i, 4y	SUBTOTAL COST - US DOLLARS		EA		SG					CIS	1-SEP-93		
1.8	1	SHOV PTS EKG 8i	BUCKET BOTTOM	3519.33 05.001	EA	1	BA	2540.00	2,540		2,540	CIS	1-SEP-93		
1.8	2	SHOV PTS EKG 8i	BOTTOM RING	3519 33 02.001	EA	2	BA	2300.00	4,600		4,600	CIS	1-SEP-93		
1.8	3	SHOV PTS EKG 8i	BUSHING LOWER	3519.06.00 002	EA	1	BA					CIS	1-SEP-93		
1.8	4	SHOV PTS EKG 8i	GEAR z=23 m=10 5	205 B.240.2060	EA	1	BA					CIS	1-SEP-93		
1.8	5	SHOV PTS EKG 8i	GEAR z=13 m=6.24	200 M 240.2110	EA	1	BA					CIS	1-SEP-93		
1.8	6	SHOV PTS EKG 8i	PIN	3519 05 06.004	EA	100	BA					CIS	1-SEP-93		
1.8	7	SHOV PTS EKG 8i	EL AIR DISTRIBUTOR	3532 14 03 000	EA	8	BA					CIS	1-SEP-93		
1.8	8	SHOV PTS EKG 8i	VALVE	3532 14 03 005	EA	20	BA					CIS	1-SEP-93		
1.8	9	SHOV PTS EKG 8i	PIN	3517 14.01 019	EA	120	BA					CIS	1-SEP-93		
1.8	10	SHOV PTS EKG 8i	JOINT 1-100-3	GOST 6678-72	EA	100	BA					CIS	1-SEP-93		
1.8	11	SHOV PTS EKG 8i	JOINT 1-225-3	GOST 6678-72	EA	8	BA					CIS	1-SEP-93		
1.8	12	SHOV PTS EKG 8i	PIPE F16		M	120	BA					CIS	1-SEP-93		
1.8	13	SHOV PTS EKG 8i	PIPE F40		M	80	BA					CIS	1-SEP-93		
1.8	14	SHOV PTS EKG 8i	GLASS	3519.18.00 230	EA	4	BA					CIS	1-SEP-93		
1.8	15	SHOV PTS EKG 8i	POINTER	GOST 9684-75	EA	2	BA					CIS	1-SEP-93		
1.8	16	SHOV PTS EKG 8i	OIL GAN SHRG 630-1		EA	5	BA					CIS	1-SEP-93		
1.8	17	SHOV PTS EKG 8i	EL. HEATER TEP 200B13	13/125&220	EA	16	BA					CIS	1-SEP-93		
1.8	18	SHOV PTS EKG 8i	CONTROL UNITS (HOIST)	EK 8212A	EA	6	BA					CIS	1-SEP-93		
1.8	19	SHOV PTS EKG 8i	C UNIT FOR PUSH	EK 8213A	EA	6	BA					CIS	1-SEP-93		
1.8	20	SHOV PTS EKG 8i	C UNIT FOR TURN	EK 8257A	EA	6	BA					CIS	1-SEP-93		
1.8	21	SHOV PTS EKG 8i	C UNIT FOR WALK	KT 1228	EA	6	BA					CIS	1-SEP-93		
1.8	22	SHOV PTS EKG 4y	BUCKET RING		EA	2	BA					CIS	1-SEP-93		
1.8	23	SHOV PTS EKG 4y	BUSHING LOWER	351 906.00.004	EA	2	BA					CIS	1-SEP-93		
1.8	24	SHOV PTS EKG 4y	BUSHING UPPER	351 906.00 011	EA	2	BA					CIS	1-SEP-93		
1.6	25	SHOV PTS EKG 4y	EL AIR DISTRIBUTOR	3532 14.03 000	EA	4	BA					CIS	1-SEP-93		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO.	No.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN LEA TIME	COMMENTS
1.8	26	SHOV PTS EKG 4y	VALVE	3532.14.03 005	EA	10	BA					CIS	1-SEP-93		
1.8	27	SHOV PTS EKG 4y		VV32SH	EA	5	BA					CIS	1-SEP-93		
1.8	28	SHOV PTS EKG 4y	CON ROD FOR VVO 8/81		EA	6	BA					CIS	1-SEP-93		
1.8	29	SHOV PTS EKG 4y	CRANK SHAFT		EA	3	BA					CIS	1-SEP-93		
1.8	30	SHOV PTS EKG 4y	PISTON		EA	4	BA					CIS	1-SEP-93		
1.8	31	SHOV PTS EKG 4y	COMPRESSOR RING Y112	GOST 1412-85/EK7A03.112	EA	20	BA					CIS	1-SEP-93		
1.8	32	SHOV PTS EKG 4y	OIL RING M 112	412-85/EK7A03.113	EA	20	BA					CIS	1-SEP-93		
1.8	33	SHOV PTS EKG 4y	PLATE RING		EA	120	BA					CIS	1-SEP-93		
1.8	34	SHOV PTS EKG 4y	DEMPER	3519.09.01 004	EA	432	BA					CIS	1-SEP-93		
1.8	35	SHOV PTS 8i & 4y	SUBTOTAL COST - US DOLLARS				BA					CIS	1-SEP-93		
1.8	36	SHOV PTS 8i & 4y	TOTAL COST - US DOLLARS								320,000				
1.9	1	COAL CRUSHER - FEEDER BREAKER			LOT						478,300	CIS	1-SEP-93		
1.10	1	OVHD TROLLEY LINES	COPPER CRNT INSULATORS	MF-100	TONNE	11	BA	1600.00	17,600		17,600	CIS	1-SEP-93		
1.10	2	OVHD TROLLEY LINES	POLYMER WIRE		EA	60	BA	12.00	720		720	CIS	1-SEP-93		
1.10	3	OVHD TROLLEY LINES		KS-012-76	EA	300	BA	3.00	900		900	CIS	1-SEP-93		
1.10	4	OVHD TROLLEY LINES		KS-013-76	EA	300	BA	5.00	1,500		1,500	CIS	1-SEP-93		
1.10	5	OVHD TROLLEY LINES		KS-014-76	EA	200	BA	4.00	800		800	CIS	1-SEP-93		
1.10	6	OVHD TROLLEY LINES		KS-024-76 D-3/4-40	EA	800	BA	8.00	6,400		6,400	CIS	1-SEP-93		
1.10	7	OVHD TROLLEY LINES		KS-035-76	EA	200	BA	6.00	1,200		1,200	CIS	1-SEP-93		
1.10	8	OVHD TROLLEY LINES		KS-035-76	EA	200	BA	12.00	2,400		2,400	CIS	1-SEP-93		
1.10	9	OVHD TROLLEY LINES		KS-040-76	EA	200	BA	12.00	2,400		2,400	CIS	1-SEP-93		
1.10	10	OVHD TROLLEY LINES		KS-039-76	EA	200	BA	12.00	2,400		2,400	CIS	1-SEP-93		
1.10	11	OVHD TROLLEY LINES		KS-049-76	EA	800	BA	7.00	5,600		5,600	CIS	1-SEP-93		
1.10	12	OVHD TROLLEY LINES		KS-055-76	EA	200	BA	8.00	1,600		1,600	CIS	1-SEP-93		
1.10	13	OVHD TROLLEY LINES		KS-059-1-76	EA	500	BA	20.00	10,000		10,000	CIS	1-SEP-93		
1.10	14	OVHD TROLLEY LINES		KS-064-67	EA	300	BA	20.00	6,000		6,000	CIS	1-SEP-93		
1.10	15	OVHD TROLLEY LINES		KS-053-76	EA	500	BA	20.00	10,000		10,000	CIS	1-SEP-93		
1.10	16	OVHD TROLLEY LINES		KS-066-76	EA	400	BA	15.00	6,000		6,000	CIS	1-SEP-93		
1.10	17	OVHD TROLLEY LINES		KS069-76Y	EA	200	BA	15.00	3,000		3,000	CIS	1-SEP-93		
1.10	18	OVHD TROLLEY LINES		KS-071-76	EA	200	BA	15.00	3,000		3,000	CIS	1-SEP-93		
1.10	19	OVHD TROLLEY LINES		KS-075-76	EA	200	BA	1.00	200		200	CIS	1-SEP-93		
1.10	20	OVHD TROLLEY LINES		OMSH-10-2000	EA	1500	BA	18.00	27,000		27,000	CIS	1-SEP-93		
1.10	21	OVHD TROLLEY LINES		PF 70-V	EA	200	BA	18.00	3,600		3,600	CIS	1-SEP-93		
1.10	22	OVHD TROLLEY LINES		PTF -70	EA	200	BA	18.00	3,600		3,600	CIS	1-SEP-93		
1.10	23	OVHD TROLLEY LINES			EA	10	BA	8.00	80		80	CIS	1-SEP-93		
1.10	24	OVHD TROLLEY LINES		RLND/3/-35-1000	EA	10	BA	60.00	600		600	CIS	1-SEP-93		
1.10	25	OVHD TROLLEY LINES	TOTAL COST - US DOLLARS						116,600		116,600	CIS	1-SEP-93		
1.11	1	CONVEYOR ZIPPER SPLICES			LOT						24,144	USA	1-SEP-93		
1.12	1	BATTERIES RR	32CT-450AMP/HR-64V	8 BAT/SET	EA	32	BA	414.00	13,248	1,644	14,892	USA	1-SEP-93		
1.12	2	BATTERIES RR	32CT-450AMP/HR-64V		EA	32	SG	414.00	13,248	1,644	14,892	USA	1-SEP-93		
1.12	3	BATTERIES RR	TOTAL COST- US DOLLARS						26,496	3,288	29,784	USA	1-SEP-93		
1.13	1	SM. E. PTS	ENGINE	D160	SET	3		7800.00	23,400		23,400	CIS	1-SEP-93		
1.13	2	SM. E. PTS	COTTER PINS	D1434	EA	48		5.40	259		259	CIS	1-SEP-93		
1.13	3	SM. E. PTS	COTTER PINS	2971	EA	48		5.40	259		259	CIS	1-SEP-93		
1.13	4	SM. E. PTS	BLOCK ENGINE	51-01-2 SP	EA	3		340.00	1,020		1,020	CIS	1-SEP-93		
1.13	5	SM. E. PTS	PACKING	40201	EA	10		1.05	11		11	CIS	1-SEP-93		
1.13	6	SM. E. PTS	RINGS	40201	EA	100		0.41	41		41	CIS	1-SEP-93		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO.	No.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN. LEA TIME	COMMENTS
1.13	7	SM. E. PTS	PACKING SET	A230113160CBN-1	SET	20		73.00	1,460		1,460	CIS	1-SEP-93		
1.13	8	SM. E. PTS	PACKING SET-LOWER	A230110311AN1	SET	20		73.00	1,460		1,460	CIS	1-SEP-93		
1.13	9	SM. E. PTS	PACKING SET-UPPER	A23 0110312AN2	SET	20		73.00	1,460		1,460	CIS	1-SEP-93		
1.13	10	SM. E. PTS	PACKING	14-02-101 SP	EA	20		12.47	249		249	CIS	1-SEP-93		
1.13	11	SM. E. PTS	ENGINE REBUILD KIT	1-03-1 SP	SET	4		105.00	420		420	CIS	1-SEP-93		
1.13	12	SM. E. PTS	BUSHING	03315	EA	10		20.00	200		200	CIS	1-SEP-93		
1.13	13	SM. E. PTS	PACKING UPPER	023 01.10003AN1	SET	20		75.00	1,500		1,500	CIS	1-SEP-93		
1.13	14	SM. E. PTS	PACKING LOWER	A23 01.10004DN1	SET	20		75.00	1,500		1,500	CIS	1-SEP-93		
1.13	15	SM. E. PTS	RING SETS	A27.00.011	SET	30		2.05	62		62	CIS	1-SEP-93		
1.13	16	SM. E. PTS		027 00 024	SET	30		2.30	69		69	CIS	1-SEP-93		
1.13	17	SM. E. PTS		A27.00.043	SET	30		3.15	95		95	CIS	1-SEP-93		
1.13	18	SM. E. PTS	PISTON RING SETS	03694-1 SP	SET	4		5.15	21		21	CIS	1-SEP-93		
1.13	19	SM. E. PTS	GENERATOR BELT	G-12 5x9x1090	EA	20		3.00	60		60	CIS	1-SEP-93		
1.13	20	SM. E. PTS	FAN BELTS	p-16x11x1650	EA	20		3.10	62		62	CIS	1-SEP-93		
1.13	21	SM. E. PTS	WATER PUMP	16 08 140 SP	EA	10		240.00	2,400		2,400	CIS	1-SEP-93		
1.13	22	SM. E. PTS	OIL PUMP	29 09.124 SP	EA	8		228.66	1,829		1,829	CIS	1-SEP-93		
1.13	23	SM. E. PTS	CYLINDER LINER	01466	EA	12		89.30	1,072		1,072	CIS	1-SEP-93		
1.13	24	SM. E. PTS	RING SETS	51-03-115 SP	EA	100		52.00	5,200		5,200	CIS	1-SEP-93		
1.13	25	SM. E. PTS	CRANK SHAFT	16-03-1120 SP	EA	4		1050.00	4,200		4,200	CIS	1-SEP-93		
1.13	26	SM. E. PTS	PISTON	51-03-103	SET	10		119.64	1,196		1,196	CIS	1-SEP-93		
1.13	27	SM. E. PTS	PACKING	700-40-2886	EA	20		1.49	30		30	CIS	1-SEP-93		
1.13	28	SM. E. PTS	FILTER	A41 20 000-1 SP	EA	40		15.14	606		606	CIS	1-SEP-93		
1.13	29	SM. E. PTS	FILTER	A41.10.000-02 SP	EA	40		28.12	1,125		1,125	CIS	1-SEP-93		
1.13	30	SM. E. PTS	RING	40843	EA	100		0.41	41		41	CIS	1-SEP-93		
1.13	31	SM. E. PTS	PACKING	40269	EA	10		0.76	8		8	CIS	1-SEP-93		
1.13	32	SM. E. PTS	SPRAYER	14-69-107-1 SP	EA	100		33.00	3,300		3,300	CIS	1-SEP-93		
1.13	33	SM. E. PTS	INSECTOR FITTINGS	14-69-117-1 SP	EA	100		62.37	6,237		6,237	CIS	1-SEP-93		
1.13	34	SM. E. PTS	CYLINDER HEAD	29-02-3 SP	EA	3		18.00	54		54	CIS	1-SEP-93		
1.13	35	SM. E. PTS	STARTER	1723 SP	EA	3		1250.00	3,750		3,750	CIS	1-SEP-93		
1.13	36	SM. E. PTS	RADIATOR	1304130101 SP	EA	10		684.77	6,848		6,848	CIS	1-SEP-93		
1.13	37	SM. E. PTS	MAGNETO	M-149A	EA	10		105.57	1,056		1,056	CIS	1-SEP-93		
1.13	38	SM. E. PTS	CARBURATOR	113-110-70-11	EA	10		67.46	675		675	CIS	1-SEP-93		
1.13	39	SM. E. PTS	GENERATOR	69-063701	EA	8		240.00	1,920		1,920	CIS	1-SEP-93		
1.13	40	SM. E. PTS	STARTER	ST-230E	EA	8		126.00	1,008		1,008	CIS	1-SEP-93		
1.13	41	SM. E. PTS	TURBO COMPRESSOR	111 30.001.10	EA	6		932.00	5,592		5,592	CIS	1-SEP-93		
1.13	42	SM. E. PTS	FUEL SYSTEM UPPER	16.67-1 SP	EA	6		110.00	660		660	CIS	1-SEP-93		
1.13	43	SM. E. PTS	TOTAL COST - US DOLLARS						82,412		82,412	CIS	1-SEP-93		
1.14	1	T-130 DOZER	PACKING	2301103160SBN-1	EA	30	BA	73.00	2,190		2,190	CIS	1-SEP-93		
1.14	2	T-130 DOZER	THIMBLE	01466-2	EA	100	BA	89.30	8,930		8,930	CIS	1-SEP-93		
1.14	3	T-130 DOZER	RINGS	51-03-115 SP	EA	100	BA	52.00	5,200		5,200	CIS	1-SEP-93		
1.14	4	T-130 DOZER	CRANK SHAFT	16-[illegible]126 SP	EA	6	BA	1050.00	6,300		6,300	CIS	1-SEP-93		
1.14	5	T-130 DOZER	CYLINDER	51-[illegible]-23	EA	100	BA	119.64	11,964		11,964	CIS	1-SEP-93		
1.14	6	T-130 DOZER	SEAL HYD.	700-40-2886	EA	48	BA	1.49	72		72	CIS	1-SEP-93		
1.14	7	T-130 DOZER	FILTER	A41.10.000.02 SP	EA	100	BA	28.12	2,812		2,812	CIS	1-SEP-93		
1.14	8	T-130 DOZER	FILTER	F A41.20.00.01 SP	EA	100	BA	15.14	1,514		1,514	CIS	1-SEP-93		
1.14	9	T-130 DOZER	RING	40843	EA	100	BA	0.41	41		41	CIS	1-SEP-93		
1.14	10	T-130 DOZER	PACKING	40269	EA	30	BA	0.76	23		23	CIS	1-SEP-93		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO.	No.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN. LEA TIME	COMMENTS
1.14	11	T-130 DOZER	GEAR PINTON	74116	EA	3	BA	20.96	63		63	CIS	1-SEP-93		
1.14	12	T-130 DOZER	REDUCTION GEAR	17-76-8 SP	EA	1	BA	276.40	276		276	CIS	1-SEP-93		
1.14	13	T-130 DOZER	INGECTORS - FUEL	14-69-107-1 SP	EA	100	BA	33.00	3,300		3,300	CIS	1-SEP-93		
1.14	14	T-130 DOZER	SPRAYER	14-69-117-1 SP	EA	100	BA	62.37	6,237		6,237	CIS	1-SEP-93		
1.14	15	T-130 DOZER	PUMP	51-67-11 SP	EA	3	BA	765.00	2,295		2,295	CIS	1-SEP-93		
1.14	16	T-130 DOZER	COMPRESSOR PIPING	92-000-06	EA	10	BA	432.00	4,320		4,320	CIS	1-SEP-93		
1.14	17	T-130 DOZER	INLET AIR	NO36-85-770	EA	9	BA	46.50	419		419	CIS	1-SEP-93		
1.14	18	T-130 DOZER	WATER PUMP	16-8-140-SP	EA	10	BA	240.00	2,400		2,400	CIS	1-SEP-93		
1.14	19	T-130 DOZER	OIL PUMP	29-09-124-SP	EA	10	BA	228.66	2,287		2,287	CIS	1-SEP-93		
1.14	20	T-130 DOZER	HYD. PUMP	NSH 100A-3-11	EA	6	BA	350.00	2,100		2,100	CIS	1-SEP-93		
1.14	21	T-130 DOZER	PUMP	NSH 32 Y-211	EA	2	BA	135.10	270		270	CIS	1-SEP-93		
1.14	22	T-130 DOZER	GEAR BOX	24-12-1 SP	EA	2	BA	4574.93	9,150		9,150	CIS	1-SEP-93		
1.14	23	T-130 DOZER	FILTER	A23 30.000 01	EA	50	BA	54.76	2,738		2,738	CIS	1-SEP-93		
1.14	24	T-130 DOZER	PACKING SEALS	709-40-2049	EA	30	BA	0.66	20		20	CIS	1-SEP-93		
1.14	25	T-130 DOZER	CARBURATOR	113-110-011	EA	12	BA	67.46	810		810	CIS	1-SEP-93		
1.14	26	T-130 DOZER	SUPPORT BRACKET	51-07-102 SP	EA	4	BA	34.54	138		138	CIS	1-SEP-93		
1.14	27	T-130 DOZER	ENGINE HEAD	07166- -SP	EA	6	BA	12.26	74		74	CIS	1-SEP-93		
1.14	28	T-130 DOZER	FUEL SYSTEM CENTRIFUGE 95000		EA	5	BA	195.95	980		980	CIS	1-SEP-93		
1.14	29	T-130 DOZER	FAN BLADES	51-08-113 SP	EA	4	BA	14.26	57		57	CIS	1-SEP-93		
1.14	30	T-130 DOZER	RADIATOR	130Y-13-010-1	EA	10	BA	684.77	6,848		6,848	CIS	1-SEP-93		
1.14	31	T-130 DOZER	DISC	738-4-SP	EA	15	BA	12.04	181		181	CIS	1-SEP-93		
1.14	32	T-130 DOZER	MAGNET SOLENOID	M149-AE	EA	14	BA	105.57	1,478		1,478	CIS	1-SEP-93		
1.14	33	T-130 DOZER	STARTER	ST-230E	EA	14	BA	126.10	1,765		1,765	CIS	1-SEP-93		
1.14	34	T-130 DOZER	GENERATOR	70-3701	EA	5	BA	240.86	1,204		1,204	CIS	1-SEP-93		
1.14	35	T-130 DOZER	RELAY STARTER	RR-0362BT	EA	15	BA	38.00	570		570	CIS	1-SEP-93		
1.14	36	T-130 DOZER	DISTRIBUTOR	R-150-A3T001	EA	3	BA	1150.00	3,450		3,450	CIS	1-SEP-93		
1.14	37	T-130 DOZER	TOTAL COST - US DOLLARS						92,474		92,474				
1.15	1	D. RIGS HV EL. CABLE	KG 2x2.5		KM	1	BA	4250.00	4,250		4,250	CIS	1-SEP-93		
1.15	2	D. RIGS HV EL. CABLE	KPGSN/KG/ 3x4 1x2.5 mm2		KM	3	BA	4250.00	12,750		12,750	CIS	1-SEP-93		
1.15	3	D. RIGS HV EL. CABLE	KPGSN/KG/ 3x5 1x4 mm2		KM	2	BA	4250.00	8,500		8,500	CIS	1-SEP-93		
1.15	4	D. RIGS HV EL. CABLE	KPGSN/KG/3x10 1x6 mm2		KM	2	BA	4250.00	8,500		8,500	CIS	1-SEP-93		
1.15	5	D. RIGS HV EL. CABLE	KPGSN/KG/ 3x16 1x6 mm2		KM	2	BA	4250.00	8,500		8,500	CIS	1-SEP-93		
1.15	6	D. RIGS HV EL. CABLE	KPGSN/KG/ 3x25 1x10 mm2		KM	3	BA	4250.00	12,750		12,750	CIS	1-SEP-93		
1.15	7	D. RIGS HV EL. CABLE	KPGSN/KG/ 3x50 1x25 mm2		KM	5	BA	4250.00	21,250		21,250	CIS	1-SEP-93		
1.15	8	D. RIGS HV EL. CABLE	KPGSN/KG/ 3x35 1x10 mm2		KM	3	BA	4250.00	12,750		12,750	CIS	1-SEP-93		
1.15	9	D. RIGS HV EL. CABLE	TOTAL COST - US DOLLARS						89,250		89,250	CIS			
1.16	1	KRAZ PTS	ENGINE	238M-1000186	EA	3	OT	11000.00	33,000		33,000	CIS	1-SEP-93		
1.16	2	KRAZ PTS	SHIM 0.25 MM	238-1000102-B2R1	EA	16	OT	156.70	2,507		2,507	CIS	1-SEP-93		
1.16	3	KRAZ PTS	SHIM 110 MM	238-1000102-B2	EA	16	OT	156.70	2,507		2,507	CIS	1-SEP-93		
1.16	4	KRAZ PTS	SHIM 88 MM	23831000104-V2	EA	16	OT	156.70	2,507		2,507	CIS	1-SEP-93		
1.16	5	KRAZ PTS	ENG RING SET	236-1000106-B2	EA	200	OT	30.06	6,012		6,012	CIS	1-SEP-93		
1.16	6	KRAZ PTS	ENG MOUNTS	236-1001008-01	EA	10	OT	9.76	98		98	CIS	1-SEP-93		
1.16	7	KRAZ PTS	SHAFT	2383-1000107-V2	EA	4	OT	2473.68	9,895		9,895	CIS	1-SEP-93		
1.16	8	KRAZ PTS	BLOCK	238-1002012-B2	EA	2	OT	3506.90	7,014		7,014	CIS	1-SEP-93		
1.16	9	KRAZ PTS	RING	236-100202A	EA	50	OT	1.18	59		59	CIS	1-SEP-93		
1.16	10	KRAZ PTS	RING	236-1002040	EA	40	OT	0.31	12		12	CIS	1-SEP-93		
1.16	11	KRAZ PTS	OIL INS	236-1002272	EA	10	OT	1.61	16		16	CIS	1-SEP-93		

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PRIORITY 1 ITEMS
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MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO.	No	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN LEA TIME	COMMENTS
1.16	12	KRAZ PTS	PIPE	238-1003290-V	EA	4	OT	28.95	116		116	CIS	1-SEP-93		
1.16	13	KRAZ PTS	PIPE	238-1003291-V	EA	4	OT	28.95	116		116	CIS	1-SEP-93		
1.16	14	KRAZ PTS	CYL WIPER COLLAR	236-1002314-B	EA	20	OT	1.78	36		36	CIS	1-SEP-93		
1.16	15	KRAZ PTS	HEAD C76G	238-10030T3-D	EA	6	OT	720.30	4,322		4,322	CIS	1-SEP-93		
1.16	16	KRAZ PTS	RING	237-1003114-V	EA	10	OT	1.09	11		11	CIS	1-SEP-93		
1.16	17	KRAZ PTS	PACKING	238-1003210-V2	EA	60	OT	31.07	1,864		1,864	CIS	1-SEP-93		
1.16	18	KRAZ PTS	PACKING	238-1003270	EA	60	OT	9.52	571		571	CIS	1-SEP-93		
1.16	19	KRAZ PTS	LINER-CYLINDER	236-1004008	EA	80	OT	345.90	27,672		27,672	CIS	1-SEP-93		
1.16	20	KRAZ PTS	ROCKER ARM	236-1004045-V2	EA	20	OT	200.40	4,008		4,008	CIS	1-SEP-93		
1.16	21	KRAZ PTS	RING	400-1004030-80	EA	20	OT	5.33	107		107	CIS	1-SEP-93		
1.16	22	KRAZ PTS	SEAL	201-1005034-B3	EA	20	OT	5.07	101		101	CIS	1-SEP-93		
1.16	23	KRAZ PTS	GEAR	236-1005030-A	EA	10	OT	65.15	652		652	CIS	1-SEP-93		
1.16	24	KRAZ PTS	COLLAR	236-1005160-A2	EA	60	OT	9.77	586		586	CIS	1-SEP-93		
1.16	25	KRAZ PTS	SHAFT	238-1006015-G2	EA	2	OT	312.00	624		624	CIS	1-SEP-93		
1.16	26	KRAZ PTS	SPAKERS	236-1006026-AR	EA	30	OT	7.54	226		226	CIS	1-SEP-93		
1.16	27	KRAZ PTS	SPAKERS	236-1006037-AR	EA	30	OT	6.80	204		204	CIS	1-SEP-93		
1.16	28	KRAZ PTS	VALVE	236-1007010	EA	30	OT	22.38	671		671	CIS	1-SEP-93		
1.16	29	KRAZ PTS	VALVE	236-1007015-V4	EA	30	OT	19.28	578		578	CIS	1-SEP-93		
1.16	30	KRAZ PTS	ROD-PUSH	236-1007176-A	EA	20	OT	5.80	116		116	CIS	1-SEP-93		
1.16	31	KRAZ PTS	PACKING	236-1008050	EA	20	OT	1.00	20		20	CIS	1-SEP-93		
1.16	32	KRAZ PTS	PACKING	238T-1009040	EA	20	OT	9.78	196		196	CIS	1-SEP-93		
1.16	33	KRAZ PTS	PUMP S74G	236-1011014-V4	EA	5	OT	153.00	765		765	CIS	1-SEP-93		
1.16	34	KRAZ PTS	RADIATOR	257-1013010-A	EA	10	OT	105.00	1,050		1,050	CIS	1-SEP-93		
1.16	35	KRAZ PTS	EXHAUST PIPE	256B-1013408-B	EA	10	OT	6.83	68		68	CIS	1-SEP-93		
1.16	36	KRAZ PTS	ELEMENT-FILTER	201T-11055040	EA	300	OT	9.84	2,952		2,952	CIS	1-SEP-93		
1.16	37	KRAZ PTS	PUMP	240-1106210	EA	5	OT	76.08	380		380	CIS	1-SEP-93		
1.16	38	KRAZ PTS	PUMP	236T1106288-A2	EA	5	OT	17.54	88		88	CIS	1-SEP-93		
1.16	39	KRAZ PTS	COLLAR	236-102940	EA	50	OT	5.40	270		270	CIS	1-SEP-93		
1.16	40	KRAZ PTS	1/2 HUB COUPLING	236-1029268-B	EA	2	OT	10.55	21		21	CIS	1-SEP-93		
1.16	41	KRAZ PTS	PIPE	236-1104308-V	EA	10	OT	7.03	70		70	CIS	1-SEP-93		
1.16	42	KRAZ PTS	PUMP	8006-1111005	EA	4	OT	2832.00	11,328		11,328	CIS	1-SEP-93		
1.16	43	KRAZ PTS	PLUNGER RODS	60-1111074-01	EA	100	OT	40.07	4,007		4,007	CIS	1-SEP-93		
1.16	44	KRAZ PTS	INJECTOR	2606-1112010-02	EA	280	OT	86.80	24,304		24,304	CIS	1-SEP-93		
1.16	45	KRAZ PTS	SPRAYER	261112111	EA	280	OT	33.77	9,456		9,456	CIS	1-SEP-93		
1.16	46	KRAZ PTS	FILTER	201T-1117038	EA	100	OT	11.49	1,149		1,149	CIS	1-SEP-93		
1.16	47	KRAZ PTS	COUPLING	090001121010 000	EA	1	OT	366.00	366		366	CIS	1-SEP-93		
1.16	48	KRAZ PTS	PACKING	256B-1203002	EA	50	OT	1.47	74		74	CIS	1-SEP-93		
1.16	49	KRAZ PTS	SLEEVE	256-B1-1203096	EA	10	OT	158.20	1,582		1,582	CIS	1-SEP-93		
1.16	50	KRAZ PTS	PACKING	256B-1203039	EA	40	OT	1.54	62		62	CIS	1-SEP-93		
1.16	51	KRAZ PTS	RADIATOR	256B-13001008-10	EA	10	OT	1485.60	14,856		14,856	CIS	1-SEP-93		
1.16	52	KRAZ PTS	PUMP	236-1307010-A3	EA	10	OT	210.40	2,104		2,104	CIS	1-SEP-93		
1.16	53	KRAZ PTS	SET	236-1307029-A	EA	40	OT	4.50	180		180	CIS	1-SEP-93		
1.16	54	KRAZ PTS	COLLAR	236-1307090	EA	40	OT	1.78	71		71	CIS	1-SEP-93		
1.16	55	KRAZ PTS	BELTS	2564111404	EA	100	OT	2.00	200		200	CIS	1-SEP-93		
1.16	56	KRAZ PTS	BELTS	64211403	EA	100	OT	2.10	210		210	CIS	1-SEP-93		
1.16	57	KRAZ PTS	MOTOR	236-1308011-G2	EA	3	OT	121.42	364		364	CIS	1-SEP-93		
1.16	58	KRAZ PTS	DISCS	238-1601690-G	EA	5	OT	490.97	2,455		2,455	CIS	1-SEP-93		

MONGOLIAN ENERGY SECTOR PROJECT
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TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
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MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO.	No.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN LEA TIME	COMMENTS
1.16	59	KRAZ PTS	DISCS	238-16016904	EA	5	OT	131.52	658		658	CIS	1-SEP-93		
1.16	60	KRAZ PTS	DISCS	238-1601130-B	EA	5	OT	136.70	684		684	CIS	1-SEP-93		
1.16	61	KRAZ PTS	DISCS	238-1601131	EA	5	OT	170.80	854		854	CIS	1-SEP-93		
1.16	62	KRAZ PTS	BRAKE FRICTION PLATE	236-1601138-A3	EA	25	OT	37.85	946		946	CIS	1-SEP-93		
1.16	63	KRAZ PTS	COUPLING	236-1601180-B3	EA	5	OT	60.15	301		301	CIS	1-SEP-93		
1.16	64	KRAZ PTS	GEAR BOX	236NT-1700003	EA	4	OT	2210.00	8,840		8,840	CIS	1-SEP-93		
1.16	65	KRAZ PTS	BOX	257-18000020-V2	EA	2	OT	5271.00	10,542		10,542	CIS	1-SEP-93		
1.16	66	KRAZ PTS	BOX	257-1800020-V2	EA	2	OT	5271.00	10,542		10,542	CIS	1-SEP-93		
1.16	67	KRAZ PTS	HEAD CROSS	131-2201025-A	EA	10	OT	49.00	490		490	CIS	1-SEP-93		
1.16	68	KRAZ PTS	DRIVE SHAFT	210G-2202045-04	EA	4	OT	210.34	841		841	CIS	1-SEP-93		
1.16	69	KRAZ PTS	REAR DRIVE AXLE	255P-2400015-02	EA	6	OT	7558.00	45,348		45,348	CIS	1-SEP-93		
1.16	70	KRAZ PTS	DIFFERENTIAL SEAL	210-2402052	EA	30	OT	6.91	207		207	CIS	1-SEP-93		
1.16	71	KRAZ PTS	DIFFERENTIAL	200-2403010-A2	EA	2	OT	556.00	1,112		1,112	CIS	1-SEP-93		
1.16	72	KRAZ PTS	AXLE	255J-2500015-02	EA	2	OT	6785.00	13,570		13,570	CIS	1-SEP-93		
1.16	73	KRAZ PTS	SHOCK ABSORBER	256B1-2902012	EA	20	OT	425.00	8,500		8,500	CIS	1-SEP-93		
1.16	74	KRAZ PTS	1ST PLATE	255B-2902074-01	EA	10	OT	96.47	965		965	CIS	1-SEP-93		
1.16	75	KRAZ PTS	2ND PLATE	255B-2902076-01	EA	10	OT	91.65	917		917	CIS	1-SEP-93		
1.16	76	KRAZ PTS	SHOCK SPRING	500-2905006	EA	40	OT	130.00	5,200		5,200	CIS	1-SEP-93		
1.16	77	KRAZ PTS	SHOCK ABSORBER	256B-2912012-11	EA	20	OT	602.00	12,040		12,040	CIS	1-SEP-93		
1.16	78	KRAZ PTS	CONN BRACKETS	219-2912408	EA	30	OT	23.00	690		690	CIS	1-SEP-93		
1.16	79	KRAZ PTS	EQULIZER	256B-2918005	EA	15	OT	832.00	12,480		12,480	CIS	1-SEP-93		
1.16	80	KRAZ PTS	ROD	214-2919011-02	EA	30	OT	157.60	4,728		4,728	CIS	1-SEP-93		
1.16	81	KRAZ PTS	ROD	210-2919012-03	EA	30	OT	153.70	4,611		4,611	CIS	1-SEP-93		
1.16	82	KRAZ PTS	COTTER PINS	200-3104050-A	EA	200	OT	2.74	548		548	CIS	1-SEP-93		
1.16	83	KRAZ PTS	COTTER PINS	200-3104051-A	EA	200	OT	2.74	548		548	CIS	1-SEP-93		
1.16	84	KRAZ PTS	RELAYS	500-3401005	EA	3	OT	89.00	267		267	CIS	1-SEP-93		
1.16	85	KRAZ PTS	HYD BOOSTER BRAKES	256B-3405010-14	EA	5	OT	738.50	3,693		3,693	CIS	1-SEP-93		
1.16	86	KRAZ PTS	DISTRIBUTOR	255B-3405016	EA	5	OT	173.70	869		869	CIS	1-SEP-93		
1.16	87	KRAZ PTS	PUMP	256B-3407199	EA	5	OT	361.00	1,805		1,805	CIS	1-SEP-93		
1.16	88	KRAZ PTS	FRIC. PLATES SHOES	200-3501105	EA	200	OT	20.30	4,060		4,060	CIS	1-SEP-93		
1.16	89	KRAZ PTS	FRIC. PLATES SHOES	200-3502105-A	EA	200	OT	11.46	2,292		2,292	CIS	1-SEP-93		
1.16	90	KRAZ PTS	COMPRESSOR	130-3509009	EA	4	OT	382.00	1,528		1,528	CIS	1-SEP-93		
1.16	91	KRAZ PTS	GENERATOR G288A	4573711587	EA	10	OT	540.00	5,400		5,400	CIS	1-SEP-93		
1.16	92	KRAZ PTS	EL BRUSHES	2501 3708050	EA	200	OT	4.13	826		826	CIS	1-SEP-93		
1.16	93	KRAZ PTS	STARTER	45.7375. 1471	EA	15	OT	450.00	6,750		6,750	CIS	1-SEP-93		
1.16	94	KRAZ PTS	RELAY	PS103-3708000	EA	5	OT	131.10	656		656	CIS	1-SEP-93		
1.16	95	KRAZ PTS	LAMPS	A-24-60-40	EA	200	OT	0.15	30		30	CIS	1-SEP-93		
1.16	96	KRAZ PTS	FILTER	FG122-3711200-B	EA	15	OT	15.00	225		225	CIS	1-SEP-93		
1.16	97	KRAZ PTS	LAMPS	A24-32-4	EA	200	OT	0.10	20		20	CIS	1-SEP-93		
1.16	98	KRAZ PTS	LAMPS	A-24-2	EA	200	OT	0.10	20		20	CIS	1-SEP-93		
1.16	99	KRAZ PTS	LAMPS	A-25-5	EA	200	OT	0.10	20		20	CIS	1-SEP-93		
1.16	100	KRAZ PTS	LAMPS	A-24-21-2	EA	200	OT	0.10	20		20	CIS	1-SEP-93		
1.16	101	KRAZ PTS	REGULATOR	1112-3702	EA	10	OT	30.00	300		300	CIS	1-SEP-93		
1.16	102	KRAZ PTS	RELAY	RS401-3726010	EA	5	OT	6.80	34		34	CIS	1-SEP-93		
1.16	103	KRAZ PTS	SUBTOTAL - US DOLLARS				OT		359,830		359,830	CIS			
1.16	1	KRAZ TIRES	12x20x16 PLY W/TUBES		EA	212	OT	341.40	72,377	276	72,653	USA	1-SEP-93	1 MO	
1.16	2	KRAZ TIRES	12x20x16 PLY W/TUBES		EA	40	SO	341.40	13,656	52	13,708	USA	1-SEP-93	1 MO	

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PRIORITY 1 ITEMS
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MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR NO	No	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN LEA TIME	COMMENTS
1.16	3	KRAZ TIRES	12x20x16 PLY W/TUBES		EA	40	BA	341.40	13,656	52	13,708	USA	1-SEP-93	1 MO	
1.16	4	KRAZ TIRES	12x20x16 PLY W/TUBES		EA	40	SG	341.40	13,656	52	13,708	USA	1-SEP-93	1 MO	
1.16	5	KRAZ TIRES	SUBTOTAL COST - US DOLLARS						113,345	432	113,777	USA	1-SEP-93	1 MO	
1.16	6	KRAZ PTS & TIRES	TOTAL COST - US DOLLARS						473,175		473,607				
1.17	1	ALUM WIRE	OVERHEAD FIELD LINE		TONNE	7.5	BA	4912.00	36,840	4,290	41,130	USA	1-SEP-93	2 MO	
1.17	2	ALUM WIRE	OVERHEAD FIELD LINE		TONNE	7.5	SG	4912.00	36,840	4,290	41,130	USA	1-SEP-93	2 MO	
1.17	3	ALUM WIRE	TOTAL COST - US DOLLARS						73,680	8,580	82,260	USA	1-SEP-93	2 MO	
1.18	1	DUMPCAR	SIDE PANELS	634-01-000-0 SB	EA	20						CIS	1-SEP-93	8 MO	
1.18	2	DUMPCAR	FRONT PANEL	634 04 000 3	EA	20						CIS	1-SEP-93	8 MO	
1.18	3	DUMPCAR	PANEL LOCKS LEFT		EA	20						CIS	1-SEP-93	8 MO	
1.18	4	DUMPCAR	PANEL LOCKS RIGHT	634-01-020-2	EA	20						CIS	1-SEP-93	8 MO	
1.18	5	DUMPCAR	PANEL SUPPORTS	634-01-150 SB	EA	10						CIS	1-SEP-93	8 MO	
1.18	6	DUMPCAR	SINGLE ACTION CYL	640-45-010 SB	EA	16						CIS	1-SEP-93	8 MO	
1.18	7	DUMPCAR	PISTON COLLARS	45-129	EA	500						CIS	1-SEP-93	8 MO	
1.18	8	DUMPCAR	DOUBLE ACTION CYL	640-45-010-1	EA	20						CIS	1-SEP-93	8 MO	
1.18	9	DUMPCAR	DOUBLE ACTION PISTON	640-45-105-2	EA	10						CIS	1-SEP-93	8 MO	
1.18	10	DUMPCAR	DISTRIBUTION VALVES	372-000-1-9	EA	50						CIS	1-SEP-93	8 MO	
1.18	11	DUMPCAR	ROD EQUALIZER	533-00-003-1	EA	5						CIS	1-SEP-93	8 MO	
1.18	12	DUMPCAR	BOGGEY CONNECTOR	522 00 010 1	EA	5						CIS	1-SEP-93	8 MO	
1.18	13	DUMPCAR	SQ AXLE CAP END	74 10 116	EA	10						CIS	1-SEP-93	8 MO	
1.18	14	DUMPCAR	OUTSIDE SPRING	522-38-001-0	EA	40						CIS	1-SEP-93	8 MO	
1.18	15	DUMPCAR	INSIDE SPRING	522-38-002-0	EA	40						CIS	1-SEP-93	8 MO	
1.18	16	DUMPCAR	SET SH ABSORBERS	522-38-016-0	EA	10						CIS	1-SEP-93	8 MO	
1.18	17	DUMPCAR	FRAME	4686-6061 40-016	EA	50						CIS	1-SEP-93	8 MO	
1.18	18	DUMPCAR	SMALL BRAKE LOCKS	40-03 015	EA	50						CIS	1-SEP-93	8 MO	
1.18	19	DUMPCAR	PUSH ROD FOR BRAKE PAD	61 40-113	EA	20						CIS	1-SEP-93	8 MO	
1.18	20	DUMPCAR	FRAME ENDS RIGHT	61 40 110	EA	8						CIS	1-SEP-93	8 MO	
1.18	21	DUMPCAR	FRAME ENDS LEFT	61 40 120	EA	8						CIS	1-SEP-93	8 MO	
1.18	22	DUMPCAR	BRK PADS-COMPOSIT POLY	TY38-114-79-72	EA	1500						CIS	1-SEP-93	8 MO	
1.18	23	DUMPCAR	WHEEL PAIRS	61 10 046	EA	10						CIS	1-SEP-93	8 MO	
1.18	24	DUMPCAR	WHEEL PACKING COVER	TY519 07	EA	10						CIS	1-SEP-93	8 MO	
1.18	25	DUMPCAR	BOGGEY CONNECTORS	522-00-020-1	EA	5						CIS	1-SEP-93	8 MO	
1.18	26	DUMPCAR	DISTRIBUTOR VALVE		EA	40						CIS	1-SEP-93	8 MO	
1.18	27	DUMPCAR	AUTOMATIC COUPLING		EA	30						CIS	1-SEP-93	8 MO	
1.18	28	DUMPCAR	AUTO COUPLING HEAD	106 00 00	EA	10						CIS	1-SEP-93	8 MO	
1.18	29	DUMPCAR	COUPLING LOCK	106 01-002	EA	20						CIS	1-SEP-93	8 MO	
1.18	30	DUMPCAR	LOCK HOLDER	106 01 003-0	EA	10						CIS	1-SEP-93	8 MO	
1.18	31	DUMPCAR	COUPLING TRIPPER	106 01 006-0	EA	20						CIS	1-SEP-93	8 MO	
1.18	32	DUMPCAR	COUPLING HINGE PINS	106 00 012-0	EA	30						CIS	1-SEP-93	8 MO	
1.18	33	DUMPCAR	COUPLING SHOCK ABS	106 00 001	EA	20						CIS	1-SEP-93	8 MO	
1.18	34	DUMPCAR	COUPLING SHOCK SLIDE	106-02-00-2	EA	10						CIS	1-SEP-93	8 MO	
1.18	35	DUMPCAR	COUPLING SHOCK ABS LOC	106-00-002-2	EA	40						CIS	1-SEP-93	8 MO	
1.18	36	DUMPCAR	DOOR ACTUATOR ARMS	634-46-010	EA	40						CIS	1-SEP-93	8 MO	
1.18	37	DUMPCAR	DOOR ACTUATOR ARMS	634-46-020-2	EA	40						CIS	1-SEP-93	8 MO	
1.18	38	DUMPCAR	DOOR ACTUATOR ARMS	634-46-030	EA	20						CIS	1-SEP-93	8 MO	
1.18	39	DUMPCAR	END VALVE		EA	50						CIS	1-SEP-93	8 MO	
1.18	40	DUMPCAR	AIR SPEED REDUCERS		EA	40						CIS	1-SEP-93	8 MO	

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO.	No.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN LEA TIME	COMMENTS
1.18	41	DUMPCAR	RING PACKING	38-72	EA	100						CIS	1-SEP-93	8 MO	
1.18	42	DUMPCAR	AIR DISTRIBUTOR	482-000	EA	50						CIS	1-SEP-93	8 MO	
1.18	43	DUMPCAR	PISTON COLLAR	270 397	EA	10						CIS	1-SEP-93	8 MO	
1.18	44	DUMPCAR	PISTON SPRING	270 397	EA	20						CIS	1-SEP-93	8 MO	
1.18	45	DUMPCAR	HOUSING ACCUM AIR	DR483-00	EA	30						CIS	1-SEP-93	8 MO	
1.18	46	DUMPCAR	BRAKE CYLINDER PTS	VR 483-000	EA	30						CIS	1-SEP-93	8 MO	
1.18	47	DUMPCAR	PIPES	VR 483-000	EA	30						CIS	1-SEP-93	8 MO	
1.18	48	DUMPCAR	REGULATOR ARM	522 10 050-1	EA	30						CIS	1-SEP-93	8 MO	
1.18	49	DUMPCAR	CAR CONNECTOR HOSE		EA	150						CIS	1-SEP-93	8 MO	
1.18	50	DUMPCAR	TOTAL COST - US DOLLARS								350,000			8 MO	
1.19	1	RR COM	SYGNAL CABLE 3x1	GOST 6436-75	KM	2	BA	1080 00	2,160		2,160	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	2	RR COM	SYGNAL CABLE 5x1	GOST 6436-75	KM	2	BA	1800 00	3,600		3,600	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	3	RR COM	SYGNAL CABLE 7x1	GOST 6436-75	KM	2	BA	2500 00	5,000		5,000	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	4	RR COM	SYGNAL CABLE 12x1	GOST 6436-75	KM	4	BA	4400 00	17,600		17,600	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	5	RR COM	SYGNAL CABLE 16x1	GOST 6436-75	KM	4	BA	5900 00	23,600		23,600	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	6	RR COM	SYGNAL CABLE 24x1	GOST 6436-75	KM	4	BA	8800 00	35,200		35,200	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	7	RR COM	SYGNAL CABLE 33x1	GOST 6436-75	KM	3	BA	12000 00	36,000		36,000	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	8	RR COM	ROAD TRANSFORMER	NFT-A	EA	30	BA	178 00	5,340		5,340	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	9	RR COM	ROAD TRANSFORMER	NOVS-5A	EA	30	BA	178 00	5,340		5,340	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	10	RR COM	SYGNAL TRANSFORMER	ST-6	EA	50	BA	57 00	2,850		2,850	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	11	RR COM	SWITCH RELAY	216200-V	EA	50	BA	198 00	9,900		9,900	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	12	RR COM	RECTIFIER	86-00-00V	EA	50	BA	180 00	9,000		9,000	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	13	RR COM	RESISTOR	7165	EA	50	BA	11 00	550		550	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	14	RR COM	SWITCHING GEAR BOX	SP-6	EA	10	BA	1439.00	14,390		14,390	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	15	RR COM	LAMPS FOR LINZ	3S-12-15	EA	500	BA	4 00	2,000		2,000	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	16	RR COM	FRAME WORK	19402-00-00	EA	10	BA	395 00	3,950		3,950	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	17	RR COM	BONDING WIRE	21-00-00	EA	50	BA	11.00	550		550	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	18	RR COM	CONTROL WIRE	40-36-60	EA	100	BA	69 00	6,900		6,900	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	19	RR COM	LAMPS FOR TERMIN BOARD	GOST 6940-74	EA	1000	BA	4 00	4,000		4,000	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	20	RR COM	SWITCHING RELAY SET	144690000A	EA	10	BA	180 00	1,800		1,800	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	21	RR COM	INST FOR EL MEAS	TS434TS431	EA	10	BA	129 00	1,290		1,290	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	22	RR COM	RR LINZ LTS-RED	26116-00-00	EA	50	BA	110 00	5,500		5,500	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	23	RR COM	RR LINZ LTS-GREEN	26116-00-00	EA	50	BA	110 00	5,500		5,500	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	24	RR COM	RR LINZ LTS-WHITE	26116-00-00	EA	40	BA	110 00	4,400		4,400	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	25	RR COM	ELECTROMOTOR	MSP- 15-160 B	EA	20	BA	265 00	5,300		5,300	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	26	RR COM	SWITCHING ARM	SP-6	EA	30	BA	45 00	1,350		1,350	CIS	SPLIT		50%1SEP93, 50%1JAN94
1.19	27	RR COM	TOTAL COST - US DOLLARS						213,070		213,070				
1.20	1	ELEC RR	ARC SHOE PLATES	3E-14D	EA	10	BA	227 00	2,270		2,270	CIS	1-SEP-93	10 MO	
1.20	2	ELEC RR	ARC SHOE PLATES	3E-14-1D	EA	10	BA	227 00	2,270		2,270	CIS	1-SEP-93	10 MO	
1.20	3	ELEC RR	AUTO SWITCHES	KPD-131	EA	2	BA	482 00	964		964	CIS	1-SEP-93	10 MO	
1.20	4	ELEC RR	AIR COMPRESSOR	KB-1V	EA	4	BA	6000 00	24,000		24,000	CIS	1-SEP-93	10 MO	
1.20	5	ELEC RR	CONT-TROLLEY LEFT	TB-13D	EA	4	BA	8000 00	32,000		32,000	CIS	1-SEP-93	10 MO	
1.20	6	ELEC RR	CONT-TROLLEY RIGHT	TB-12D	EA	4	BA	8000 00	32,000		32,000	CIS	1-SEP-93	10 MO	
1.20	7	ELEC RR	AUTO CON COUPLING	CA-3M	EA	20	BA	350 00	7,000		7,000	CIS	1-SEP-93	10 MO	
1.20	8	ELEC RR	PACKING SHAFT MOTOR		SET	6	BA	120 00	720		720	CIS	1-SEP-93	10 MO	
1.20	9	ELEC RR	AIR VALVE	24 024 01-76	EA	10	BA	30 00	300		300	CIS	1-SEP-93	10 MO	
1.20	10	ELEC RR	AIR VALVE	24-290-16-86	EA	20	BA	32 00	640		640	CIS	1-SEP-93	10 MO	

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING/ANALYSIS
PRIORITY 1 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 1 MATERIALS AND SPARE PARTS LIST

PR. NO	No	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	SEA/RR COST	TOTAL $	SOURCE CNTRY	NEED DATE	MAN. LEA TIME	COMMENTS
1 20	11	ELEC RR	SWITCH START & STOP		EA	5	BA	60 00	300		300	CIS	1-SEP-93	10 MO	
1 20	12	ELEC RR	SWITCH BLK W/MAG		EA	20	BA	149 00	2,980		2,980	CIS	1-SEP-93	10 MO	
1 20	13	ELEC RR	CONCENSORS		EA	2	BA	5400 00	10,800		10,800	CIS	1-SEP-93	10 MO	
1 20	14	ELEC RR	GROUNDING ROD		EA	6	BA	80 00	480		480	CIS	1-SEP-93	10 MO	
1 20	15	ELEC RR	TRIRISTER-ELEC		EA	30	BA	35 00	1,050		1,050	CIS	1-SEP-93	10 MO	
1 20	16	ELEC RR	DIRISTER		EA	200	BA	20 00	4,000		4,000	CIS	1-SEP-93	10 MO	
1 20	17	ELEC RR	HOUSING FOR AUTO CPLG		EA	5	BA	200 00	1,000		1,000	CIS	1-SEP-93	10 MO	
1 20	18	ELEC RR	TOTAL COST - US DOLLARS						122,774		122,774	CIS	1-SEP-93	10 MO	
1 21	1	D TRAIN	DISTRIBUTOR	D50 17 101 SB-1	EA	500	SG	32 00	16,000		16,000	CIS	1-SEP-93	10 MO	
1 21	2	D TRAIN	PUMP ELEMENT	D50 27 104 SB	EA	50	SG	28 00	1,400		1 400	CIS	1-SEP-93	10 MO	
1 21	3	D TRAIN	SEAL	D50 27 204 SB-2	EA	100	SG	5 00	500		500	CIS	1-SEP-93	10 MO	
1 21	4	D TRAIN	DIRECTIONAL VALVE	D50 27 209 SB-1	EA	10	SG	20.00	200		200	CIS	1-SEP-93	10 MO	
1 21	5	D TRAIN	OIL PUMP	D50 12 3 01	EA	30	SG	600 00	18,000		18,000	CIS	1-SEP-93	10 MO	
1 21	6	D TRAIN	WATER PUMP	D50 11-01	EA	30	SG	430 00	12,900		12,900	CIS	1-SEP-93	10 MO	
1 21	7	D TRAIN	SHOCK	D50 10 111	EA	40	SG	4 80	192		192	CIS	1-SEP-93	10 MO	
1 21	8	D TRAIN	SEAL	D50 34 114-01	EA	50	SG	4 50	225		225	CIS	1-SEP-93	10 MO	
1 21	9	D TRAIN	REGULATOR	D50 27 200 SB	EA	10	SG	40 00	400		400	CIS	1-SEP-93	10 MO	
1 21	10	D TRAIN	OUTLET VALVE	KT6-06-001 SB 2	EA	50	SG	47 46	2,373		2,373	CIS	1-SEP-93	10 MO	
1 21	11	D TRAIN	INLET VALVE	KT6-06-001 SB 2	EA	50	SG	47 46	2,373		2,373	CIS	1-SEP-93	10 MO	
1 21	12	D TRAIN	SPRING VALVE	KT6-06-033-2	EA	2000	SG	2 47	4,940		4,940	CIS	1-SEP-93	10 MO	
1 21	13	D TRAIN	INLET FILTER	KT6-06-021	EA	500	SG	0 53	265		265	CIS	1-SEP-93	10 MO	
1 21	14	D TRAIN	DRIVE HUB	T33-55-6 SB	EA	100	SG	23 00	2,300		2,300	CIS	1-SEP-93	10 MO	
1 21	15	D TRAIN	BELT	B-2240	EA	100	SG	2 00	200		200	CIS	1-SEP-93	10 MO	
1 21	16	D TRAIN	BELT	B-1250	EA	100	SG	1 50	150		150	CIS	1-SEP-93	10 MO	
1 21	17	D TRAIN	SHOCK ABSORBER SPRING	3 35 30 101	EA	40	SG	43 00	1,720		1,720	CIS	1-SEP-93	10 MO	
1 21	18	D TRAIN	PRESS ELEC GAUGE		EA	10	SG	3 00	30		30	CIS	1-SEP-93	10 MO	
1 21	19	D TRAIN	SWITCHES	TB1-2	EA	50	SG	0.75	38		38	CIS	1-SEP-93	10 MO	
1 21	20	D TRAIN	SWITCHES	TB1-1	EA	50	SG	0 75	38		38	CIS	1-SEP-93	10 MO	
1 21	21	D TRAIN	SWITCHES	TB1-4	EA	50	SG	0 75	38		38	CIS	1-SEP-93	10 MO	
1 21	22	D TRAIN	COUPLERS-RAIL	GEM-70-85-000	EA	10	SG	38 00	380		380	CIS	1-SEP-93	10 MO	
1 21	23	D TRAIN	BRAKE SHOES	GEM-2-4211	EA	1000	SG	9 00	9,000		9,000	CIS	1-SEP-93	10 MO	
1 21	24	D TRAIN	AUTO COUPLING	SA-3	EA	40	SG	350 00	14,000		14,000	CIS	1-SEP-93	10 MO	
1 21	25	D TRAIN	BATTERY	32TN-450	SET	6	SG	6000 00	36,000		36,000	CIS	1-SEP-93	10 MO	
1 21	26	D TRAIN	LAMP	Px50x50	EA	200	SG	0 20	40		40	CIS	1-SEP-93	10 MO	
1 21	27	D TRAIN	LAMP	24x25	EA	100	SG	0.10	10		10	CIS	1-SEP-93	10 MO	
1 21	28	D RAIN	COMPRESSOR	KT-6	SET	10	SG	5000 00	50,000		50,000	CIS	1-SEP-93	10 MO	
1 21	29	D. TRAIN	TOTAL COST - US DOLLARS						173,711		173,711				
1.22	1	DIESEL LOCOMOTIVE REBUILDING			EA	3		90000.00	270,000		270,000	CIS	1-SEP-93		

TOTAL	5359948
AMERICAN SUBTOTAL	1631212

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING /ANALYSIS
PRIORITY 2 ITEMS

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	A FRT. COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN. LE TIME	COMMENTS
II 1	1	DRAG BUCK	10/70 DRAG BUCKET/COMP		EA	1	BA	113000 00	113,000	8,008	121,008	USA	1-SEP-93	5 MO	
II 1	2	DRAG BUCK	10/70 DRAG BUCKET/COMP		EA	1	SG	113000 00	113,000	8 008	121,008	USA	1-SEP-93	5 MO	
II 1	3	DRAG BUCK	TOTAL COST - US DOLLARS						226,000	16 016	242,016				
II 2	1	EXPLOSIVES	AN BLASTING PRILL		TONNE	1600	BA	190 00	304,000	160,000	464,000	SWD	SPLIT	2 MO	50% 1SEP93, 50%1JAN94
II 2	2	EXPLOSIVES	AN BLASTING PRILL		TONNE	1000	SG	190 00	190,000	100,000	290,000	SWD	SPLIT	2 MO	50% 1SEP93, 50%1JAN94
II 2	3	EXPLOSIVES	TOTAL COST - US DOLLARS						494,000	260,000	754,000				
II 3	1	EXPLOSIVES	6"x30"(20kg)BAGGED EMULSION		KG	200000	BA	0 66	132,000	20,000	152,000	SWD	1-SEP-93	2 MO	
II 3	2	EXPLOSIVES	6"x30"(20kg)BAGGED EMULSION		KG	500000	SG	0 66	330,000	50,000	380,000	SWD	1-SEP-93	2 MO	
II 3	3	EXPLOSIVES	TOTAL COST - US DOLLARS						462,000	70,000	532,000				
II 4	1	EXPLOSIVES	AMMONIT 20MM CARTRIDGES		TONNE	20	OT	500 00	10,000		10,000	CIS	SPLIT		50% 1SEP93, 50% 1JAN94
II 5	1	TIRE TRUCK	TIRE HANDLING TRUCK		EA	1	SG	79925 00	79,925	17,400	97,325	USA	1-SEP-93	2 MO	
II 5	2	TIRE TRUCK	TIRE HANDLING TRUCK		EA	1	SO	79925 00	79,925	17,400	97,325	USA	1-SEP-93	2 MO	
II 5	3	TIRE TRUCK	TIRE HANDLING TRUCK		EA	1		79925 00	79,925	17,400	97,325	USA	1-SEP-93	2 MO	
II.5	4	TIRE TRUCK	TOTAL COST - US DOLLARS				BA		239,775	52,200	291,975				
II 6	1	YM-2 PARTS	CYLINDER	240H-1004008-D	EA	264	BA	361.76	95,505		95,505	CIS	1-SEP-93		
II 6	2	YM-2 PARTS	CRANK SHAFT	240-1000107-BG	EA	8	BA	3651 20	29,210		29,210	CIS	1-SEP-93		
II 6	3	YM-2 PARTS	RINGS	236-1000106-B4	EA	264	BA	17 27	4,559		4,559	CIS	1-SEP-93		
II 6	4	YM-2 PARTS	PACKING	240-1000104-B2	EA	20	BA	152 54	3,051		3,051	CIS	1-SEP-93		
II 6	5	YM-2 PARTS	PACKING	240-1000104-P2	EA	10	BA	152 54	1,525		1,525	CIS	1-SEP-93		
II 6	6	YM-2 PARTS	PACKING	240-1000104-P1	EA	10	BA	152 54	1,525		1,525	CIS	1-SEP-93		
II 6	7	YM-2 PARTS	SEAL	240-1003213A3	EA	200	BA	13 00	2,600		2,600	CIS	1-SEP-93		
II 6	8	YM-2 PARTS	PUMP	240-1011014	EA	6	BA	101 24	607		607	CIS	1-SEP-93		
II 6	9	YM-2 PARTS	ELEMENT	240-1017038	EA	1000	BA	15 95	15,950		15,950	CIS	1-SEP-93		
II 6	10	YM-2 PARTS	ELEMENT	238H-1109080	EA	100	BA	62 15	6,215		6,215	CIS	1-SEP-93		
II 6	11	YM-2 PARTS	TURBO COMPRESSOR	240H-1118010B	EA	8	BA	877 50	7,020		7,020	CIS	1-SEP-93		
II 6	12	YM-2 PARTS	TURBO COMPRESSOR	240H-1118011B	EA	8	BA	877 50	7,020		7,020	CIS	1-SEP-93		
II 6	13	YM-2 PARTS	BLOCK CYLINDER	240H-1002012H	EA	2	BA	3916 00	7,832		7,832	CIS	1-SEP-93		
II 6	14	YM-2 PARTS	PUMP	9016111008-02	EA	2	BA	2539 00	5,078		5,078	CIS	1-SEP-93		
II 6	15	YM-2 PARTS	SPRAY INJECTOR	26161112110	EA	120	BA	23 00	2,760		2,760	CIS	1-SEP-93		
II 6	16	YM-2 PARTS	RING	236-1002024A	EA	200	BA	1 35	270		270	CIS	1-SEP-93		
II 6	17	YM-2 PARTS	RING	236-1002040	EA	100	BA	1 23	123		123	CIS	1-SEP-93		
II 6	18	YM-2 PARTS	ELEMENT FILTER	240T-1017040 A3	EA	200	BA	15 95	3,190		3,190	CIS	1-SEP-93		
II 6	19	YM-2 PARTS	ELEMENT	201T-1105540	EA	200	BA	8 93	1,786		1,786	CIS	1-SEP-93		
II 6	20	YM-2 PARTS	RINGS	236-1004002-A3	EA	96	BA	29 11	2,795		2,795	CIS	1-SEP-93		
II 6	21	YM-2 PARTS	PACKING SEALS	240-1008098	EA	10	BA	1 21	12		12	CIS	1-SEP-93		
II 6	22	YM-2 PARTS	PACKING SEALS	240T-1009040 A2	EA	10	BA	13 80	138		138	CIS	1-SEP-93		
II 6	23	YM-2 PARTS	FUEL PUMP	1111008-20	EA	2	BA	2539 00	5,078		5,078	CIS	1-SEP-93		
II 6	24	YM-2 PARTS	ELEMENT	201-1117038-A2	EA	500	BA	10 12	5,060		5,060	CIS	1-SEP-93		
II 6	25	YM-2 PARTS	PUMP	240-1307010-A	EA	5	BA	264 40	1,322		1,322	CIS	1-SEP-93		
II 6	26	YM-2 PARTS	GENERATOR	45 7371 0209	EA	3	BA	807 60	2,423		2,423	CIS	1-SEP-93		
II 6	27	YM-2 PARTS	STARTER	45 7375 1471	EA	3		878 00	2,634		2,634	CIS	1-SEP-93		
II 6	28	YM-2 PARTS	TOTAL COST - US DOLLARS				BA		215,288		215,288				
II 7	1	ELEC MOTORS	20/90 DRAGLINE	A02-72-4Y230 KVT	EA	1	BA	9000 00	9,000		9,000	CIS	1-JAN-93		
II 7	2	ELEC MOTORS	20/90 DRAGLINE	A02-72-4Y222 KVT	EA	1	BA	6600 00	6,600		6,600	CIS	1-JAN-93		
II 7	3	ELEC MOTORS	20/90 DRAGLINE	MPE1000-630 YXLZ	EA	1	BA	100000 00	100,000		100,000	CIS	1-JAN-93		
II 7	4	ELEC MOTORS	20/90 DRAGLINE	GPE-2500-750 YXLZ	EA	1	BA	100000 00	100,000		100,000	CIS	1-JAN-93		
II 7	5	ELEC MOTORS	10/70, 13/50 DRAGLINE	GPE 8536-6K	EA	2	BA	60000 00	120,000		120,000	CIS	1-JAN-93		
II 7	6	ELEC MOTORS	10/70, 13/50 DRAGLINE	SDE-2-16-46-6Y2	EA	1	BA	125000 00	125,000		125,000	CIS	1-JAN-93		
II 7	7	ELEC MOTORS	10/70, 13/50 DRAGLINE	MPE 450-900Y3	EA	2	BA	90000 00	180,000		180,000	CIS	1-JAN-93		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING /ANALYSIS
PRIORITY 2 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO	NO	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	A FRT. COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN LE TIME	COMMENTS
II 7	8	ELEC MOTORS	10/70, 13/50 DRAGLINE	MPVE-400	EA	1	BA	80000 00	80,000		80,000	CIS	1-JAN-93		
II 7	9	ELEC MOTORS	10/70, 13/50 DRAGLINE	GPE 85-36-6KT2	EA	1	BA	100000 00	100 000		100 000	CIS	1-JAN-93		
II 7	10	ELEC MOTORS	MISC ELEC MOTORS	VAO 61-4 13 KWT	EA	1	BA	3900 00	3,900		3,900	CIS	1-JAN-93		
II 7	11	ELEC MOTORS	MISC ELEC MOTORS	VAO 62-4 17 KWT	EA	1	BA	5100 00	5,100		5,100	CIS	1-JAN-93		
II 7	12	ELEC MOTORS	MISC ELEC MOTORS	VAO 71-4 22 KWT	EA	1	BA	6600 00	6,600		6 600	CIS	1-JAN-93		
II 7	13	ELEC MOTORS	MISC ELEC MOTORS	VAO 72-4 30 KWT	EA	1	BA	9000 00	9,000		9,000	CIS	1-JAN-93		
II 7	14	ELEC MOTORS	MISC ELEC MOTORS	VAO 82-4 55 KWT	EA	1	BA	16500 00	16 500		16 500	CIS	1-JAN-93		
II 7	15	ELEC MOTORS	MISC ELEC MOTORS	VAO 180M4 30 KWT	EA	2	BA	9000 00	18,000		18 000	CIS	1-JAN-93		
II 7	16	ELEC MOTORS	MISC ELEC MOTORS	VAO 62-6 13 KWT	EA	1	BA	3900 00	3,900		3,900	CIS	1-JAN-93		
II 7	17	ELEC MOTORS	MISC ELEC MOTORS	VAO 72-6 22 KWT	EA	2	SG	6600 00	13 200		13,200	CIS	1-JAN-93		
II 7	18	ELEC MOTORS	MISC ELEC MOTORS	VAO 81-6 30 KWT	EA	1	SG	9000 00	9,000		9,000	CIS	1-JAN-93		
II 7	19	ELEC MOTORS	MISC ELEC MOTORS	VAO 82-6 40 KWT	EA	1	SG	12000 00	12,000		12,000	CIS	1-JAN-93		
II 7	20	ELEC MOTORS	MISC ELEC MOTORS	VAP 160M6 15KWT	EA	1	SG	4500 00	4,500		4,500	CIS	1-JAN-93		
II 7	21	ELEC MOTORS	MISC ELEC MOTORS	VAO B1-BY2 22KWT	EA	1	SG	6600 00	6,600		6,600	CIS	1-JAN-93		
II 7	22	ELEC MOTORS	MISC ELEC MOTORS	4TP 155 00B	EA	1	SG	15000 00	15 000		15,000	CIS	1-JAN-93		
II 7	23	ELEC MOTORS	MISC ELEC MOTORS	NB 511 6TP 155 002	EA	1	SG	13650 00	13 650		13 650	CIS	1-JAN-93		
II 7	24	ELEC MOTORS	MISC ELEC MOTORS	A02-92-8/6/4	EA	5	SG	15000 00	75 000		75,000	CIS	1-JAN-93		
II 7	25	ELEC MOTORS	MISC ELEC MOTORS	MTKE 312-6	EA	1	SG	4500 00	4,500		4 500	CIS	1-JAN-93		
II 7	26	EL M EKG 8i 4y	HOIST MOTOR	DE 816 300V	EA	3	SG	49200 00	147,600		147,600	CIS	1-JAN-93		
II 7	27	EL M EKG 8i 4y	VENTILATION FAN MOTOR	4A10054-YYA 220/380V	EA	3	SG	450 00	1,350		1,350	CIS	1-JAN-93		
II 7	28	EL M EKG 8i 4y	SWING OIL PUMP MOTOR	4A-80-A4	EA	4	SG	50 00	200		200	CIS	1-JAN-93		
II 7	29	EL M EKG 8i 4y	FAN MOTOR, GENERATOR	AO2-51-4	EA	2	SG	150 00	300		300	CIS	1-JAN-93		
II 7	30	EL M EKG 8i 4y	AIR COMPRESSOR EL MOTOR	MTKN-411-8	EA	2	SG	900 00	1,800		1,800	CIS	1-JAN-93		
II 7	31	EL EQUIPMENT	SYN MOTOR	SDE-2-15-34-642	EA	1	SG	63000 00	63,000		63,000	CIS	1-JAN-93		
II 7	32	EL EQUIPMENT	SINGLE SHAFT MOTOR	DE-816Y2	EA	2	SG	49200 00	98 400		98,400	CIS	1-JAN-93		
II 7	33	EL EQUIPMENT	HORIZ MOTOR	DEV-12	EA	2	SG	25000 00	50 000		50,000	CIS	1-JAN-93		
II 7	34	EL EQUIPMENT	TWO SHAFT MOTOR	DPE-52	EA	3	SG	19000 00	57,000		57 000	CIS	1-JAN-93		
II 7	35	EL EQUIPMENT	DC GENERATOR	2VP-250M94	EA	1	SG	100 00	100		100	CIS	1-JAN-93		
II 7	36	EL EQUIPMENT	HV MOTOR / VACUUM SWITCH	2KVE-6-630-10yx	EA	1	SG	50000 00	50,000		50 000	CIS	1-JAN-93		
II 7	37	EL EQUIPMENT	RING TYPE CURRENT RECEIVE	TKE-12-492	EA	2	SG	800 00	1,600		1,600	CIS	1-JAN-93		
II 7	38	ELEC MOTORS	TOTAL COST - US DOLLARS						1,508,400		1,508,400				
II 8	1	HV EL CABLES	AVBBSHV 3x20+1x50 mm2		KM	0 5	BA	6000 00	3,000		3,000	CIS	1-JAN-94		
II 8	2	HV EL CABLES	KVVG 4x1 5 mm2		KM	1	BA	5000 00	5,000		5,000	CIS	1-JAN-94		
II 8	3	HV EL CABLES	KVVG 14x1 5 mm2		KM	1	BA	5000 00	5,000		5,000	CIS	1-JAN-94		
II 8	4	HV EL CABLES	KVVG 16x1 5 mm2		KM	1	BA	5000 00	5,000		5,000	CIS	1-JAN-94		
II 8	5	HV EL CABLES	KVVG 27x1 5 mm2		KM	1	BA	5000 00	5 000		5,000	CIS	1-JAN-94		
II 8	6	HV EL CABLES	KGE 3x95+1x1 5		KM	2	BA	13000 00	26 000		26,000	CIS	1-JAN-94		
II 8	7	HV EL CABLES	KGE 3x35+1x10		KM	5	BA	13000 00	65,000		65 000	CIS	1-JAN-94		
II 8	8	HV EL CABLES	KGE 3x50+1x16		KM	5	BA	13000 00	65,000		65,000	CIS	1-JAN-94		
II 8	9	HV EL CABLES	KGE 3x70+1x25		KM	5	BA	13000 00	65,000		65 000	CIS	1-JAN-94		
II 8	10	HV EL CABLES	KGE 3x95+1x20		KM	3	BA	13000 00	39 000		39,000	CIS	1-JAN-94		
II 8	11	HV EL CABLES	RKGM 95		KM	3	BA	1000 00	3,000		3,000	CIS	1-JAN-94		
II 8	12	HV EL CABLES	KG 3x10		KM	1	BA	1000 00	1,000		1,000	CIS	1-JAN-94		
II 8	13	HV EL CABLES	KG 3x25		KM	1	BA	1000 00	1,000		1,000	CIS	1-JAN-94		
II 8	14	HV EL CABLES	KG 3x35		KM	1	BA	1000 00	1,000		1,000	CIS	1-JAN-94		
II 8	15	HV EL CABLES	RK 75-4		KM	1	BA	1200 00	1,200		1,200	CIS	1-JAN-94		
II 8	16	HV EL CABLES	TPP 10x2x 5		KM	5	BA	1200 00	6,000		6,000	CIS	1-JAN-94		
II 8	17	HV EL CABLES	TPP 20x2x 5		KM	5	BA	1200 00	6,000		6,000	CIS	1-JAN-94		
II 8	18	HV EL CABLES	TPP 30x2x 7		KM	10	BA	1200 00	12,000		12,000	CIS	1-JAN-94		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING /ANALYSIS
PRIORITY 2 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO.	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC.	UNIT COST $	TOTAL COST $	A. FRT. COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN. LE TIME	COMMENTS
II.8	19	HV EL. CABLES	TASSH 2x0.8		KM	8	BA	1800 00	14,400		14,400	CIS	1-JAN-94		
II 8	20	HV EL. CABLES			KM	2	BA	1800 00	3,600		3,600	CIS	1-JAN-94		
II 8	21	HV EL. CABLES			KM	2	BA	1800 00	3,600		3,600	CIS	1-JAN-94		
II.8	22	HV EL. CABLES			KM	2	BA	1800 00	3,600		3,600	CIS	1-JAN-94		
II.8	23	HV EL. CABLES			KM	2	BA	1800 00	3,600		3,600	CIS	1-JAN-94		
II 8	24	HV EL. CABLES			KM	2	BA	1800 00	3,600		3,600	CIS	1-JAN-94		
II 8	25	HV EL. CABLES			KM	2	BA	1800 00	3,600		3,600	CIS	1-JAN-94		
II.8	26	HV EL. CABLES	TOTAL COST - US DOLLARS						350,200		350,200				
II.9	1	WATER PUMP	PUMP CENTROPUGE	TSNS-180-65	EA	1	BA	10000.00	10,000		10,000	CIS	1-JAN-94		
II 9	2	WATER PUMP	PUMP CENTROPUGE	TSNS-180.225	EA	1	BA	19000 00	19,000		19,000	CIS	1-JAN-94		
II 9	3	WATER PUMP	PUMP CENTROPUGE	D-1250-65	EA	1	BA	12000 00	12,000		12,000	CIS	1-JAN-94		
II 9	4	WATER PUMP	PUMP CENTROPUGE	D-200-95	EA	1	BA	3500 00	3,500		3,500	CIS	1-JAN-94		
II 9	5	WATER PUMP	PUMP CENTROPUGE	NTSS-3	EA	2	SG	500 00	1,000		1,000	CIS	1-JAN-94		
II.9	6	WATER PUMP	PUMP	VKS-1/16	EA	2	SG	4000 00	8,000		8,000	CIS	1-JAN-94		
II 9	7	WATER PUMP	PUMP	FG-81/81	EA	1	SG	4000 00	4,000		4,000	CIS	1-JAN-94		
II 9	8	WATER PUMP	PUMP CENTROPUGE	D-320-150	EA	1	SG	4000 00	4,000		4,000	CIS	1-JAN-94		
II 9	9	WATER PUMP	PUMP CENTROPUGE	D-1250-65	EA	2	SG	12000 00	24,000		24,000	CIS	1-JAN-94		
II 9	10	WATER PUMP	PUMP	GNOM-10-10	EA	4	SG	400 00	1,600		1,600	CIS	1-JAN-94		
II.9	11	WATER PUMP	PUMP	NTSS-3	EA	1	SG	400 00	400		400	CIS	1-JAN-94		
II.9	12	WATER PUMP	PUMP	FG-144/46	EA	2	SG	400 00	800		800	CIS	1-JAN-94		
II.9	13	WATER PUMP	PUMP CENTROPUGE	TSNSGA-38-220	EA	2	SG	400 00	800		800	CIS	1-JAN-94		
II 9	14	WATER PUMP	PUMP CENTROPUGE	K-20-30	EA	8	SG	250 00	2,000		2,000	CIS	1-JAN-94		
II 9	15	WATER PUMP	PUMP CENTROPUGE	K-45/55	EA	4	SG	250.00	1,000		1,000	CIS	1-JAN-94		
II.9	16	WATER PUMP	PUMP CENTROPUGE	TSNS-400-105	EA	1	SG	19500 00	19,500		19,500	CIS	1-JAN-94		
II 9	17	WATER PUMP	PUMP CENTROPUGE	TSNS-240-300	EA	1	SG	19500 00	19,500		19,500	CIS	1-JAN-94		
II 9	18	WATER PUMP	PUMP	ETSV-6-16-75	EA	1	SG	3000 00	3,000		3,000	CIS	1-JAN-94		
II.9	19	WATER PUMP	PUMP	ETSV-8-40-165	EA	2	SG	3800 00	7,600		7,600	CIS	1-JAN-94		
II.9	20	WATER PUMP	PUMP	ETSV-10-120-60	EA	2	SG	3000 00	6,000		6,000	CIS	1-JAN-94		
II 9	21	WATER PUMP	PUMP	ETSV-10-120-60	EA	5	SO	3500 00	17,500		17,500	CIS	1-JAN-94		
II.9	22	WATER PUMP	TOTAL COST - US DOLLARS						165,200		165,200				
II.10	1	TRUCK TIRES	21.00x33 (BELAZ)		EA	100	BA	900.00	90,000		90,000	CIS	1-JAN-94		
II.11	1	TRUCK TIRES	18x33x32 PLY		EA	120	AD	1706.00	204,720	46,800	251,520	USA	1-JAN-94		
II.12	1	BATTERIES	6 CT-132 AMP/HR-12V		EA	60	AD	169 60	10,176	780	10,956	USA	1-SEP-93	1 MO	
II.12	2	BATTERIES	6 CT-182 AMP/HR-12V		EA	60	OT	204 06	12,244	780	13,024	USA	1-JAN-93	1 MO	
II.12	3	BATTERIES	6 CT-132 AMP/HR-12V		EA	20	OT	169 60	3,392	260	3,652	USA	1-SEP-93	1 MO	
II.12	4	BATTERIES	6 CT-182 AMP/HR-12V		EA	20	SG	204 06	4,081	260	4,341	USA	1-JAN-93	1 MO	
II.12	5	BATTERIES	6 CT-182 AMP/HR-12V		EA	50	BA	204 06	10,203	650	10,853	USA	1-JAN-93	1 MO	
II.12	6	BATTERIES	6 CT-132 AMP/HR-12V		EA	50	BA	169 60	8,480	650	9,130	USA	1-JAN-93	1 MO	
II.12	7	BATTERIES	6 CT-182 AMP/HR-12V		EA	50	SG	204 60	10,230	650	10,880	USA	1-SEP-93	1 MO	
II.12	8	BATTERIES	6 CT-132 AMP/HR-12V		EA	50	SO	169 60	8,480	260	8,740	USA	1-SEP-93	1 MO	
II.12	9	BATTERIES	6 CT-182 AMP/HR-12V		EA	20	SO	204 06	4,081	260	4,341	USA	1-JAN-93	1 MO	
II.12	10	BATTERIES	TOTAL COST - US DOLLARS				BA		71,367	4,550	75,917				
II.13	1	WIRE ROPE	64 mm (2.5"), 16 8 Kg/M -15 TONNE		FT	2851	BA	8 05	22,951	8,580	31,531	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	2	WIRE ROPE	57 mm (2.25"), 13 6 Kg/M - 35 TONNE		FT	8244	BA	5 97	49,217	20,020	69,237	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	3	WIRE ROPE	52 mm (2"), 10 7 Kg/M - 25 TONNE		FT	7458	BA	4 60	34,307	14,300	48,607	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	4	WIRE ROPE	39 mm (1.5"), 4 2 Kg/m - 25 TONNE		FT	11040	OT	2.31	25 502	14,300	39,802	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II 13	5	WIRE ROPE	30 mm (1.25"), 4 0 Kg/M - 5 TONNE		FT	318	SG	1 73	550	2,860	3,410	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II 13	6	WIRE ROPE	5 mm (2"), 10 7 Kg/M - 15 TONNE		FT	4475	SG	4 60	20,585	8,580	29,165	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	7	WIRE ROPE	39 mm (1.5"), 4 2 Kg/m - 15 TONNE		FT	6625	SO	2.31	15,304	8,580	23,884	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING /ANALYSIS
PRIORITY 2 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO.	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC.	UNIT COST $	TOTAL COST $	A. FRT. COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN. LE TIME	COMMENTS
II.13	8	WIRE ROPE	39 mm (1.5"), 4.2 Kg/m - 10 TONNE		FT	4417	SO	2.31	10,203	5,720	15,923	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	9	WIRE ROPE	30 mm (1.25"), 4.0 Kg/M - .5 TONNE		FT	318	BA	1.73	550	286	836	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	10	WIRE ROPE	45.5 mm (1.75"), 8.2 Kg/M - 10 TONNE		FT	3888		2.91	11,314	5,720	17,034	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	11	WIRE ROPE	30 mm (1.25"), 4.0 Kg/M - 3 TONNE		FT	1907		1.73	3,299	1,716	5,015	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	12	WIRE ROPE	16 mm (5/8"), .9 Kg/M - 1.5 TONNE		FT	4563		0.55	2,510	858	3,368	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	13	WIRE ROPE	13.5 mm (9/16) - 2.5 TONNE		FT	9340	BA	0.50	4,670	1,430	6,100	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	14	WIRE ROPE	9-11 mm (7/16) - 2 TONNE		FT	12958	AD	0.40	5,183	1,144	6,327	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	15	WIRE ROPE	39 mm (1.5"), 4.2 Kg/m - 10 TONNE		FT	4417	SG	2.31	10,203	5,720	15,923	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	16	WIRE ROPE	45.5 mm (1.75"), 8.2 Kg/M - 15 TONNE		FT	5832	SG	2.91	16,971	8,580	25,551	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	17	WIRE ROPE	30 mm (1.25"), 4.0 Kg/M - 2 TONNE		FT	1271	SG	1.73	2,199	1,144	3,343	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	18	WIRE ROPE	16 mm (5/8"), .9 Kg/M - 1.5 TONNE		FT	4593	SG	0.55	2,526	858	3,384	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	19	WIRE ROPE	13.5 mm (9/16) - 2.5 TONNE		FT	9340	SG	0.50	4,670	1,430	6,100	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	20	WIRE ROPE	9-11 mm (7/16) - 2 TONNE		FT	12598	SG	0.40	5,039	1,144	6,183	USA	SPLIT	3 MO	50% 1SEP91, 50% 1JAN94
II.13	21	WIRE ROPE	TOTAL COST - US DOLLARS						247,753	112,970	360,723				
II.14	1	CONV. BELT	1000 mm - 5 PLY FABRIC		M	800	SG	65.00	52,000		52,000	CIS	1-JAN-94		
II.14	2	CONV. BELT	1200 mm - 6PLY FABRIC		M	670	SG	65.00	43,550		43,550	CIS	1-JAN-94		
II.14	3	CONV. BELT	800 mm - 6 PLY FABRIC		M	500	BA	65.00	32,500		32,500	CIS	1-JAN-94		
II.14	4	CONV. BELT	1000 mm - 5 PLY FABRIC		M	800	BA	65.00	52,000		52,000	CIS	1-JAN-94		
II.14	5	CONV. BELT	1200 mm - 6PLY FABRIC		M	1000	BA	65.00	65,000		65,000	CIS	1-JAN-94		
II.14	6	CONV. BELT	800 mm - 6 PLY FABRIC		M	500		65.00	32,500		32,500	CIS	1-JAN-94		
II.14	7	CONV. BELT	TOTAL COST - US DOLLARS				BA		277,550		277,550				
II.15	1	DRAG. BUCKET	15/90 DRAG. BUCKET/COMPL.		EA	1	BA	180000.00	180,000	10,296	190,296	USA	1-SEP-93	5 MO	
II.16	1	DRAG. BUCKET	20/90 DRAG. BUCKET/COMPL.		EA	1	SG	220000.00	220,000	14,300	234,300	USA	1-SEP-93	5 MO	
II.17	1	DRAG PTS 10/70	BUCKET	0-118084	SET	1	SG					CIS	1-NOV-93		
II.17	2	DRAG PTS 10/70	CHAIN. DRAG	3-21749,3-230581	EA	8	SG					CIS	1-NOV-93		
II.17	3	DRAG PTS 10/70	HOIST CHAIN UPPER	3-253190		8	SG					CIS	1-NOV-93		
II.17	4	DRAG PTS 10/70	HOIST CHAIN LOWER	3-231716		8	SG					CIS	1-NOV-93		
II.17	5	DRAG PTS 10/70	RUBBER RING	3-343730		10	SG					CIS	1-NOV-93		
II.17	6	DRAG PTS 10/70	CARF YR - 300	3-350026-02		12	SG					CIS	1-NOV-93		
II.17	7	DRAG PTS 10/70	RING YR -300	NS 3-12093-02		12	SG					CIS	1-NOV-93		
II.17	8	DRAG PTS 10/70	SPRING	NS 2-4562-32		12	SG					CIS	1-NOV-93		
II.17	9	DRAG PTS 10/70	PUMP	22.4-1	SET	4	SG					CIS	1-NOV-93		
II.17	10	DRAG PTS 10/70	COMPRESSOR PK-1.75 M		EA	2	SG					CIS	1-NOV-93		
II.17	11	DRAG PTS 10/70	PRESSURE SENSOR DD-10-11		EA	1	SG					CIS	1-NOV-93		
II.17	12	DRAG PTS 10/70	AIR VALVE	1-162086	EA	2	SG					CIS	1-NOV-93		
II.17	13	DRAG PTS 10/70	BACK ACTION VALVE	0-102471-101	EA	2	SG					CIS	1-NOV-93		
II.17	14	DRAG PTS 10/70	PULLEY BLOCK	1-130223	EA	2	SG					CIS	1-NOV-93		
II.17	15	DRAG PTS 10/70	WIRE ROPE F 52.0 mm	GOST 7669-69	TONNE	40	SG					CIS	1-NOV-93		
II.17	16	DRAG PTS 10/70	WIRE ROPE F 45.5 mm	GOST 7669-80	TONNE	50	SG					CIS	1-NOV-93		
II.17	17	DRAG PTS 10/70	WIRE ROPE F 39.0 mm	GOST 7669-80	TONNE	20	SG					CIS	1-NOV-93		
II.17	18	DRAG. PTS 6/45	LINK	3-347500	EA	2	SG					CIS	1-DEC-93		
II.17	19	DRAG. PTS 6/45	END LINK	3-21779	EA	2	SG					CIS	1-DEC-93		
II.17	20	DRAG. PTS 6/45	DRAG RING	3-392644	EA	2	SG					CIS	1-DEC-93		
II.17	21	DRAG. PTS 6/45	HOIST CHAIN 1.77 mm	3-285256	EA	2	SG					CIS	1-DEC-93		
II.17	22	DRAG. PTS 6/45	BUSHING	3-328259	EA	1	SG					CIS	1-DEC-93		
II.17	23	DRAG. PTS 6/45	OIL RING TSVD	PK-3.5-04.003	EA	10	SG					CIS	1-DEC-93		
II.17	24	DRAG. PTS 6/45	OIL RING TSND	PK-3.5-03.003	EA	10	SG					CIS	1-DEC-93		
II.17	25	DRAG. PTS 6/45	COMPRESSOR RING TSVD	PK-3.5-04.004	EA	10	SG					CIS	1-DEC-93		
II.17	26	DRAG. PTS 6/45	COMPRESSOR RING TSND	PK-3.5-03.004	EA	10	SG					CIS	1-DEC-93		

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MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO.	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC.	UNIT COST $	TOTAL COST $	A. FRT. COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN. LE TIME	COMMENTS
II.17	27	DRAG. PTS 6/45	AIR VALVE	1-162086	EA	4	SG					CIS	1-DEC-93		
II.17	28	DRAG. PTS 6/45	SEAL 1.2 - 17x32	GOST 8752-79	EA	10	SG					CIS	1-DEC-93		
II.17	29	DRAG. PTS 6/45	JOINT YR -360	2-202828-27	EA	2	SG					CIS	1-DEC-93		
II.17	30	DRAG. PTS 6/45	LOCK RING YR - 360	2-202828-19	EA	6	SG					CIS	1-DEC-93		
II.17	31	DRAG. PTS 6/45	BRACKET YR - 360	2-202828-19	EA	2	SG					CIS	1-DEC-93		
II.17	32	DRAG. PTS 6/45	SEAL RING	4-508743	EA	12	SG					CIS	1-DEC-93		
II.17	33	DRAG. PTS 6/45	CARF	0-86-1304-69	EA	20	SG					CIS	1-DEC-93		
II.17	34	DRAG. PTS 6/45	END LOCK RING YR-530	2-202828-18	EA	10	BA					CIS	1-DEC-93		
II.17	35	DRAG. PTS 6/45	CHAIN SH67	GOST 6345-65	EA	4	BA					CIS	1-NOV-93		
II.17	36	DRAG. PTS 6/45	CHAIN SH68	GOST 6345-65	EA	4	BA					CIS	1-NOV-93		
II.17	37	DRAG. PTS 6/45	CON. LINK	1060.61.07	EA	18	BA					CIS	1-NOV-93		
II.17	38	DRAG. PTS 6/45	CRAMP	1060-61-594	EA	10	BA					CIS	1-NOV-93		
II.17	39	DRAG. PTS 6/45	CRAMP	1055-12-272	EA	6	BA					CIS	1-NOV-93		
II.17	40	DRAG. PTS 6/45	CON. LINK	3-374501	EA	8	BA					CIS	1-NOV-93		
II.17	41	DRAG. PTS 6/45	BUCKET	2-201964	EA	12	BA					CIS	1-NOV-93		
II.17	42	DRAG. PTS 6/45	BUCKET	2-201962	EA	8	BA					CIS	1-NOV-93		
II.17	43	DRAG. PTS 6/45	OIL RING TSND	PK 3.5-03.003	EA	6	BA					CIS	1-NOV-93		
II.17	44	DRAG. PTS 6/45	COMPRESSOR RING TSND	PK 3.5-04.004	EA	6	BA					CIS	1-NOV-93		
II.17	45	DRAG. PTS 6/45	OIL RING TSND	PK3.5-04.003	EA	6	BA					CIS	1-NOV-93		
II.17	46	DRAG. PTS 6/45	COMPRESSOR RING TSND	PK 3.5-04-004	EA	6	BA					CIS	1-NOV-93		
II.17	47	DRAG. PTS 6/45	SPRING PLATE	PK 3.5-06.003F	EA	24	BA					CIS	1-NOV-93		
II.17	48	DRAG. PTS 6/45	SPRING PLATE	PK 3.5-05.003F	EA	24	BA					CIS	1-NOV-93		
II.17	49	DRAG. PTS 6/45	INTAKE VALVE	KT-6-06-002 SB-2	EA	12	BA					CIS	1-NOV-93		
II.17	50	DRAG. PTS 6/45	IDLE VALVE	PKS 525-0304 SP	EA	12	BA					CIS	1-NOV-93		
II.17	51	DRAG. PTS 6/45	BUSHING 51-1004058-VI	GOST 613-79	EA	12	BA					CIS	1-NOV-93		
II.17	52	DRAG. PTS 6/45	CON. ROD PK 1.75 m		EA	2	BA					CIS	1-NOV-93		
II.17	53	DRAG. PTS 6/45	CRANK SHAFT PK1.75 m		EA	3	BA					CIS	1-NOV-93		
II.17	54	DRAG. PTS 6/45	LOCK PING	3-161826	EA	126	BA					CIS	1-NOV-93		
II.17	55	DRAG. PTS 6/45	RAIL LOWER	0-78869	EA	1	BA					CIS	1-NOV-93		
II.17	56	DRAG. PTS 6/45	RAIL UPPER	0-78398	EA	1	BA					CIS	1-NOV-93		
II.17	57	DRAG. PTS 6/45	GAUGE MTP 100/T-10x2.5	GOST 8625-77	EA	4	BA					CIS	1-NOV-93		
II.17	58	DRAG. PTS 6/45	HEATING SECTION SEV 3Y3		EA	18	BA					CIS	1-NOV-93		
II.17	59	DRAG. PTS 6/45	HEATING SECTION DMZ		EA		BA					CIS	1-NOV-93		
II.17	60	DRAG. PTS 6/45	VALVE	GOST or TY 1284-1-80	EA	6	BA					CIS	1-NOV-93		
II.17	61	DRAG. PTS 6/45	BELT A-1060T		EA	6	BA					CIS	1-NOV-93		
II.17	62	DRAG. PTS 6/45	CARF 40	GOST 6678-72	EA	4	BA					CIS	1-NOV-93		
II.17	63	DRAG. PTS 6/45	JOINT 200	GOST 6678-72	EA	4	BA					CIS	1-NOV-93		
II.17	64	DRAG. PTS 6/45	SECTOR	3-225648	EA	36	BA					CIS	1-NOV-93		
II.17	65	DRAG. PTS 6/45		1-116290	EA	2	BA					CIS	1-NOV-93		
II.17	66	DRAG. PTS 6/45	HOUSING	1-130123	EA	2	BA					CIS	1-NOV-93		
II.17	67	DRAG. PTS 6/45	BLOCK	2-148202	EA	2	BA					CIS	1-NOV-93		
II.17	68	DRAG PTS 10/70	BUCKET	0-118084	EA	1	BA					CIS	1-NOV-93		
II.17	69	DRAG PTS 10/70	BUCKET	2-170730	EA	8	BA					CIS	1-NOV-93		
II.17	70	DRAG PTS 10/70	BUCKET	2-148991	EA	8	BA					CIS	1-NOV-93		
II.17	71	DRAG PTS 10/70	BLOCK	0-97563	EA	1	BA					CIS	1-NOV-93		
II.17	72	DRAG PTS 10/70	CHAIN	3-250582	EA	7	BA					CIS	1-NOV-93		
II.17	73	DRAG PTS 10/70	DRAG CHAIN	3-21749	EA	8	BA					CIS	1-NOV-93		
II.17	74	DRAG PTS 10/70	HOIST CHAIN	3-231716	EA	8	BA					CIS	1-NOV-93		
II.17	75	DRAG PTS 10/70	CON. LINK	3-21749, 3-347499, 3-374174	EA	24	BA					CIS	1-NOV-93		

MONGOLIAN ENERGY SECTOR PROJECT
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MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO.	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC.	UNIT COST $	TOTAL COST $	A. FRT COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN. LE TIME	COMMENTS
II.17	76	DRAG PTS 10/70	LINK	2-158441	EA	50	BA					CIS	1-NOV-93		
II.17	77	DRAG PTS 10/70	LINK	2-161311	EA	50	BA					CIS	1-NOV-93		
II.17	78	DRAG PTS 10/70	HALF LINK	3-31434	EA	40	BA					CIS	1-NOV-93		
II.17	79	DRAG PTS 10/70	CON LINK	3-255881	EA	40	BA					CIS	1-NOV-93		
II.17	80	DRAG PTS 10/70	RING	2-148357	EA	40	BA					CIS	1-NOV-93		
II.17	81	DRAG PTS 10/70	FRONT RING	1-129.285	EA	10	BA					CIS	1-NOV-93		
II.17	82	DRAG PTS 10/70		2-140139	EA	1	BA					CIS	1-NOV-93		
II.17	83	DRAG PTS 10/70		2-163557	EA	2	BA					CIS	1-NOV-93		
II.17	84	DRAG PTS 10/70	BLOCK	1-130228	EA	3	BA					CIS	1-NOV-93		
II.17	85	DRAG PTS 10/70	BLOCK	1-59862	EA	3	BA					CIS	1-NOV-93		
II.17	86	DRAG PTS 10/70	GEAR	2-177212	EA	2	BA					CIS	1-NOV-93		
II.17	87	DRAG PTS 10/70	PINION GEAR	2-187317	EA	2	BA					CIS	1-NOV-93		
II.17	88	DRAG PTS 10/70	P. GEAR m=8, z=30	3-225421	EA	1	BA					CIS	1-NOV-93		
II.17	89	DRAG PTS 10/70	P.GEAR m=8, z=105	3-225420	EA	3	BA					CIS	1-NOV-93		
II.17	90	DRAG PTS 10/70	RING	4-348136	EA	2	BA					CIS	1-NOV-93		
II.17	91	DRAG PTS 10/70	PUMP	BG-22-23AT 22.4-1	EA	9	BA					CIS	1-NOV-93		
II.17	92	DRAG PTS 10/70	PUMP	BG-11-22, BC-11-22T	EA	9	BA					CIS	1-NOV-93		
II.17	93	DRAG PTS 10/70	COMPRESSOR PK 1.75 m	1-116965-17, 1-162087-20	EA	2	BA					CIS	1-NOV-93		
II.17	94	DRAG PTS 10/70	TEETH	2-160338	EA	400	BA					CIS	1-NOV-93		
II.17	95	DRAG PTS 10/70	SAFETY ROLLER	2-202931-01	EA	30	BA					CIS	1-NOV-93		
II.17	96	DRAG PTS 10/70	GENERATOR	GPE 85/36-6K	EA	3	BA					CIS	1-NOV-93		
II.17	97	DRAG PTS 10/70	SYN MOTOR	SDE-2-16-46-6Y2	EA	1	BA					CIS	1-NOV-93		
II.17	98	DRAG PTS 10/70	DC MOTOR	MPE 450-900Y3	EA	2	BA					CIS	1-NOV-93		
II.17	99	DRAG PTS 10/70	TURNING MOTOR	MPVE 400-900Y3	EA	1	BA					CIS	1-NOV-93		
II.17	100	DRAG PTS 10/70	EL BRUSHES 25x32	EG-14	EA	1000	BA					CIS	1-NOV-93		
II.17	101	DRAG PTS 10/70	EL BRUSHES 25x32	EG-14	EA	2000	BA					CIS	1-NOV-93		
II.17	102	DRAG PTS 10/70	EL BRUSHES 25x32	EG-74	EA	4000	BA					CIS	1-NOV-93		
II.17	103	DRAG PTS 10/70	WHEEL GEAR	1-92299	EA	2						CIS	1-NOV-93		
II.17	104	DRAG PTS	TOTAL COST - US DOLLARS		LOT		SG		100,000		100,000				
II.8	1	BELAZ	ENGINE	YAM3-240N-1000411B	SET	1	SG	21000.00	21,000		21,000	CIS	1-JAN-94		
II.8	2	BELAZ	TRANSMISSION	GMP 548T-1700007	SET	2	SG	2867.00	5,734		5,734	CIS	1-JAN-94		
II.8	3	BELAZ	CABIN	548T-5000012-50	SET	2	SG	980.00	1,960		1,960	CIS	1-JAN-94		
II.8	4	BELAZ	LAMPS	A24-5-1	EA	500	SG	0.60	300		300	CIS	1-JAN-94		
II.8	5	BELAZ	LAMPS	A24-55x50	EA	250	SG	2.00	500		500	CIS	1-JAN-94		
II.8	6	BELAZ	LAMPS	A24-60x40	EA	100	SG	0.80	80		80	CIS	1-JAN-94		
II.8	7	BELAZ	BELT	19501003681	EA	30	SG	9.00	270		270	CIS	1-JAN-94		
II.8	8	BELAZ	PUMP	NSH50Y-3-T	EA	15	SG	370.00	5,550		5,550	CIS	1-JAN-94		
II.8	9	BELAZ	PUMP	NSH50Y-2-1	EA	15	SG	370.00	5,550		5,550	CIS	1-JAN-94		
II.8	10	BELAZ	SHIMS	240-10000104B2	EA	8	SG	70.00	560		560	CIS	1-JAN-94		
II.8	11	BELAZ		240-100010452R1	EA	8	SG	70.00	560		560	CIS	1-JAN-94		
II.8	12	BELAZ		240-100010452R2	EA	5	SG	70.00	350		350	CIS	1-JAN-94		
II.8	13	BELAZ	RING SET	236-10000106-B4	EA	120	SG	10.00	1,200		1,200	CIS	1-JAN-94		
II.8	14	BELAZ	CRANK SHAFT	240-1000107B6	EA	15	SG	1650.00	24,750		24,750	CIS	1-JAN-94		
II.8	15	BELAZ	PACKING	240-1002265	EA	20	SG	2.00	40		40	CIS	1-JAN-94		
II.8	16	BELAZ		240-1003210A3	EA	30	SG	22.00	660		660	CIS	1-JAN-94		
II.8	17	BELAZ		240-1003212	EA	100	SG	22.00	2,200		2,200	CIS	1-JAN-94		
II.8	18	BELAZ		240-1003270-B	EA	60	SG	22.00	1,320		1,320	CIS	1-JAN-94		
II.8	19	BELAZ	SET	240N-1004008-B	EA	60	SG	361.76	21,706		21,706	CIS	1-JAN-94		
II.8	20	BELAZ	LINER	240N-1004008	EA	30	SG	180.00	5,400		5,400	CIS	1-JAN-94		

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MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO.	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC.	UNIT COST $	TOTAL COST $	A FRT COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN LE TIME	COMMENTS
II.8	21	BELAZ	COLLAR	236-1005160A2	EA	16	SG	7 00	112		112	CIS	1-JAN-94		
II 8	22	BELAZ	RING	240-1005576	EA	40	SG	0 30	12		12	CIS	1-JAN-94		
II.8	23	BELAZ	RING	240-1005582B	EA	40	SG	0 20	8		8	CIS	1-JAN-94		
II.8	24	BELAZ	PACKING	240N-1008027	EA	50	SG	4 38	219		219	CIS	1-JAN-94		
II 8	25	BELAZ	PACKING	240T-1009040A2	EA	40	SG	13 77	551		551	CIS	1-JAN-94		
II 8	26	BELAZ	PUMP	240N-1011014B	EA	8	SG	101 24	810		810	CIS	1-JAN-94		
II 8	27	BELAZ	ELEMENT	201T-1017038A	EA	500	SG	15 00	7,500		7,500	CIS	1-JAN-94		
II 8	28	BELAZ	OIL CLEANER	236-1029240	EA	3	SG	37 80	113		113	CIS	1-JAN-94		
II 8	29	BELAZ	COLLAR	236-1029240	EA	10	SG	70 00	700		700	CIS	1-JAN-94		
II 8	30	BELAZ	SHAFT	240-1029336	EA	5	SG	65 45	327		327	CIS	1-JAN-94		
II 8	31	BELAZ	ELEMENT	201-1105538	EA	500	SG	8 93	4,465		4,465	CIS	1-JAN-94		
II 8	32	BELAZ	ELEMENT	238N-1109080	EA	100	SG	52 95	5,295		5,295	CIS	1-JAN-94		
II 8	33	BELAZ	PUMP	9016-11110082	EA	2	SG	2539 00	5,078		5,078	CIS	1-JAN-94		
II 8	34	BELAZ	PLUNGER	PARA 60-1111073	EA	45	SG	22 00	990		990	CIS	1-JAN-94		
II 8	35	BELAZ	SPRAYER	261-1112110	EA	45	SG	22 00	990		990	CIS	1-JAN-94		
II.8	36	BELAZ	ELEMENT	201-1117038-A2	EA	500	SG	15 95	7,975		7,975	CIS	1-JAN-94		
II 8	37	BELAZ	TURBO COMPRESSOR	240-1118010B	EA	5	SG	877 00	4,385		4,385	CIS	1-JAN-94		
II 8	38	BELAZ	TURBO COMPRESSOR	240-1118011B	EA	5	SG	877 00	4,385		4,385	CIS	1-JAN-94		
II 8	39	BELAZ	RING	240N-1118106	EA	60	SG	0 51	31		31	CIS	1-JAN-94		
II 8	40	BELAZ	FLANGE	240N-1118272	EA	10	SG	25 70	257		257	CIS	1-JAN-94		
II 8	41	BELAZ	COVER	240N-1118280-B	EA	10	SG	6 76	68		68	CIS	1-JAN-94		
II 8	42	BELAZ	BELT	1735/256421.1413	EA	30	SG	19 00	570		570	CIS	1-JAN-94		
II 8	43	BELAZ	RADIATOR	548A-1301010	EA	5	SG	1200 00	6 000		6,000	CIS	1-JAN-94		
II.8	44	BELAZ	PIPE	240-1303100-V2	EA	3	SG	2008 00	6,024		6,024	CIS	1-JAN-94		
II 8	45	BELAZ	PIPE	240-1303101-V2	EA	3	SG	108 00	324		324	CIS	1-JAN-94		
II 8	46	BELAZ	GEARS	7523-1731002	EA	2	SG	108 00	216		216	CIS	1-JAN-94		
II 8	47	BELAZ	AXLE	540-1731030-20	EA	4	SG	153 80	615		615	CIS	1-JAN-94		
II 8	48	BELAZ	AXLE	548A-1731101-01	EA	3	SG	186 00	558		558	CIS	1-JAN-94		
II 8	49	BELAZ	CROSSET	540-2201025-02	EA	10	SG	139 00	1,390		1,390	CIS	1-JAN-94		
II 8	50	BELAZ	SHAFT	548T-2208010	EA	2	SG	1487 00	2 974		2 974	CIS	1-JAN-94		
II 8	51	BELAZ	SHAFT	7523-2201010	EA	3	SG	1130 00	3,390		3,390	CIS	1-JAN-94		
II 8	52	BELAZ	SHAFT	540T-2208117	EA	20	SG	127 00	2,540		2,540	CIS	1-JAN-94		
II 8	53	BELAZ	TRANSMISSION	548-2402010-11	EA	2	SG	6755 00	13 510		13 510	CIS	1-JAN-94		
II 8	54	BELAZ	BUMPER	7523-2803010	EA	2	SG	600 00	1,200		1,200	CIS	1-JAN-94		
II 8	55	BELAZ	CYLINDER	540-2917056-31	EA	10	SG	3280 00	32,800		32,800	CIS	1-JAN-94		
II.8	56	BELAZ	CYLINDER	548-2917020-11	EA	3	SG	3779 00	11,337		11,337	CIS	1-JAN-94		
II 8	57	BELAZ	SHIFTING FORK	540-291412-23	EA	3	SG	314 00	942		942	CIS	1-JAN-94		
II.8	58	BELAZ	PIN	540M-2919426	EA	5	SG	41 30	207		207	CIS	1-JAN-94		
II.8	59	BELAZ	ROD	540-2919429-30	EA	3	SG	564 00	1,692		1,692	CIS	1-JAN-94		
II 8	60	BELAZ	SEAL	540-2919440-B1	EA	30	SG	2 70	81		81	CIS	1-JAN-94		
II 8	61	BELAZ	RING	7540-2919442	EA	20	SG	1 80	36		36	CIS	1-JAN-94		
II 8	62	BELAZ	ROD	7548-2919016-01	EA	5	SG	234 00	1,170		1,170	CIS	1-JAN-94		
II 8	63	BELAZ	SPACERS	548-3001016	EA	16	SG	23 60	378		378	CIS	1-JAN-94		
II 8	64	BELAZ	SPACERS	548-3001017	EA	16	SG	27 60	442		442	CIS	1-JAN-94		
II.8	65	BELAZ	SPACERS	548-3001026	EA	16	SG	18 70	299		299	CIS	1-JAN-94		
II 8	66	BELAZ	PULLEY	540-3003057	EA	4	SG	383 00	1,532		1,532	CIS	1-JAN-94		
II 8	67	BELAZ	BOOSTER	525-3405010-06	EA	4	SG	1352 00	5,408		5,408	CIS	1-JAN-94		
II 8	68	BELAZ	SET	7522-3405155	EA	5	SG	35 00	175		175	CIS	1-JAN-94		
II.8	69	BELAZ	PACKING	548-3501105	EA	120	SG	18 20	2,184		2,184	CIS	1-JAN-94		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING /ANALYSIS
PRIORITY 2 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO.	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC.	UNIT COST $	TOTAL COST $	A FRT. COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN LE TIME	COMMENTS
II 8	70	BELAZ	PIPE	540T-3506060-01	EA	10	SG	35 40	354		354	CIS	1-JAN-94		
II 8	71	BELAZ	BRAKE PLATE	549A-3507015	EA	30	SG	58 20	1,746		1,746	CIS	1-JAN-94		
II 8	72	BELAZ	COMPRESSOR	540T-3509015	EA	5	SG	112 00	560		560	CIS	1-JAN-94		
II 8	73	BELAZ	RING	130-35L-167	EA	20	SG	14 20	284		284	CIS	1-JAN-94		
II 8	74	BELAZ	REGULATOR	11-3512010	EA	4	SG	56 30	225		225	CIS	1-JAN-94		
II 8	75	BELAZ	COLLAR	540-3519137-B	EA	20	SG	23 00	460		460	CIS	1-JAN-94		
II 8	76	BELAZ	CYLINDER	540M-3519310	EA	6	SG	661 50	3,969		3,969	CIS	1-JAN-94		
II 8	77	BELAZ	BRUSHHOLDER	G263A-3701010	EA	10	SG	5 04	50		50	CIS	1-JAN-94		
II 8	78	BELAZ	LOCK	856-3708000	EA	10	SG	23 20	232		232	CIS	1-JAN-94		
II 8	79	BELAZ	RELE STARTER	RC103-37078000	EA	5	SG	25.30	127		127	CIS	1-JAN-94		
II 8	80	BELAZ	STARTER	45 7375.1451	EA	4	SG	842.00	3,368		3,368	CIS	1-JAN-94		
II 8	81	BELAZ	VOLTAGE REGULATOR	21 3702	EA	10	SG	170 00	1,700		1,700	CIS	1-JAN-94		
II 8	82	BELAZ	SOLENOID	CT103-3708120-150	EA	10	SG	43 20	432		432	CIS	1-JAN-94		
II 8	83	BELAZ	ROTOR	25-3708200	EA	10	SG	135 00	1,350		1,350	CIS	1-JAN-94		
II 8	84	BELAZ	EQUALIZER	25-3708320	EA	6	SG	19 40	116		116	CIS	1-JAN-94		
II 8	85	BELAZ	SWITCH	P602-3709210	EA	5	SG	93.10	466		466	CIS	1-JAN-94		
II 8	86	BELAZ	LIGHT SET	122-3711010-BV	EA	15	SG	22 00	330		330	CIS	1-JAN-94		
II 8	87	BELAZ	LIGHT SET	6-3711000 KT	EA	15	SG	54 00	810		810	CIS	1-JAN-94		
II 8	88	BELAZ	FILTER ELEMENT	140-37112000-01	EA	15	SG	8 00	120		120	CIS	1-JAN-94		
II 8	89	BELAZ	INST LIGHTS	130-3712010-B	EA	10	SG	28 00	280		280	CIS	1-JAN-94		
II 8	90	BELAZ	INST LIGHTS	130-3716010-V	EA	8	SG	52 50	420		420	CIS	1-JAN-94		
II 8	91	BELAZ	INST. LIGHTS	130-3716010-G	EA	8	SG	52 50	420		420	CIS	1-JAN-94		
II 8	92	BELAZ	REFLECTOR	FN130-3716210	EA	10	SG	45 50	455		455	CIS	1-JAN-94		
II 8	93	BELAZ	REFLECTOR	FN130 37162103	EA	10	SG	45 50	455		455	CIS	1-JAN-94		
II 8	94	BELAZ	SIGNAL	C40-3721000	EA	6	SG	21 00	126		126	CIS	1-JAN-94		
II 8	95	BELAZ	ENGINE DIP STICKS	YP 101-3726000-V1T	EA	15	SG	50 80	762		762	CIS	1-JAN-94		
II 8	96	BELAZ	SWITCH	P145-3726000T	EA	10	SG	89 30	893		893	CIS	1-JAN-94		
II 8	97	BELAZ	RELAY	RC 951A-3726010-70	EA	6	SG	105 40	632		632	CIS	1-JAN-94		
II 8	98	BELAZ	SENSOR	MM355-3829010	EA	10	SG	29 54	295		295	CIS	1-JAN-94		
II 8	99	BELAZ	HYD. JACK	11107-39103010	EA	5	SG	368 00	1,840		1,840	CIS	1-JAN-94		
II 8	100	BELAZ	GLASS	540-5206010-10	EA	10	SG	55 20	552		552	CIS	1-JAN-94		
II 8	101	BELAZ	WINDOW HANDLES	81-6104013-B	EA	5	SG	12 90	65		65	CIS	1-JAN-94		
II 8	102	BELAZ	MIRROR	5040-8201015-01	EA	15	SG	22 00	330		330	CIS	1-JAN-94		
II 8	103	BELAZ	HOOD	7523-8402012	EA	3	SG	624 00	1,872		1,872	CIS	1-JAN-94		
II 8	104	BELAZ	HOOD	548A-8402411	EA	2	SG	225 00	450		450	CIS	1-JAN-94		
II 8	105	BELAZ	FENDERS	548A-840-3010	EA	2	SG	221 00	442		442	CIS	1-JAN-94		
II 8	106	BELAZ	GENERATOR	G263A, 457371-1487	EA	3	SG	1785 00	5,355		5,355	CIS	1-JAN-94		
II 8	107	BELAZ	STARTER	G263A	EA	6	SG	842 00	5,052		5,052	CIS	1-JAN-94		
II 8	108	BELAZ	ELECTROMOTOR	MN-1	EA	5	SG	200 00	1,000		1,000	CIS	1-JAN-94		
II 8	109	BELAZ	LAMPS	A24-1	EA	500	SG	1 57	785		785	CIS	1-JAN-94		
II 8	110	BELAZ	LAMPS	A24-21-5	EA	500	SG	1 39	695		695	CIS	1-JAN-94		
II 8	111	BELAZ	ENGINE	240N-1000187	EA	2	SG	21000 00	42,000		42,000	CIS	1-JAN-94		
II 8	112	BELAZ	CYL LINER SETS	240N-1004006D	EA	72	SG	362 00	26,064		26,064	CIS	1-JAN-94		
II 8	113	BELAZ	PACKING	240-1003213	EA	100	SG	13 00	1,300		1,300	CIS	1-JAN-94		
II 8	114	BELAZ	RING SETS	236-100106B3	EA	100	SG	17 27	1,727		1,727	CIS	1-JAN-94		
II 8	115	BELAZ	CLUTCH SHIMS	240-1000104	EA	8	SG	153 00	1,224		1,224	CIS	1-JAN-94		
II 8	116	BELAZ	SHIMS	240-1000104BR	EA	5	SG	153 00	765		765	CIS	1-JAN-94		
II 8	117	BELAZ	PACKING		EA	15	SG	153 00	2,295		2,295	CIS	1-JAN-94		
II 8	118	BELAZ	FILTER	240-1017040A2	EA	1000	SG	15 95	15,950		15,950	CIS	1-JAN-94		

MONGOLIAN ENERGY SECTOR PROJECT
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PRIORITY 2 ITEMS
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MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	A FRT COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN LE TIME	COMMENTS
II 8	119	BELAZ	FILTER	201-1105538	EA	1000	SG	8 93	8,930		8,930	CIS	1-JAN-94		
II 8	120	BELAZ	INJECTOR	236-1112110B2	EA	100	SG	22 75	2,275		2,275	CIS	1-JAN-94		
II 8	121	BELAZ	TURBO CHARGER	240N-118010B	EA	5	SG	877 00	4,385		4,385	CIS	1-JAN-94		
II 8	122	BELAZ	TURBO CHARGER	240N-1118011B	EA	5	SG	877 00	4,385		4,385	CIS	1-JAN-94		
II 8	123	BELAZ	FILTER	201-1117040A	EA	500	SG	15 95	7,975		7,975	CIS	1-JAN-94		
II 8	124	BELAZ	FILTER	238-1109080	EA	250	SG	62 15	15,538		15,538	CIS	1-JAN-94		
II 8	125	BELAZ	FILTER COVER	240-1002264	EA	3	SG	494 30	1,483		1,483	CIS	1-JAN-94		
II 8	126	BELAZ	PACKING	240-1002314	EA	10	SG	13 00	130		130	CIS	1-JAN-94		
II 8	127	BELAZ	HARMONIC BALANCER	240-1002310	EA	3	SG	25 00	75		75	CIS	1-JAN-94		
II 8	128	BELAZ	CRANK SHAFT	240-100500864	EA	3	SG	3651 00	10,953		10,953	CIS	1-JAN-94		
II 8	129	BELAZ	PUSH RODS	236-1007180	EA	12	SG	3 10	37		37	CIS	1-JAN-94		
II 8	130	BELAZ	PACKING	240-1008098	EA	15	SG	1 21	18		18	CIS	1-JAN-94		
II 8	131	BELAZ	PUMP	240-1011014-B	EA	3	SG	260 00	780		30	CIS	1-JAN-94		
II 8	132	BELAZ	PIPE-HOSE	240-1104308-G	EA	12	SG	20 10	241		241	CIS	1-JAN-94		
II 8	133	BELAZ	PIPE	240-1104300-B	EA	6	SG	9 10	55		55	CIS	1-JAN-94		
II 8	134	BELAZ	PIPE	240-1104390A	EA	3	SG	9 10	27		27	CIS	1-JAN-94		
II 8	135	BELAZ	PIPE	240-1104346A	EA	4	SG	18 30	73		73	CIS	1-JAN-94		
II 8	136	BELAZ	PUMP	240-1106210	EA	3	SG	3893 00	11,679		11,679	CIS	1-JAN-94		
II 8	137	BELAZ	PISTON PLUNGER	60 1111074	EA	12	SG	29 23	351		351	CIS	1-JAN-94		
II 8	138	BELAZ	VALVE	33 1111102	EA	20	SG	11 10	222		222	CIS	1-JAN-94		
II 8	139	BELAZ	INJECTORS	262 111201	EA	12	SG	89 70	1,076		1,076	CIS	1-JAN-94		
II 8	140	BELAZ	ROTORS	240N-1118080B	EA	10	SG	938 60	9,386		9,386	CIS	1-JAN-94		
II 8	141	BELAZ	COVER	240N-1118280B	EA	15	SG	68 00	1,020		1,020	CIS	1-JAN-94		
II 8	142	BELAZ	RING	240N-1118240	EA	20	SG	5 34	107		107	CIS	1-JAN-94		
II 8	143	BELAZ	PUMP	240N-1307010A	EA	2	SG	264 40	529		529	CIS	1-JAN-94		
II 8	144	BELAZ	SET	240-1307029	EA	10	SG	15 00	150		150	CIS	1-JAN-94		
II 8	145	BELAZ	STARTER	25 3708	EA	3	SG	878 08	2,634		2,634	CIS	1-JAN-94		
II 8	146	BELAZ	GENERATOR	G263	EA	3	SG	808 00	2,424		2,424	CIS	1-JAN-94		
II 8	147	BELAZ	REGULATOR- RELAY	RR 363-3702000	EA	3	SG	170 28	511		511	CIS	1-JAN-94		
II 8	148	BELAZ	COMPRESSOR	540-3509015	EA	5	SG	290 00	1,450		1,450	CIS	1-JAN-94		
II 8	149	BELAZ	WASHER	540A-3509130	EA	3	SG	2 30	7		7	CIS	1-JAN-94		
II 8	150	BELAZ	SHIMS	130-3509092	EA	3	SG	15 80	47		47	CIS	1-JAN-94		
II 8	151	BELAZ	PISTON	130-350909160	EA	5	SG	13 90	70		70	CIS	1-JAN-94		
II 8	152	BELAZ	RING	130-3509164	EA	10	SG	3 50	35		35	CIS	1-JAN-94		
II 8	153	BELAZ	RING	130-3509166	EA	10	SG	3 10	31		31	CIS	1-JAN-94		
II 8	154	BELAZ	RING	130-3509167	EA	10	SG	14 20	142		142	CIS	1-JAN-94		
II 8	155	BELAZ	FILTER	740-1109560	EA	50	SG	67 80	3,390		3,390	CIS	1-JAN-94		
II 8	156	BELAZ	ROLLER	540-1308110-01	EA	3	SG	64 15	192		192	CIS	1-JAN-94		
II 8	157	BELAZ	ROLLER	540-13008111-01	EA	3	SG	64 15	192		192	CIS	1-JAN-94		
II 8	158	BELAZ	BELT	P21x14x1950	EA	50	SG	19 00	950		950	CIS	1-JAN-94		
II 8	159	BELAZ	BELT	P21x14x1735	EA	50	SG	12 00	600		600	CIS	1-JAN-94		
II 8	160	BELAZ	HYD BOOSTER	548A-1700004-10	EA	2	SG	2867 00	5,734		5,734	CIS	1-JAN-94		
II 8	161	BELAZ	FRICTION PLATES-BRAKE	540-1701330-01	EA	6	SG	1300 00	7,800		7,800	CIS	1-JAN-94		
II 8	162	BELAZ	DISC	540-1701352-11	EA	120	SG	68 46	8,215		8,215	CIS	1-JAN-94		
II 8	163	BELAZ	DISC	540-1701344	EA	170	SG	106 00	18,020		18,020	CIS	1-JAN-94		
II 8	164	BELAZ	BRAKE DRUM	540-1701312-10	EA	6	SG	101 00	606		606	CIS	1-JAN-94		
II 8	165	BELAZ	PACKING RING	540-1701326 B	EA	25	SG	4 27	107		107	CIS	1-JAN-94		
II 8	166	BELAZ	ELEC MAGNETO	RC330-1705000	EA	10	SG	85 75	858		858	CIS	1-JAN-94		
II 8	167	BELAZ	RADIATOR	548A-1301010	EA	3	SG	2008 00	6,024		6,024	CIS	1-JAN-94		

MONGOLIAN ENERGY SECTOR PROJECT
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TASK 1 - VALUE ENGINEERING /ANALYSIS
PRIORITY 2 ITEMS
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MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO	NO	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	A FRT COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN. LE TIME	COMMENTS
II 8	168	BELAZ	DRIVE SHAFT	548A-2201010-02	EA	3	SG	1487 00	4,461		4,461	CIS	1-JAN-94		
II 8	169	BELAZ	DRIVE SHAFT	548-2208010	EA	3	SG	577 00	1,731		1,731	CIS	1-JAN-94		
II 8	170	BELAZ	TRANSMISSION GEAR	548P-2402010-10	EA	1	SG	6755 00	6,755		6,755	CIS	1-JAN-94		
II 8	171	BELAZ	CYLINDER	548-2917020-11	EA	3	SG	3779 00	11,337		11,337	CIS	1-JAN-94		
II 8	172	BELAZ	RINGS	540-2917064	EA	200	SG	1 40	280		280	CIS	1-JAN-94		
II 8	173	BELAZ	SHIFTING FORK	7540-2919412	EA	2	SG	314 00	628		628	CIS	1-JAN-94		
II 8	174	BELAZ	LEVER	548-3001031	EA	3	SG	527 30	1,582		1,582	CIS	1-JAN-94		
II 8	175	BELAZ	PULLEY	540-3003052-02	EA	2	SG	383 20	766		766	CIS	1-JAN-94		
II 8	176	BELAZ	HYD BOOSTER	525-3405010-06	EA	3	SG	1352 00	4,056		4,056	CIS	1-JAN-94		
II 8	177	BELAZ	RINGS	016-020-25-2-2	EA	25	SG	1 23	31		31	CIS	1-JAN-94		
II 8	178	BELAZ	RINGS	080-090-58-2-2	EA	10	SG	1 18	12		12	CIS	1-JAN-94		
II 8	179	BELAZ	PISTON	130-3509160-02	EA	20	SG	14 00	280		280	CIS	1-JAN-94		
II 8	180	BELAZ	RINGS	130-3509167	EA	20	SG	14 20	284		284	CIS	1-JAN-94		
II 8	181	BELAZ	SPRAYER DEFLECTORS	FG-140-371200	EA	50	SG	45 50	2,275		2,275	CIS	1-JAN-94		
II 8	182	BELAZ	LAMPS	A2M-55-50	EA	150	SG	1 26	189		189	CIS	1-JAN-94		
II 8	183	BELAZ	LAMPS	A24-5	EA	150	SG	1 26	189		189	CIS	1-JAN-94		
II 8	184	BELAZ	LAMPS	A24-21-2	EA	100	SG	1 30	130		130	CIS	1-JAN-94		
II 8	185	BELAZ	LAMPS	A24-60-40	EA	50	SG	1.15	58		58	CIS	1-JAN-94		
II 8	186	BELAZ	SPRAYER DEFLECTORS	FP-130-3716200-B	EA	25	SG	45 50	1,138		1,138	CIS	1-JAN-94		
II 8	187	BELAZ	COLLAR	540-2917062	EA	100	SG	39 80	3,980		3,980	CIS	1-JAN-94		
II 8	188	BELAZ	CYLINDER	540-2917080-01	EA	50		32 60	1,630		1,630	CIS	1-JAN-94		
II.8	189	BELAZ	TOTAL COST - US DOLLARS						556,863		556,863				
II 9	1	KOMATSU	TIRES	1800-33E-4 V-STEEL R-LUGS	EA	120		1250 00	150,000		150,000	JAP	1-JAN-93		
II 9	2	KOMATSU	TIRES	CAT D8N		20		10 00	200		200	JAP	1-JAN-93		
II 9	3	KOMATSU	ARM	556-40-41311		1		1922 00	1,922		1,922	JAP	1-JAN-93		
II 9	4	KOMATSU	LEVER	556-40-41311		2		1706 00	3,412		3,412	JAP	1-JAN-93		
II 9	5	KOMATSU	VALVE ASS'Y	556-40-42500		1		2159 00	2,159		2,159	JAP	1-JAN-93		
II 9	6	KOMATSU	CYLINDER ASS'Y			2		1768 50	3,537		3,537	JAP	1-JAN-93		
II 9	7	KOMATSU	PUMP ASS'Y			1		2566 00	2,566		2,568	JAP	1-JAN-93		
II 9	8	KOMATSU	ENGINE OIL	SAE-30API CD		1		25000 00	25,000		25,000	JAP	1-JAN-93		
II.9	9	KOMATSU	ENGINE OIL	SAE-30API CD		1		25000 00	25,000		25,000	JAP	1-JAN-93		
II.9	10	KOMATSU	TOTAL COST				SG		213,796		213,796				
II.20	1	DET-250	LINK	748-22-132 SP	EA	10	SG	166.23	1,662		1,662	CIS	1-JAN-94		
II 20	2	DET-250	LINK	748-22-133 SP	EA	10	SG	1422 61	14,226		14,226	CIS	1-JAN-94		
II 20	3	DET-250	LINK	748-22-134 SP	EA	10	SG	1520 37	15,204		15,204	CIS	1-JAN-94		
II 20	4	DET-250	END PIN	748-22-6	EA	100	SG	40 43	4,043		4,043	CIS	1-JAN-94		
II 20	5	DET-250	HEAD LAMP SET	748-10-318 SP	EA	18	SG	25 00	450		450	CIS	1-JAN-94		
II 20	6	DET-250	PACKING	748-18-234	EA	20	SG	8 00	160		160	CIS	1-JAN-94		
II 20	7	DET-250	PACKING	748-18-228	EA	20	SG	7.00	140		140	CIS	1-JAN-94		
II.20	8	DET-250	PACKING	748-18-229	EA	20	SG	7 00	140		140	CIS	1-JAN-94		
II 20	9	DET-250		748-19-1	EA	4	SG	412 04	1,648		1,648	CIS	1-JAN-94		
II 20	10	DET-250	COUPLING	748-19-5	EA	2	SG	55 00	110		110	CIS	1-JAN-94		
II 20	11	DET-250	GENERATOR GPA-222	748-82-349 SP	EA	1	SG	22500 00	22,500		22,500	CIS	1-JAN-94		
II 20	12	DET-250	OIL PUMP	748-60-276 SP	EA	4	SG	686 84	2,747		2,747	CIS	1-JAN-94		
II 20	13	DET-250	BRUSH 16x32x40	EG-2A, K1-3	EA	36	SG	3 23	116		116	CIS	1-JAN-94		
II 20	14	DET-250	BRUSH 2x12, 5x40x52	EG-2A, K12-8	EA	18	SG	3 81	69		69	CIS	1-JAN-94		
II 20	15	DET-250	DISTRIBUTOR	748-99-465 SP	EA	1	SG	1856 37	1,856		1,856	CIS	1-JAN-94		
II 20	16	DET-250	HYDRO PUMP	933-02-06	EA	1	BA	3000 00	3,000		3,000	CIS	1-JAN-94		
II 20	17	DET-250	ENGINE V-31M	748-01-4 SB	EA	1	BA	16636 10	16,636		16 636	CIS	1-JAN-94		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING /ANALYSIS
PRIORITY 2 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC	UNIT COST $	TOTAL COST $	A FRT COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN. LE TIME	COMMENTS
II.20	18	DET-250	HOUSING	748-05-120 SP	EA	10	BA	46 93	469		469	CIS	1-JAN-94		
II 20	19	DET-250	HOUSING	748-05-271 SP	EA	10	BA	68 91	689		689	CIS	1-JAN-94		
II 20	20	DET-250	REFLECTOR LIGHTS	748-07-182 SP	EA	1	BA	527 87	528		528	CIS	1-JAN-94		
II 20	21	DET-250	REFLECTOR LIGHTS	748-07-121 SP	EA	1	BA	593 86	594		594	CIS	1-JAN-94		
II 20	22	DET-250	REGULATOR	R5M	EA	5	BA	616 96	3,085		3,085	CIS	1-JAN-94		
II 20	23	DET-250	LIGHT SET	FG-122V	EA	10	BA	25 00	250		250	CIS	1-JAN-94		
II.20	24	DET-250	LAMP	A24-75x60	EA	500	BA	0 15	75		75	CIS	1-JAN-94		
II 20	25	DET-250	PLANETARY MECH.	748-16-141 SB	EA	1	BA	915 00	915		915	CIS	1-JAN-94		
II.20	26	DET-250	RINGS	748-16-86	EA	2	BA	3 06	6		6	CIS	1-JAN-94		
II 20	27	DET-250	RINGS	748-58-2059	EA	2	BA	3 11	6		6	CIS	1-JAN-94		
II 20	28	DET-250	SHIMS	748-18-226,232	EA	80	BA	7.00	560		560	CIS	1-JAN-94		
II 20	29	DET-250	CLIPS	3629	EA	5000	BA	0 19	950		950	CIS	1-JAN-94		
II 20	30	DET-250	GEAR BOX	748-19-209 SP	EA	1	BA	4545 61	4,546		4,546	CIS	1-JAN-94		
II.20	31	DET-250	SHIFTING FORK	748-19-1	EA	15	BA	412 04	6,181		6,181	CIS	1-JAN-94		
II 20	32	DET-250	IDLER	748-21-112 SP	EA	24	BA	900 00	21,600		21,600	CIS	1-JAN-94		
II 20	33	DET-250	IDLER	748-21-130 SP	EA	24	BA	144 00	3,456		3,456	CIS	1-JAN-94		
II 20	34	DET-250	SETS - TRACK	748-22-101 SP	SET	4	BA	3386 44	13,546		13,546	CIS	1-JAN-94		
II 20	35	DET-250	GROUSERS	748-22-132 SP	EA	10	BA	58 00	580		580	CIS	1-JAN-94		
II 20	36	DET-250	TRACK BOLTS	700-28-232	EA	500	BA	0 11	55		55	CIS	1-JAN-94		
II 20	37	DET-250	TRACK BUSHING	748-22-3	EA	50	BA	23 46	1,173		1,173	CIS	1-JAN-94		
II 20	38	DET-250	TRACK LINKS	748-22-1	EA	20	BA	42 53	851		851	CIS	1-JAN-94		
II 20	39	DET-250	TRACK LINKS	748-22-2	EA	20	BA	42 53	851		851	CIS	1-JAN-94		
II 20	40	DET-250	TRACK PINS	748-22-6	EA	50	BA	40 43	2,022		2,022	CIS	1-JAN-94		
II 20	41	DET-250	CONE	748-22-71	EA	100	BA	3 76	376		376	CIS	1-JAN-94		
II 20	42	DET-250	WASHERS	748-22-50	EA	500	BA	0 12	60		60	CIS	1-JAN-94		
II 20	43	DET-250	BLOWER	748-27-208 SP	EA	1	BA	22 00	22		22	CIS	1-JAN-94		
II 20	44	DET-250	PACKING	748-31-11	EA	5	BA	15 80	79		79	CIS	1-JAN-94		
II 20	45	DET-250	PACKING	748-31-138	EA	5	BA	13 40	67		67	CIS	1-JAN-94		
II 20	46	DET-250	COUPLING	748-13-75	EA	1	BA	54 00	54		54	CIS	1-JAN-94		
II 20	47	DET-250	AXLE	748-50-206	EA	1	BA	276 40	276		276	CIS	1-JAN-94		
II 20	48	DET-250	COUPLING	748-50-177 SP	EA	1	BA	117 30	117		117	CIS	1-JAN-94		
II 20	49	DET-250	DISC	748-50-302 SP	EA	2	BA	32 26	65		65	CIS	1-JAN-94		
II 20	50	DET-250	DISC	748-50-152 SP	EA	2	BA	32 26	65		65	CIS	1-JAN-94		
II 20	51	DET-250	PUMP	748-50-232 SB	EA	3	BA	315 01	945		945	CIS	1-JAN-94		
II 20	52	DET-250	CONTACTOR	TKS 611DOD	EA	4	BA	15 00	60		60	CIS	1-JAN-94		
II.20	53	DET-250	CONTROLLER	KV30G 748-82-371	EA	1	BA	39 00	39		39	CIS	1-JAN-94		
II 20	54	DET-250	EL BRUSH	EG-2A, 2/12, 5x40x60	EA	150	BA	3 81	572		572	CIS	1-JAN-94		
II 20	55	DET-250	EL BRUSH	EG-2A, 16x32x40	EA	250	BA	3 23	808		808	CIS	1-JAN-94		
II 20	56	DET-250	INITIATOR	DK 913A	EA	1	BA	1456 06	1,456		1,456	CIS	1-JAN-94		
II 20	57	DET-250	HYDRO PUMP	748-99-230 SB	EA	1	BA	250 00	250		250	CIS	1-JAN-94		
II 20	58	DET-250	WASHER	748-99-993	EA	10	BA	0 15	2		2	CIS	1-JAN-94		
II 20	59	DET-250	RINGS	748-99-446	EA	10	BA	3 04	30		30	CIS	1-JAN-94		
II 20	60	DET-250	DISTRIBUTOR	748-99-465 SP	EA	1	BA	1856 37	1,856		1,856	CIS	1-JAN-94		
II 20	61	DET-250	POWER CYLINDER	748-99-10 SP	EA	3	BA	300 00	900		900	CIS	1-JAN-94		
II 20	62	DET-250	SHOCK ABSORBER	402-50-7	EA	12	BA	31 00	372		372	CIS	1-JAN-94		
II 20	63	DET-250	PACKING	3303-08-1	EA	2	BA	29 33	59		59	CIS	1-JAN-94		
II 20	64	DET-250	RING	303-10-2	EA	36	BA	0 36	13		13	CIS	1-JAN-94		
II 20	65	DET-250	PIPE	303-18-1A	EA	36	BA	0 13	5		5	CIS	1-JAN-94		
II 20	66	DET-250	GENERATOR	SBV 30940-3	EA	2	BA	1038 16	2,076		2,076	CIS	1-JAN-94		

MONGOLIAN ENERGY SECTOR PROJECT
COMPONENT III
TASK 1 - VALUE ENGINEERING /ANALYSIS
PRIORITY 2 ITEMS
(Cont'd)

MORRISON KNUDSEN COMPANY

EMERGENCY HEAT AND POWER PROJ. NO. 2 MATERIALS AND SPARE PARTS LIST

PR NO.	NO.	UNIT NAME	DESCRIPTION	PART NUMBER	UNITS	QNT	LOC.	UNIT COST $	TOTAL COST $	A FRT. COST $	TOTAL	SOURCE CNTRY	NEED DATE	MAN LE TIME	COMMENTS
II 20	67	DET-250	BUSHING	3308-233-2	EA	1	BA	22 00	22		22	CIS	1-JAN-94		
II 20	68	DET-250	PUMP	SB 3311-00-4	EA	1	BA	300.15	300		300	CIS	1-JAN-94		
II 20	69	DET-250	SHAFT	SB 411-22-16	EA	1	BA	15 00	15		15	CIS	1-JAN-94		
II 20	70	DET-250	PUMP	SB 412-00-5	EA	1	AD	352 66	353		353	CIS	1-JAN-94		
II 20	71	DET-250	TRACK ASSEMBLEY	748-27-101 SP	SET	1	AD	3386 44	3,386		3,386	CIS	1-JAN-94		
II 20	72	DET-250	PINS - TRACK	748-22-6	EA	10	AD	40.43	404		404	CIS	1-JAN-94		
II 20	73	DET-250	FILTER HOUSING	748-05-120 SP	EA	1	AD	46 93	47		47	CIS	1-JAN-94		
II 20	74	DET-250	FILTER HOUSING	748-65-272 SP	EA	1	AD	68 91	69		69	CIS	1-JAN-94		
II 20	75	DET-250	PUMP	BNK-12	EA	1	SO	352 66	353		353	CIS	1-JAN-94		
II 20	76	DET-250	CUTTING EDGES	D3-132-1.02001	EA	4	SO	148.00	592		592	CIS	1-JAN-94		
II 20	77	DET-250	CUTTING EDGES	D3-132-1 02002	EA	4	SO	148 00	592		592	CIS	1-JAN-94		
II 20	78	DET-250	CUTTING EDGES	D3-59XL-0100030	EA	2	SO	148 00	296		296	CIS	1-JAN-94		
II 20	79	DET-250	CUTTING EDGES	D3-118 10 001	EA	2		148 00	296		296	CIS	1-JAN-94		
II.20	80	DET-250	TOTAL COST - US DOLLARS				BA		165,042		165,042				
II.21	1	DRAG W. PTS	10/70		LOT	1	SG	30000 00	30,000	5,720	35,720	USA	1-JAN-94	2MO	
II 21	2	DRAG W PTS	10/70		LOT	1		30000 00	30,000	5,720	35,720	USA	1-JAN-94	2MO	
II.21	3	DRAG W PTS	TOTAL COST - US DOLLARS				BA		60,000	11,440	71,440				
II.22	1	DRAG W. PTS	15/90		LOT	1	BA	93500.00	93,500	2,860	96,360	USA	1-JAN-94	2MO	
II.23	1	DRAG W. PTS	20/90		LOT	1	BA	93500.00	93,500	2,860	96,360	USA	1-JAN-94	2MO	
II 24	1	GRADER	CAT 16G MOTOR GRADER		EA	1	SG	385000 00	385,000	31,320	416,320	USA	1-JAN-94	2MO	
II 24	2	GRADER	CAT 16G MOTOR GRADER		EA	1	SO	385000 00	385,000	31,320	416,320	USA	1-JAN-94	2MO	
II 24	3	GRADER	CAT 16G MOTOR GRADER		EA	1		385000 00	385,000	31,320	416,320	USA	1-JAN-94	2MO	
II.24	4	GRADER	TOTAL COST - US DOLLARS						1,155,000	93,960	1,248,960				
II.25		NALAIKH UNDERGROUND MINE PTS			LOT				100,000		100,000	CIS	1-JAN-94		
II.26	1	SHOVEL PTS EKG 5A			LOT				120,000		120,000	CIS	1-JAN-94		

TOTAL	8,318,208
AMERICAN SUBTOTAL	3,159,867
GRAND TOTAL	13,677,485
AMERICAN TOTAL	4,791,079

APPENDIX B - 1

MONGOLIAN ENERGY SECTOR PROJECT VALUE ENGINEERING MEETING CRITICAL SPARE PARTS LIST

ITEM NUMBER	DESCIPTION	QUANITY	UNIT COST $	TOTAL COST $	SHIP COST $	TOTAL INC SHIP COST	UNIT WT. (M.TONS)	DIMENSNS EA. (M)	SOURCE COUNTRY	COMMENTS
	POWER PLANT NO. 3									
1	Fireproof Bricks, Diatomaceous for Brick Work around Boile Class "A" 250 x 123 x 65 Gost 2574-78 US Type: 9" x 4 1/2" x 2 1/2"	160 M^3	$1= 1 Brick	160000	124000	284000	2.1825	N/A	U.S.	Ship via Ocan Est on Site Date Oct 93
2	Insulating bricks M400 Gost 6788-74 500 x 170 x 60 ("sovelete plate") US Type: 9" x 4 1/2" x 21/2"	150 M^3	$1.1=1 Bric	150000	96662	246662	0.875	N/A	U.S.	Ship via Ocean Est on Site Date Oct 93
3	Cement for 1 & 2 above	80 tns	$0.6 - Kg	24000	18200	42200	1	N/A	U.S.	Ship via Ocean Est on Site Date Oct 93
4	Crown Gear for Ball Mills Type M-287-410. Year 1967	2	132000	264000	5005	269005	5.5	4.5x4.5x4.5	U.S.	Ship via Ocean Est on Site Date Aug 94
5	Pinion Gear for Ball Mills Type	7	23000	69000	1195	70195	0.875	65x 65x 45	U.S.	Ship via Ocean Est on Site Date Aug 94
6	Crown Gear for Ball Mills Type M 287/470	2	132000	264000	5005	269005	5.5	4.5x4.5x	U.S.	Ship via Ocean Est on Site Date Aug 94
7	Pinion Gear for Ball Mills as above	2	23000	46000	796	46796	0.875	65x 65x 4	U.S.	Ship via Ocean Est on Site Date Dec 93
8	Boiler Feed Water Pumps Type -150-53 Q-150 M3/h; H=580M; 500 kwt, 2970 RPM	2 Cmp	140000	140000	36960	176960	10.5	5x1.7x2.2	U.S.	Ship via Air Est on Site Date Dec 93 (for expedited delivery)
9	Brass Tubing OD 19 x 1 x 4545 Mark -68	25 tns	7000	175000	11375	186375	1		U.S.	4.6 M Long Ship via Ocean Est on Site Date Sept 93
10	Gear for Coal Powder Feeder Type-7, Year 1976	12 Pcs	345	2076	0	2076	0	N/A	C.I.S.	N/A
11	Electric Motors Type 61-y2 0.9 KWT, 450-1500 RPM, DC 220 Volt For coal Feeders, 20 Kg Ea.	5 Pcs	5400	27000	352	27352	0.02		U.S.	Ship via Air Est On Site Date Dec 93
12	Electric Motors Type 62-Y2 4.0 KWT, 450-1500 RPM, DC 220 Volt For Coal Powder Feeders. 20 Kg Ea.	6 Pcs	9550	57300	422	57722	0.02			Ship via Air Est onsite Date Dec 93
13	Electric Motors type AC 3 Phase Type A 30-4-450Y-8Y1 6000 Volt 500 KWT; 735 RPM	2 Pcs	53000	106000	31687	137687	2.25	2.4x1.4x1.4		Ship via Air Est onsite Date Dec 93
14	Ash Sluice Pump, Type PT-400/40; Q=400 M^3/h H = 40M; 132 KWT; 960 RPM	1 Cmp	30000	30000	8802	38802	2.5	1x1.5x1		Ship via Air Est onsite Date Dec 93
15	High Pressure Heater (H/E Type B-30) Bundle Only	1 Cmp	120000	120000	28167	148167	8	Dia 1.5x7.5		Ship via Air Est onsite Date Dec 93
16	District Water Pump Type C-2500-180	1 Cmp	200000	200000	35208	235208	10			Ship via Air Est onsite Date Dec 93
17	Primary Fan Gear Housing (Fan Type BM-18A-4 Year 1976	1 Pcs	12492	12492	0	12492	N/A		C.I.S.	N/A

MONGOLIAN ENERGY SECTOR PROJECT VALUE ENGINEERING MEETING CRITICAL SPARE PARTS LIST

ITEM NUMBER	DESCIPTION	QUANITY	UNIT COST $	TOTAL COST $	SHIP COST $	TOTAL INC SHIP COST	UNIT WT. (M.TONS)	DIMENSNS EA. (M)	SOURCE COUNTRY	COMMENTS
	POWER PLANT NO. 3									
For Low Pressure Turbine T-12-35/IOM 378/1 YEAR 1976										
18	Diaphragm Compression Ring Dwg No. 126-C-378/1	15 Pcs	236	3540	0	3540			C.I.S.	
19	Diapragm Compression Ring Dwg No. 126-C-381/1	6 Pcs	225	1800	0	1800			C.I.S.	
20	Compressed End Flat Spring Dwg. No. 185-M-643	200 Pcs	1	200	0	200			C.I.S.	
21	Compressed End Flat Spring Dwg. No. 185-M-640	24 Pcs	1.2	28	0	28			C.I.S.	
22	Compressed End Flat Spring Dwg. No. 185-M-644	132 Pcs	1.2	158	0	158			C.I.S.	
23	Compressed Tendril to Rotors Dwg. No. 126-C-245/1	90 Pcs	1.2	108	0	108			C.I.S.	
24	Compressed Tendril to Rotors Dwg. No. 126-C-245/3	100 Pcs	1.2	120	0	120	0	N/A	C.I.S.	
25	Compressed Tendril to Rotors Dwg. No. 126-C-245/12	150 pcdd	1.2	180	0	180	0	N/A	C.I.S.	
For High Pressure Turbine T-25-90/IOM YEAR 1976										
26	Compressed End Flat Spring Dwg. No. 185-M-643	66 pcs	1	66	0	66	0	N/A	C.I.S.	
27	Compressed Ring Dwg. No. 126-C-328	30 pcs	290	8700	0	8700	0	N/A	C.I.S.	
28	Compressed End Flat Spring Dwg. No. 185-M-644	132 pcs	1.2	158	0	158	0	N/A	C.I.S.	
29	Compressed End Flat Spring Dwg. No. 185-M-637	200 pcs	1	200	0	200	0	N/A	C.I.S.	
30	Compressed End Flat Spring Dwg. No. 185-M-639	200 pcs	0.7	140	0	140	0	N/A	C.I.S.	
31	Compressed Tendril to Rotors Dwg. No. 126-C-245/10	100 pcs	1.2	120	0	120	0	N/A	C.I.S.	
32	Compressed Tendril to Rotors Dwg. No. 126-C-245/11	24 Pcs	1	24	0	24	0	N/A	C.I.S.	
33	Rotor Assembly for Hammer Crusher Type M20 - 20 Dwg. No. 3591.02.00.0	1 Cmp	113693	113639	0	113639	0	N/A	C.I.S.	
34	Flexible Coupling for Hammer Crusher Type M20 - 20 Dwg. No. 3591-09-080	1	3960	3960	0	3960	0	N/A	C.I.S.	

MONGOLIAN ENERGY SECTOR PROJECT VALUE ENGINEERING MEETING CRITICAL SPARE PARTS LIST

ITEM NUMBER	DESCIPTION	QUANITY	UNIT COST $	TOTAL COST $	SHIP COST $	TOTAL INC SHIP COST	UNIT WT. (M.TONS)	DIMENSNS EA. (M)	SOURCE COUNTRY	COMMENTS
	POWER PLANT NO. 3									
35	Healproof Stainless Steel 12 x 18H9T GOST 5332-72. Thickness from 6 to 10 mm For Boiler Repair, Deaerator Trays	6 tns	3000	18000	2730	20730	1		U.S.	
36	Bearing , Russian No. 2222 US No. N222 ENI 5 Kg ea.	20 pcs	189.25	3785	352	4137	0.005		U.S.	Ship via Air Est onsite Date Sept 93
37	Bearing Russian No. 2317 US No. N317 ENI 5.2 Kg ea.	20 pcs	155.35	3107	366	3473	0.0052		U.S.	Ship via Air Est onsite Date Sept 93
38	Bearing Russian No. 2319 US No. 319 7 Kg ea	20 pcs	200	2000	247	2247	0.007		U.S.	Ship via Air Est onsite Date Sept 93
39	Bearing Russian No. 2324 US No. N324 EMI 14 Kg ea.	25 pcs	427.9	10687.5	1232.5	11920	0.014		U.S.	Ship via Air Est onsite Date Sept 93
40	Bearing Russian No. 2326 US No. N326 EMI 18 Kg ea.	15 pcs	414.15	6212	950	7162	0.018		U.S.	Ship via Air Est onsite Date Sept 93
41	Bearing Russian No. 3616 US No. 22316 5 Kg ea.	20 pcs	108.95	1089	176	1265	0.005		U.S.	Ship via Air Est onsite Date Sept 93
42	Bearing Russian No. 7620 US No. 32330A 20 Kg ea.	15 pcs	3180	47700	1056	48756	0.02		U.S.	Ship via Air Est onsite Date Sept 93
43	Bearing Russian No. 8216 US No. 51216 1 Kg ea.	20 pcs.	35.45	709	70.5	779.5	0.001		U.S.	Ship via Air Est onsite Date Sept 93
44	Bearing Russian No. 46330 US No. B7330E.TPA.P4UL 26 Kg ea.	40 pcs	2374	47480	1831	49311	0.026		U.S.	Ship via Air Est onsite Date Sept 93
45	Bearing Russian No. 50306 US No. 6306N 1 Kg ea.	30 pcs	20	600	105.5	705.5	0.001		U.S.	Ship via Air Est onsite Date Sept 93
46	Bearing Russian No. 60306 US No. 6306 ZR 1 Kg ea.	20 pcs	23	460	70.5	530.5	0.001		U.S.	Ship via Air Est onsite Date Sept 93
47	Bearing Russian No. 3530 US No. 222.30 20 Kg ea.	10 pcs	266.2	2662	704	3366	0.02		U.S.	Ship via Air Est onsite Date Sept 93
48	Electrical Motor A 3012-55-4MYI 6000 Volt; 500 KWT; 1500 RPM	1 ea.	39700	39700	10914	50614	1.55	2x1.3 1.2	U.S.	Ship via Air Est onsite Date Dec 93
49	Electrical Motor A 302-17-69-8/10. YI 6000 Volt; 1000/500 KWT; 742/594 RPM	1 ea.	235200	235000	39433	274433	11.2	3.4x2.3x2.1	U.S.	Ship via Air Est onsite Date Dec 93
50	Electrical motor 4 A 315M-4Y3;	2 ea.	21000	42000	17604	59604	1.66		U.S.	Ship via Air

MONGOLIAN ENERGY SECTOR PROJECT VALUE ENGINEERING MEETING CRITICAL SPARE PARTS LIST

ITEM NUMBER	DESCIPTION	QUANITY	UNIT COST $	TOTAL COST $	SHIP COST $	TOTAL INC SHIP COST	UNIT WT. (M.TONS)	DIMENSNS EA. (M)	SOURCE COUNTRY	COMMENTS
	POWER PLANT NO. 3									
	380 Volt; 200 KWT; 1475 RPM									Est onsite Date Dec 93
51	Electrical Motor MTH-612-10y2 380 Volt; 60 KWT; 565 RPM	1 ea.	12500	12500	6337	18837	1.8	1.5x85x1.1	U.S.	Ship via Air Est onsite Date Dec 93
52	Electrical Motor 4 AM-225-M8/6/4Y2 15/17/25 KWT; 380 Volt 740/990/1480 RPM	6 pc	7500	45000	16900	61900	0.8	1.3x66x.84	U.S.	Ship via Air Est onsite Date Dec 93
53	Electrodes 13/55 Dia. 3mm	10 tns	3190	31900	4550	36450	1		U.S.	Ship via Air Est onsite Date Sept 93
54	Winch 5 Ton;Type Y - 5M	3 Cmp	2000	6000	410	6410	0.3		U.S.	Ship via Ocean Est onsite Date Sept 93
55	Portable Electric Drill Type -1019; -1017A. 220 Volt 3 Kg ea.	10 ea.	160	1600	14	1614	0.003		U.S.	Ship via Ocean Est onsite Date Sept 93
56	Portable Electric Grinder -2004A; 220 Volt 6 Kg ea.	10 ea.	160	1600	27	1627	0.006		U.S.	Ship via Ocean Est onsite Date Sept 93
57	Current Frequency Converter 13 Kg. ea.	10 ea.	1000	10000	59	10059	0.013		U.S.	Ship via Ocean Est onsite Date Sept 93
58	Belt Scales; Width 1000 mm For Coal Weight Measurements	2 cmp	15000	30000	455	30455	0.5	3x0.65x1.4	U.S.	Ship via Ocean Est onsite Date Sept 93
59	Turbine Oil Centrifuge Type -3000 for Turbine Lubrication Oil Purification	1 cmp	95000	95000	4401	99401	1.25	2x1.5x2	U.S.	Ship via Air Est onsite Date Dec 93
60	Electrical Motor A 12-52-4 630 KWT; 6000 Volt, 1500 Rpm Q=1000 M^3/h; H= 180 M	1 cmp	44150	44150	11971	56121	3.4	2.2x1.3x1.2	U.S.	Ship via Air Est onsite Date Dec 93
				$ 2,718,951	$ 526,802	$ 3,245,753				
	Total Power Plant #3 =			**$ 3,245,753**		**Wt. = 53.7717 M Ton Shipment from US to Mongolia**				