Application of the Analytical Hierarchy Process in the Environmental Management System at the Bureau of Engraving and Printing

Elaine Cochran
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1. Management Summary

The Bureau of Engraving and Printing (BEP, Bureau) prints billions of Federal Reserve notes for delivery to the Federal Reserve System each year. As the largest producer of security documents in the United States[1], the BEP is committed to the fact that environmental considerations must be a fundamental and integral component of its policies, operations, planning, and management.

The Bureau of Engraving and Printing Western Currency Facility (WCF) maintains three (3) York-Shipley boilers for the generation of steam. Steam is utilized at the facility for heating requirements and, in conjunction with the facility chillers, to maintain required humidity throughout the facility, specifically in the production and currency storage areas.

1.1 Boiler History and Usage at the WCF

The three boilers at the WCF were installed in 1991 when the plant opened for production. Two 800-horsepower boilers were installed with the intention of operating when the facility's demand for heat and steam is at high capacity. In 1991, high capacity at the WCF was projected to occur during the winter season and at times of unusually high levels of output in plant production. The third 200-HP boiler was originally intended to operate during times of lower demand (i.e. summer season), or when the need for steam was not high enough to warrant efficient use of the larger boilers.

Since 1991, the WCF has expanded considerably and the size of its facilities has outgrown the capacity of steam production from the 200-HP boiler. The two 800-HP boilers now function as the sole producers of steam for the WCF. The Bureau's typical demand for steam requires only that one of the 800-HP be in operation at all times; the other 800-HP boiler remains idle, but ready to be fired up in case of a surge in demand.

1.2 Application of the Analytical Hierarchy Process

As part of its commitment to upholding environmental standards in its facilities, the Bureau has identified the need to reduce nitrous-oxide emissions from its two 800-HP boilers by retrofitting them with new burners. After contacting several burner vendors, the BEP met with Neal & Associates and Holman Boiler Works Inc. to discuss the details and specifications needed for submissions of budget proposals.

After receiving the budget proposals, the vendor marketing the optimal burner is chosen and awarded a contract for installation. In order to justify the decision, I have chosen the Analytical Hierarchy Process (AHP) as the chosen methodology to support my evaluation.

AHP is a scientific procedure that utilizes qualitative and quantitative decision-making in order to arrive at an educated decision. The BEP has identified several criteria

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[1] Mission Statement, Bureau of Engraving and Printing

imperative to the performance of a new burner. Based on these criteria, AHP identifies the optimal vendor using a scorecard approach. AHP shows that Neal & Associates and their Weishaupt burner are the optimal solution to reducing NOx emissions at the WCF.

2. Background and Description of the Problem Situation

As a government agency located in the Executive Branch of the Federal Government, the BEP and its Western Currency Facility in Fort Worth, Texas must abide by Executive Orders issued from Washington D.C. Executive Orders are issued by the President in his acting pursuant to an act of Congress or to the Constitution itself[2].

2.1 Environmental Management Systems

The issuance of Executive Order (EO) 13148, *Greening the Government through Leadership in Environmental Management* (April 2000), established new goals and requirements for Federal agencies. The primary goal of the EO is to ensure an integration of environmental accountability into Federal agencies and their facilities. One primary means to this goal is the establishment of Environmental Management Systems to provide a systematic approach to environmental management.

The WCF has developed an Environmental Management System and as a part of its EMS, two of the objectives the WCF has set are:

- Reduction of ozone precursor or greenhouse emissions
- Natural gas conservation

The present project, Retrofit Power Plant Boilers with Low NOx Burners, has been identified as an Environmental Management Program (EMP) within the EMS. Its objectives are to reduce the generation and release of nitrous oxide (NOx) emissions and reduce natural gas consumption in the two larger, 35MMBTU/hr, boilers at the WCF. This will be done by retrofitting these boilers with multi-flame low NOx burners and control systems allowing for more efficient operation by controlling the fuel to air ratio for a more complete combustion.

2.2 Multi-Flame Burner Technology

The multi-flame burner technology that will be utilized allows a facility to reduce fuel consumption and emissions. Multi-flame technology ensures a more complete air-to-fuel combustion, thereby eliminating by-products such as the pollutant NOx. Such highly efficient fuel distribution is obtained by spraying the main fuel flow from several concentrically arranged secondary oil nozzles. The oil spray from the nozzles then

[2] Derfner, Jeremy

travels a short route, and is combined with combustion air and flue gases recirculated from the combustion area. In addition to lower thermal NOx emissions, Multi-Flame combustion produces low excess air values and a burn-off that is soot free[3].

2.3 Introduction to Vendors

Project discussions were held with two local vendors, Neal & Associates and Holman Boiler Works Inc. These vendors were primarily chosen because of their proximity to the WCF and their responsiveness to contact emails. Project restraints were put into effect based on a deadline set for April 26, 2005, and it was imperative that the vendors chosen for the study comply with a sense of urgency.

Neal & Associates is a company based in Tarrant County that sells a Weishaupt burner. Weishaput RGL70/2-A is the model that would meet the specifications of the WCF. It should be noted that Weishaupt is a reputable German firm responsible for developing multi-flame technology and its prominence in the industry prompted the BEP to contact Neal & Associates for further product information.

Holman Boiler Works Inc. is a company based in Houston, Texas that sells a Cleaver-Brooks burner. Cleaver-Brooks D-378-420 is the model that would be retrofitted to the two boilers at the WCF. Holman Boiler Works installed the original York-Shipley boilers at the WCF in 1991. Past experience with BEP policies and equipment provided the rationale for their inclusion in the search for the optimal vendor.

2.4 Business Case Justification and Fair Procurement

The specification, design and installation of the low NOx burners includes identification and project discussions with applicable vendors to determine the facility specifications and design requirements, development of a project budget and Request for Proposal (RFP) and installation logistics. The RFP is used to construct a Business Case Justification, which is submitted to Congress for approval. The Business Case Justification outlines the description of the asset to be acquired, the purpose and scope of the project, supported strategic goals, performance measures, recommendation and cost/benefit analysis, project costs and milestones, and the associated risks.

After the Business Case Justification is approved by legislators and the BEP is granted the funds for project completion, the process begins for competitive bidding. At this time, outside contractors are invited to submit budgetary proposals to be reviewed by a panel of legislators in Washington D.C. The panel selects a bidder to award the contract to and the BEP is allowed to proceed with the installation phase of the project. It should be noted that a smooth transition to this next phase is often impeded by lawsuits and allegations of unfair treatment from bidders who were not awarded the contract. These legal accusations often delay the beginning of installation and, consequently, project completion may be considerably delayed.

[3] Weishaupt Report

To minimize the risk of legal complications, the Bureau must justify procurement from competitive bidders. The complexity and crucial nature of this decision indicate that experience and intuition alone will not be sufficient in its justification. By applying a scientific method of analysis such as AHP, the BEP will eliminate or be able to quickly dismiss allegations of unfairness and discrimination from bidders.

2.5 Project Phases

Since the timeframe of my project roughly spans three months and does not allow sufficient time for me to follow the typical protocol for project implementation at a Federal Agency, I have established a set of feasible goals by which to define it.

The first third of my project involved researching and learning about the mechanics of boilers and burners. This included several tours of the power plant at the WCF, a tour of the power plant at Alcon in Fort Worth, and reading material on related subjects. Meetings were also arranged during this time with Neal & Associates and Holman Boiler Works Inc. Project specifications and the timeline for budgetary proposals were discussed at these meetings.

The second phase of my project was spent writing the Business Case Justification. After receiving the budgetary proposals, I submitted several drafts of this technical document to employees within the Environmental, Health, and Safety (EHS) Branch at the BEP. My team of editors included: Colleen McKinney, EHS Branch Manager; Michael Byington, environmental consultant; Tony Fast, Chief Engineer of Power Plant Facilities; Dennis Stark, Facilities Support Branch.

The last phase was spent applying the technical model of AHP to the project, making necessary computations, and forming a conclusion.

3. Analysis of the Situation

As a Federal Agency, the Bureau must assure a fair and equitable selection of contract bidders. AHP is a sufficient methodology in validating complex decisions and its utilization will allow the BEP to scientifically explain the reasoning used to derive its decision.

AHP reduces a complex decision into a manageable series of simpler comparisons and then compiles the results to show the best decision and provide a clear rationale for doing so. Using AHP to decide which boiler vendor to award a contract will make the decision-making process a combination of qualitative and quantitative analyses.

The four steps main steps of AHP methodology are[4]:

1. Model the decision problem and list the decision criteria and the decision alternatives
2. Undertake pairwise comparisons
3. Calculate the relative priorities (weights) of the elements
4. Determine the priority ranking of the decision elements

3.1 Decision Criteria and Alternatives

AHP would involve determining which criteria were to be used in performing a one-by-one comparison of the two vendors. I came up with a list of criteria and had them approved by Colleen McKinney. The criteria used were:

- Price
- Reduction in NOx emissions
- Reduction in CO, O_2 emissions
- Fuel Efficiency
- Warranty
- Time Needed for Project Completion

3.2 Pairwise Comparisons

Upon investigation, it became clear that both vendors offered unique advantageous features in different categories. For example, one vendor might offer a cheaper burner while the other vendor's burner produced lower NOx emissions. Part of the problem would involve identifying criteria in which to compare the vendors and then decide which criteria were most important to the project. For example, the cheapest burner might not be the optimal product if price is not considered an important factor.

3.3 Weights of Criteria

After a pairwise comparison of the two vendors, the next step is to assign relative priorities, or weights, to each of the criterion. Relative importance is assigned by 'rating' each criterion and alternative against each other. For example, the most significant criteria NOx emissions and fuel efficiency were assigned 35% and 30% respectively of the importance. The least influential criterion, warranty, was assigned 5% of the importance.

The weights of the six criteria add up to 1.000, which becomes a crucial factor if more than two vendors are to be compared.

My research allowed me to propose weights for the six criteria, which were then submitted to Colleen McKinney for approval. Her recommendations are reflected in the final criteria weightings.

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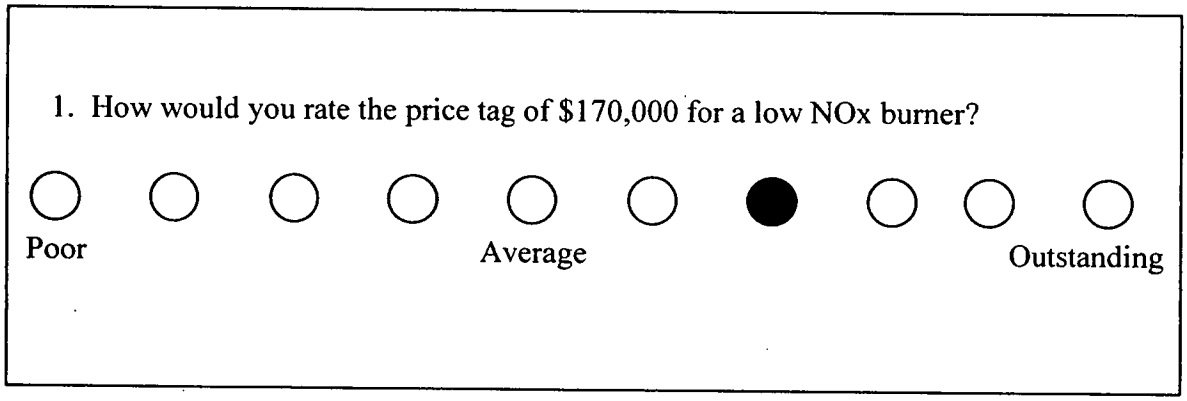
[4] Saaty, Thomas

3.4 Priority Rankings

The vendors are given priority rankings for each of the criteria. The priority rankings are based on a scale of 1-10, where 1 represents poor and 10 represents outstanding. Tese rankings reflect how the vendors' burners perform in each of the six categories. For example, the price of Neal & Associates' burner is $171,482, which is given a priority ranking of 6. On the other hand, Holman Boiler Works supplies a cheaper burner at an inclusive price of $170,000, which earns a priority ranking of 7. In the price category, Holman's lower price gives it a higher performance rating than Neal & Associates.

I assigned the priority rankings based on a survey I created and then submitted to industry experts. The surveys did not reveal the weights of the criteria, but only asked the participant to consider how each vendor performed in the six categories.

An excerpt from the survey appears below:



Here the participant has given a priority ranking of 7 to Holman Boiler Works' price of $170,000 for its burner. After the complete survey has been filled out, it is easy to assign priority rankings to each vendor in the six categories.

4. Technical Description of the Model

After identifying the decision problem and its alternatives, the criteria, the individual criterion weights, and the priority rankings, the next steps are to organize the gathered information and calculate the final score for each vendor based on the priority rankings and the criteria weights. However, before the final weight matrix is calculated, the following figures and tables will exhibit the information that has been gathered thus far.

The problem structuring and analysis process is conceptualized in Fig. 1[5].

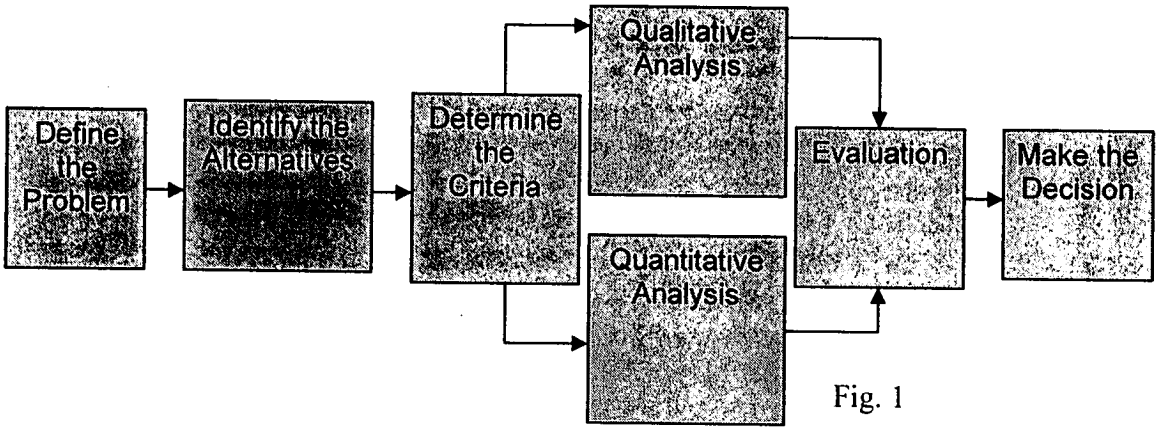


Fig. 1

Fig. 2 is a representation of Step 1 in the AHP decision-making process (refer to section 3.1): model the decision problem. The top tier contains the decision to be made, the second tier contains the criteria, and the third tier contains the alternatives.

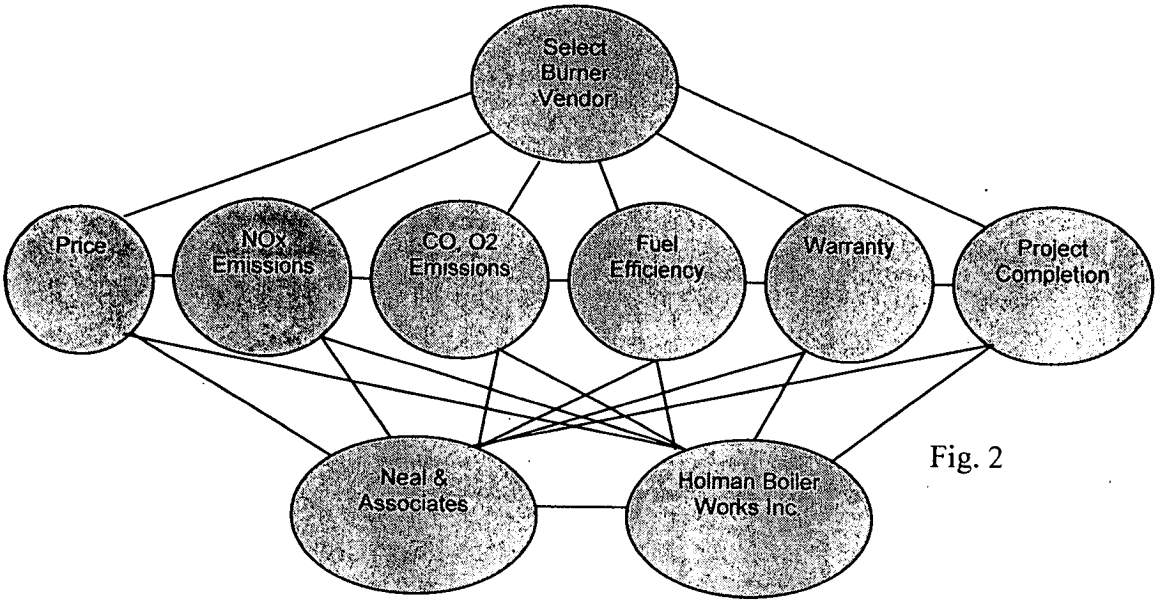


Fig. 2

[5] Kazakidis, Mayer, Scoble

Table 1 shows Step 2 in the AHP decision-making process: pairwise comparisons. Information from each of the vendors has been organized according to the six criteria. The information is based on the budgetary proposals submitted by Neal & Associates and Holman Boiler Works.

	Neal & Associates	Holman Boiler Works Inc.
Price	$171,482	$170,000
NOx emissions	30 ppm	≤ 30 ppm
CO, O2 emissions	3% reduction in O2 0 ppm CO	3% reduction in O2 ≤ 50 ppm CO
Fuel Efficiency	10-1 Turndown natural gas	6-1 Turndown natural gas
Warranty	360 day warranty on labor 2 year warranty on parts	90 day warranty on labor 2 year warranty on parts
Project Completion	22 days	10 days

Table 1

Table 2 shows Step 3 in the decision-making process: weighting the criteria:

Criteria	Weight
Price	0.100
NOx emissions	0.350
CO, O2 emissions	0.050
Fuel Efficiency	0.300
Warranty	0.050
Project Completion	0.150
Total	**1.000**

Table 2

Table 3 shows the results from the final step in AHP decision-making process: priority ranking.

	Neal & Associates	Rank	Holman Boiler Works Inc.	Rank
Price	$171,482	6	$170,000	7
NOx emissions	30 ppm	7	≤ 30 ppm	8
CO, O2 emissions	3% reduction in O2 0 ppm CO	9	3% reduction in O2 ≤ 50 ppm CO	6
Fuel Efficiency	10-1 Turndown natural gas	7	6-1 Turndown natural gas	4
Warranty	360 day warranty on labor 2 year warranty on parts	6	90 day warranty on labor 2 year warranty on parts	3
Project Completion	22 days	3	10 days	7

Table 3

The formula used to calculate the final weight matrix is:

$$\underset{2x1}{\begin{bmatrix}\text{Final}\\ \text{scores}\end{bmatrix}} = \underset{2x6}{\begin{bmatrix}\text{Options weightings}\end{bmatrix}} \times \underset{6x1}{\begin{bmatrix}\text{Objectives}\\ \text{weightings}\end{bmatrix}}$$

Filling in the values and eigenvectors for each of the matrices, the resulting 2x1 matrix shows the final scores for Neal & Associates and Holman Boiler Works:

Neal & Associates

$$\begin{pmatrix} \mathbf{6/13} & \mathbf{7/15} & \mathbf{9/15} & \mathbf{7/11} & \mathbf{6/9} & \mathbf{3/10} \\ \mathbf{7/13} & \mathbf{8/15} & \mathbf{6/15} & \mathbf{4/11} & \mathbf{3/9} & \mathbf{7/10} \end{pmatrix} \times \begin{pmatrix} 0.100 \\ 0.350 \\ 0.050 \\ 0.300 \\ 0.050 \\ 0.150 \end{pmatrix} = \begin{pmatrix} \mathbf{0.5087} \\ \mathbf{0.4913} \end{pmatrix}$$

Holman Boiler Works Inc.

The final weight matrix shows Neal & Associates has a final score of 0.5087 and is the optimal choice. Holman Boiler Works has a slightly lower score of 0.4913.

5. *Conclusions and Critique*

The present project, Retrofit Power Plant Boilers with Low NOx Burners, has objectives to reduce the generation and release of nitrous oxide (NOx) emissions and reduce the natural gas consumption in the two larger, 33.75 MMBtu/hr boilers at the WCF. This will be done by retrofitting these boilers with low NOx burners and control systems allowing for more efficient operation by controlling the air-to-fuel ratio for a more complete combustion.

The final scores for Neal & Associates and Holman Boiler Works differ by only 0.0175, showing the high degree of competition between the two vendors. Had the criteria been weighted differently, Holman Boiler Works could very easily have been the optimal decision. For example, had the price criterion had a higher weight, of say 35% importance, then the outcome would no longer be in Neal & Associates favor.

Since the main goals of the EMP are to decrease NOx emissions and increase fuel efficiency, Neal & Associates provides the best burner to meet the facility requirements at the WCF. In addition to supporting a main goal of lowering NOx emissions, Neal & Associates will also lower CO emissions and virtually eliminate any by-products of O_2. There is also a 360 day warranty on labor and a 2 year warranty on the manufacturer's parts. The 22 days needed by Neal & Associates for project completion may be inflated to take into account the security checkpoints the company's installation crew will encounter every day. Neal & Associates has never had a contract with a secure Federal Agency and may have overestimated the time needed for these checkpoints.

5.1 Fuel Efficiency

A consensus of the boiler companies that have been surveyed demonstrated that installation of low NOx burners can provide a potential fuel reduction of up to 10% (Neal & Associates). Cost of gas over the past contract was $4.29 per MMBtu, the new contract (next 3-years) is at a cost of $6.10 per MMBtu; an increase of approximately 42%. The WCF has reviewed gas usage over the past year and determined the following benefit to the present project.

Peak usage for the consumption of natural gas are the months November through March, where an average of 11,272,000 cu/ft of natural gas and an average of 13,336.4 MMBtu is used per month (based on WCF Natural Gas Usage from 2003-2004). During this span, an average payment of $57,213.16 is needed for the cost of natural gas.

With the retrofitting of the Weishaupt burners, the WCF projects a reduction of 10% in fuel usage. This translates to a projected monthly average during peak usage (November through March) of 10,144,800 cu/ft. The low NOx burners are also projected to produce an average of 12,002.75 MMBtu during this five-month span, resulting in a savings of $5,721.32 according to the old contract of $4.29 per MMBtu. The savings under the new contract of $6.10 per MMBtu is $8,135.27 (resulting from $81,352.04 - $73,216.78).

With the price of natural gas expected to continue to increase and the price per MMBtu of the next contract expected to be even higher, any savings in fuel consumption will benefit the WCF.

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Appendix A:
Business Case Justification

BUSINESS CASE JUSTIFICATION FOR NON-IT CAPITAL INVESTMENTS
$500,000 AND UNDER
Retrofit Power Plant Boilers with Low NOx Burners

AMOUNT REQUIRED: $172,000

DESCRIPTION OF ASSET TO BE ACQUIRED:

The Bureau of Engraving and Printing (BEP, Bureau) is committed to the fact that environmental considerations must be a fundamental and integral component of its policies, operations, planning, and management.

The issuance of Executive Order (EO) 13148, *Greening the Government through Leadership in Environmental Management* (April 2000), established new goals and requirements for Federal agencies. The primary goal of the EO is to ensure an integration of environmental accountability into Federal agencies and their facilities. One primary means to this goal is the establishment of EMS's to provide a systematic approach to environmental management.

The WCF has developed an Environmental Management System and as a part of its EMS, two of the objectives the WCF has set are;

- Reduction of ozone precursor or greenhouse emissions
- Natural gas conservation

The Bureau of Engraving and Printing Western Currency Facility (WCF) maintains three (3) York-Shipley boilers for the generation of steam. Steam is utilized at the facility for heating requirements and, in conjunction with the facility chillers, to maintain required humidity throughout the facility, specifically in the production and currency storage areas.

The present project, Retrofit Power Plant Boilers with Low NOx Burners, has been identified as an Environmental Management Program (EMP) within the EMS. Its objectives are to reduce the generation and release of nitrous oxide (NOx) emissions and reduce natural gas consumption in the two larger, 35MMBTU/hr, boilers at the WCF. This will be done by retrofitting these boilers with low NOx burners and control systems allowing for more efficient operation by controlling the fuel to air ratio for a more complete combustion. The multi-flame burner technology that will be utilized allows a facility to reduce fuel consumption and emissions.

The specification, design and installation of the low NOx burners will include identification and project discussions with applicable vendors to determine the facility specifications and design requirements, development of a project budget and Request for Proposal (RFP) and installation logistics.

PURPOSE AND SCOPE:

Funds are requested to procure and install a Multi-Flame Burner system in two (2) boilers at the Bureau of Engraving and Printing Western Currency Facility. The retrofitting of the present 15-year old, aging burner systems will provide the WCF with a mechanism to reduce overall fuel (natural gas) consumption and reduce NOx emissions.

The scope of this project includes:

1. Disconnecting all burner piping and electricity from one York-Shipley 800-HP boiler
2. Removal of the existing burner from boiler
3. Removal of the disconnected burner from the building and proper disposal
4. Installation of new burner throat refractory
5. Rig and mount new burner onto boiler
6. Tie-in natural gas line, reconfiguring as required
7. Tie-in oil piping, reconfiguring as required
8. Tie-in electrical supply
9. Bring unit on-line, check for proper operation of all limits, controls, safeties, and interlocks
10. Set combustion to optimum efficiency on natural gas and #2 fuel oil
11. Furnish written combustion report
12. Repeat all steps for second burner installation

PROGRAM/BUSINESS REQUIREMENT SUPPORTED:

x Currency ___ Postage ___ Other

TYPE:

_____ New Technology/Requirement
_____ Replace Equipment
_____ Security/Safety
_____ Facility Improvements
_____ Reengineering, Business Process Change

STRATEGIC GOALS SUPPORTED:

Program Supported. This project will assist the Western Currency Facility in the environmentally safe manufacture of currency today and in the future by reaching the objectives and targets established by the WCF Environmental Management System. The EMS was developed and implemented to comply with Executive Order 13148.

Linkage to Bureau Strategic Plan and Performance Measures.

Strategic Goal X: Resource Management (Manage Bureau resources to increase internal efficiency and effectiveness in support of the other strategic goals.) A performance goal requires the BEP to "Strategically align Bureau policies, business plans, programs and resources to achieve meaningful business results and improve financial management."

This project will provide Multi-Flame low NOx burner technology to the two existing 800-horsepower York-Shipley boilers, increasing the boilers' economic efficiency through the reduction of natural gas consumption and reduce facility emissions of NOx.

PERFORMANCE MEASURES:

With this project, the following improvements will be realized:

1. Two low NOx burners will be retrofitted to the existing 800-horsepower York-Shipley boilers in the WCF's power plant.
2. A rotary damper with an air silencer to control combustion air volume.
3. A combustion control system to independently meter the fuel and air mixture, maintaining a precise fuel-to-air ratio for optimum combustion efficiency.
4. A burner-mounted control cabinet for ultraviolet flame supervision and motor starters with overload heaters.

These performance goals all work towards reducing NOx emissions, while improving economic efficiency of the facility.

RECOMMENDATION AND COST/BENEFIT ANALYSIS:

This capital investment proposes to address an economic and environmental improvement. A cost benefit analysis was prepared for this business case.

Cost and Milestones.

Initial Cost. The cost shown indicated on this business case is based on the tasks listed below. No design costs are required for implementation of this project.

Total price for both burners	$150,000.00
Installation of burners	$22,000.00
Total	$172, 00.00

Yearly Cost. The cost of $170,000 is the estimated yearly cost of the project for one year.

Milestones. The WCF has set the following milestones.

• Project Funding Complete by	August 2005
• Complete Design	October 2005
• Award Contract for Construction for Installation	December 2005
• Installation Completed	February 2006

PROJECT MANAGEMENT

Project Sponsor: Charlene Williams, Deputy Associate Director
Program Manager: Robert Hobbs, Manager, Facilities Management Division
System/Project Owner: Dennis Stark, Manager, Facilities Support Branch

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RISK – List the most significant risks associated with this project and the plans to mitigate such risks:

Procurement: An estimate of probable cost has been prepared by the BEP based on the Request For Proposals from two contractors, Holman Boiler Works Inc. and Neal & Associates Division. Cost of the project will be monitored and controlled with the design and specifications developed and the use of commercial products and materials. Competitive bidding will insure that the BEP will receive fair and equitable pricing for the work.

Production: Only minor impact on Production is expected. Contractor coordination with Currency Manufacturing Operations will be scheduled and ongoing throughout the project and will be managed to minimize interference. One boiler will be retrofitted at a time in order to minimize interruptions in the heat and steam supply to the WCF.

Technical: Improvements that are technically innovative include the low NOx burners being retrofitted to the existing boilers that employ stage combustion. This technology will increase the boilers cost efficiency and improve air pollution control. Technical risk will be mitigated by having the burners arrive completely assembled, wired, and factory tested.

Risk: The overall risk of investment failure is minimal. Most of the equipment involved is already in use. The new equipment uses technology that involves light risk of failure. To minimize risk, installation will be closely monitored and testing of the system will be thorough. There is a high probability of success as a result of employing proven technology at a fair and reasonable cost.

STAKEHOLDERS BENEFITED:

Internal Stakeholders. The internal stakeholders are BEP Facilities Management and all personnel at the Western Currency Facility.

External Stakeholders. External stakeholders include the U.S. Treasury Department and the Federal Reserve for their commitment to the safe manufacture of U.S. Currency.

IT COMPLIANCE – This project is in compliance with the following:

Enterprise Architecture Y___N___N/A_X__ **IT Security Requirements Y___N___N/A_X__**
IT Privacy Requirements Y___N___N/A_X_ **IT Certification Requirements Y___N___N/AX_**
IT Accreditation Requirements Y___N___N/A_X__

Approval by:

_____ _____
Kit A. Regone, Associate Directory **Date**

Appendix B:
Quotation from Neal & Associates

NEAL & ASSOCIATES DIV.

JOHN R. NEAL & ASSOCIATES, INC.
P.O. BOX 550127
Dallas, TX. 75355-0127
(214) 340-1464

Department of the Treasury
Bureau of Engraving and Printing
Ft. Worth, Texas 76131
Attn: Michael Byington

- QUOTATION -

Date: April 11, 2005

Reference: 800 Hp Weishaupt Burners

IMPORTANT! → **Issue ORDER to:**

Prices do not include applicable sales or use tax. Quoted
Prices are current; subject to manufacturer's price changes.
Conditions of sale. See attached Exhibit 'A'.

Terms: **NET 30 DAYS FROM INVOICE DATE**

NEAL & ASSOCIATES DIV.
P.O. BOX 550127
DALLAS, TX. 75355-0127

The following is submitted for your evaluation and consideration:

We will furnish the following Weishaupt burner for your consideration, based on the following technical data; York Shipley Firetube boiler 800 HP Steam 15 psig, 31,500,00 BTU/Hr firing rate,Chamber Length 26' 2" Installed in Ft. Worth Texas approximately 1000' ASL, Modulating operation, horizontal mounted, 460/3/60 main voltage, Star/Delta, Control voltage 120/1/60, Firing natural gas 224" W.C. 1000 BTU Calorific value, secondary fuel is #2 fuel oil, supply pressure < 70 psig with a calorific value of 140,000 BTU.

BURNER AND ACCESSORIES

1 ea. RGL70/2-A, 3LN low Nox modulating natural gas, modulating #2 oil burner
1 ea. Add for Autoflame burner size RGL-70 requires next two items
2 ea. Small servomotors
3 ea. Large servomotors.

CONTROLS AND ACCESSORIES

1 ea. Remote mounted control panel: applicable to: RGL burner – size 70/2, voltage 460 v, 3 ph, 60 hz, star/delta motor starter
1 ea. Autoflame – MK6 module – for gas and #2 oil burner, C/W J Autoflame manual, additional copies are extra
1 ea. Autoflame – MK 6, High sensitivity UV scanner
1 ea. Autoflame – pressure sensor, 0-267 psig (0-18 bar) field wiring not included
1 ea. Autoflame add for gas/#2 oil operation
1 ea. Alarm horn with silencing switch (good for 1 fault, each additional fault requires 97-0044 – dry contact relay
1 ea. Main isolation switch & indicating light – 80 A – unfused

NEAL & ASSOCIATES DIV.
JOHN R. NEAL & ASSOCIATES, INC.
P.O. BOX 550127
Dallas, TX. 75355-0127
(214) 340-1464

Department of the Treasury
Bureau of Engraving and Printing
Ft. Worth, Texas 76131
Attn: Michael Byington

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Terms: **NET 30 DAYS FROM INVOICE DATE**

NEAL & ASSOCIATES DIV.
P.O. BOX 550127
DALLAS, TX. 75355-0127

The following is submitted for your evaluation and consideration:

GAS TRAIN AND ACCESSORIES

1 ea. 3" Seimens SKP10 + SKP20, IRI gas train
1 ea. Gas train connection flange 3" with connection parts
1 ea. Pilot gas train, 1", NFPA, IRI above 0.4 MMBH pilot firing rate,
1 ea. Assembled gas train – (Main Gas Only, pilot shipped as components only) 3"
1 ea. Gas train "Main" wired to junction box – Junction box mounted onto gas train, 1 length of conduit attached to junction box for pilot 12 ft. & 3 x conduit fittings shipped loose

OIL TRAIN ACCESSORIES

1 ea. Oil pressure gauge and shut off, 0-600 psi c/w RM to MPT adaptor (either for pump pressure or return pressure)
1 ea. Oil pressure gauge and shut off, 30-160 psi c/w RM to FPT adaptor
1 ea. 1" NPT oil hose adaptors > size 8

Expected performance:

- 10-1 Turndown natural gas
- 8-1 Turndown #2 fuel oil
- 30 ppm NOx natural gas
- 120 ppm NOx #2 fuel oil

3% O_2 across entire firing rate natural gas

a) Burner Housing:
Cast aluminum burner housing
Construction - Separate combustion fan Finish - Powder Paint, High Gloss, Resilient, Baked Enamel
Removable cover to provide access for service Differential air pressure switch

NEAL & ASSOCIATES DIV.

JOHN R. NEAL & ASSOCIATES, INC.
P.O. BOX 550127
Dallas, TX. 75355-0127
(214) 340-1464

Department of the Treasury
Bureau of Engraving and Printing
Ft. Worth, Texas 76131
Attn: Michael Byington

- QUOTATION -

Date: April 11, 2005

Reference: 800 Hp Weishaupt Burners

IMPORTANT! → **Issue ORDER to:**

Prices do not include applicable sales or use tax. Quoted
Prices are current; subject to manufacturer's price changes.
Conditions of sale. See attached Exhibit 'A'.

Terms: **NET 30 DAYS FROM INVOICE DATE**

NEAL & ASSOCIATES DIV.
P.O. BOX 550127
DALLAS, TX. 75355-0127

The following is submitted for your evaluation and consideration:

Observation port provided for viewing the flame

b) Air Intake:
Multiple louvers, pressure side of the fan
Air louver(s) controlled by single linkage from cam

c) Combustion Head:
Stainless steel alloy flametube
Stainless steel alloy diffuser assembly
Flametube and diffuser assembly capable of withstanding 1475° F
Diffuser, ignition electrodes, mixing assembly (and oil nozzle(s) if applicable) are accessible and can be removed without removing the burner
Gas butterfly valve an integral part mounted directly onto the burner housing
Gas butterfly valve equipped with a return spring to close the valve when the linkage is disconnected
Combustion head does not require to be, and must not be cast in refractory
Automatic moving diffuser assembly between low and high fire to maximize mixing pressure
1" N.P.T. Pilot Gas Train IRI Approved (Shipped Loose)
#2 Oil Pump and Motor on Frame to include Oil Pressure Gauges & Shut Off Valve
Oil Hoses and Adapters

d)

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DALLAS, TX. 75355-0127

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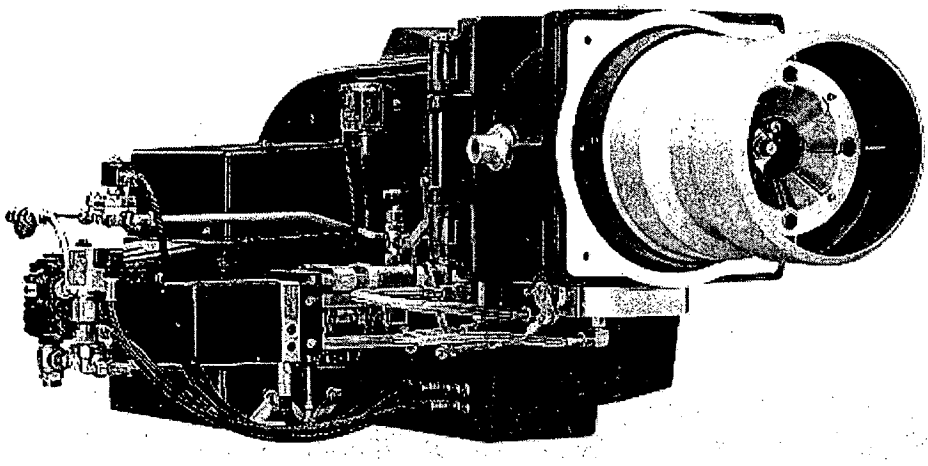

Total price for the above described burner..... $ 74,541.00 per burner
Plus any applicable taxes

F.O.B. Weishaupt Corporation, Mississauga, Ontario
Terms net 30 days
Delivery 6-12 weeks ARO

WARRANTY – Weishaupt parts 2 years
WARRANTY – Non Weishaupt parts as per manufactures warranty
This quotation is subject to final technical approval by Weishaupt engineering department
If the combustion chamber dimensions are smaller than recommended, full firing rate cannot be guaranteed
Delivery – Shop drawings 2-3 weeks from receipt of order
Delivery – Equipment delivery is 6-12 weeks from receipt of approved shop drawings
Confirmation of delivery is given upon receipt of order

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P.O. BOX 550127
DALLAS, TX. 75355-0127

The following is submitted for your evaluation and consideration:

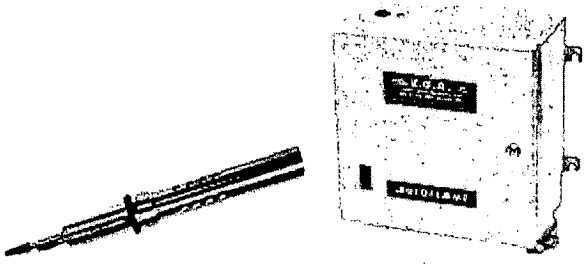
Installation of the burner

Removal of the existing burner, and installing the new burner, complete with commissioning of the Autoflame control system, Startup, setting combustion and owner training.

Total labor cost.....$ 22,400.00

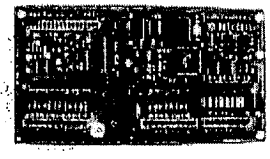
OPTIONS

Autoflame EGA Exhaust Gas Analyzer with sampling probe.....$ 9,442.00



Total labor to install the EGA.....$ 2,220.00

Autoflame Feedwater valve and actuator complete with capacitance probes (2), Probe bowl.....$ 8,459.22



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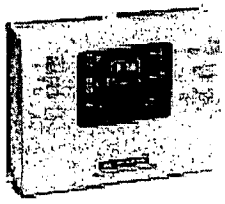
NEAL & ASSOCIATES DIV.
P.O. BOX 550127
DALLAS, TX. 75355-0127

The following is submitted for your evaluation and consideration:

Total labor charges to install the Feedwater bowl, probes and Feedwater valve.....$ 6,280.00

Autoflame DTI Data Transfer Interface.....$ 4,973.00



Labor to install the DTI has been included in the burner installation labor. But does not include the connecting of the DTI to any outside source.

Labor warranty is one year from date of startup, but does not include equipment warranty defects

If you have any questions or changes please give me a call.

Thank you

Louis Halfmann
Louis Halfmann
Neal & Associates Div.

NEAL & ASSOCIATES DIV.

JOHN R. NEAL & ASSOCIATES, INC.
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NEAL & ASSOCIATES DIV.
P.O. BOX 550127
DALLAS, TX. 75355-0127

The following is submitted for your evaluation and consideration:

Appendix C:
Budgetary Proposal
from
Holman Boiler Works Inc.

HOLMAN
BOILER WORKS INC.
"the Boiler Supermarket"
®

Colleen McKinney
EHS Branch Manager
BEP Western Currency Facility
9000 Blue Mound Road
Ft. Worth, Texas

April 12, 2005
Proposal No. BU0504-1001KJ
Tel: (817) 847-3820
Fax: (817) 847-3651
e-mail: Colleen.McKinney@bep.treas.gov

Subject: Budgetary Burner Retrofit Project – York-Shipley 800 HP Boilers (2ea) – Ft. Worth Facility

In accordance with your request, Holman Boiler Works, Inc. is pleased to submit the following budgetary proposal for your consideration.

Replace Existing Burners With ProFire Model PF-LNDG-378P-30, Gas/ #2 Fuel Oil Low NOx Burners

As a Cleaver-Brooks factory authorized sales and service representative, Holman Boiler Works will supply the materials, tools, labor, insurance and supervision to replace the existing burners on your York-Shipley 800 HP steam boilers. The new burners will be capable of firing natural gas and #2 fuel oil, and will reduce NOx emissions on natural gas below 30 PPM, with less than 50 PPM of CO, when corrected to 3% dry O2. The scope of supply and installation is as follows:

Scope Of Supply

We will provide two (2) Cleaver-Brooks Model PF-LNDG-378P-30 high efficiency forced-draft low NOx burners. The burners will be completely assembled, wired and factory tested. The burners will have the following characteristics:

1. The burners will be the high radiant multi-port type for gas, and the low pressure air atomizing type for oil, capable of burning ASTM D396 Grade No. 2 fuel oil at a maximum firing rate of 240 US GPH or 33,600 CFH of 1000 BTU/CF natural gas at a pressure of 7 PSIG at the inlet of the control train, with a minimum turndown ratio of 6:1.

2. Fuel changeover will be accomplished with a selector switch without any mechanical changes required when switching from one fuel to the other. The burner will be capable of firing against a furnace pressure from -.05" WC to +4.0WC without reduction in capacity or efficiency.

3. The blower motor to be 75 HP, 3450 RPM, 480/60/3-phase, directly driving a backward-curved impeller.

4. Combustion air volume will be controlled by an integral linear flow characterized rotary-type damper with an air silencer. The rotary damper will be counter-balanced and equipped with quick-connect ball joints. The burner air housing will be hinged to swing away allowing easy access to the burner head components including the diffuser. Neither fuel lines nor electrical wiring will require disconnection when opening the hinged assembly.

5. The burner-mounted control cabinet will include a Fireye E-110 Micro-processing Burner Controller for ultra-violet flame supervision, motor starters with overload heaters and 3-leg protection for 3-phase motors, ignition transformer, operating switches, signal lights and color-coded wiring. The control circuit transformer will be 120/60/1.

6. The combustion control system will incorporate a Fireye **NEXUS** Integrated Burner Control System, using servo-motors to independently meter the fuel and air mixture, on either fuel, to maintain a precise fuel to air ratio for optimum combustion efficiency. Solid-state steam and fuel sensors will be included for accurate operating control.

1. The burners will include a flame observation port, automatic oil safety shutoff valve, low pressure air atomizing nozzle, low atomizing air pressure switch and burner oil strainer.

2. Ignition will be of the interrupted gas-electric type. A pilot shut-off cock, gas pressure regulator and automatic pilot gas valve will be provided for each burner.

3. The burner will include all necessary safety shutoff valves, manual shutoff valves, high and low gas pressure switches, pressure regulator, N.O. vent valve and pressure gauge.

10. The low-pressure air-oil atomizing system will include a volumetric piston-type oil metering device. The device will be burner-mounted and driven by a separate motor. A low-pressure air compressor of the force-free, pressure-lubricated, rotary vane type will be mounted on a separate module. A solid-state oil level control with signal light will be provided to indicate low compressor lubricating oil.

4. A #2 fuel oil circulating pump, with contactor and starter, will be provided.

5. A natural gas flow meter will be included with each gas train for usage totalization.

Scope Of Installation

We propose to install the above Cleaver-Brooks Profire Low NOx Burners, as follows:

1. Mobilize and travel to job site.
2. Disconnect all burner piping and electrical from one (1) York-Shipley 800 HP boiler.
3. Rig and remove existing burner from boiler, remove from building.
4. Remove existing burner refractory and dispose of in customer supplied dumpster.
5. Modify burner mounting plate, as required for installation of new burner.
6. Properly install new burner throat refractory.
7. Rig and mount new Cleaver-Brooks burner onto boiler.
8. Tie-in natural gas line, reconfiguring as required.
9. Tie-in oil piping, reconfiguring as required.
10. Tie-in electrical supply.
11. Bring unit on-line, check for proper operation of all limits, controls, safeties and interlocks.
12. Set combustion to optimum efficiency on natural gas and #2 fuel oil.
13. Furnish written combustion report.
14. Repeat all steps for second burner installation.

Budgetary Price

Total budgetary price for the supply and installation of two (2) new Cleaver-Brooks Profire burners, as described in the above scope of installation and supply, **$170,000.00.** This proposal is firm for thirty (30) days. We reserve the right to adjust pricing based upon the current materials and/or equipment costs at the time of Purchase Order.

Payment Terms

Payment terms are to be negotiated, prior to acceptance of the order.

Delivery

Delivery is estimated at 6-8 weeks ARO. Installation can be scheduled promptly upon arrival of new burners at our Dallas, TX facility.

Warranty

We offer the manufacturer's warranty on parts and materials, plus a ninety (90) day Holman Boiler Works, Inc. warranty on labor.

Notes

1. Pricing is based upon working five (5) 10-hour working days, Monday through Friday, with no work on weekends. Project completion (including operator training) is estimated at 11 working days, per burner.
2. The boiler to be retrofitted shall be offline upon arrival by Holman Boiler Works, Inc. personnel.
3. Holman Boiler Works, Inc. to furnish forklift.
4. Customer is to provide adequate power and disconnect.
5. Customer is to confirm voltage, natural gas pressure, and oil loop pressure.
6. Asbestos removal and/or encapsulation are excluded from this proposal.
7. This proposal does not include any repairs/replacements discovered to be necessary during the above scope of work. Any additional repairs/replacements will be performed on a time and materials basis, upon written approval by BEP personnel.
8. Piping insulation is not included in this proposal.
9. Roof and/or wall penetrations and sealing are excluded from this proposal.
10. Customer is to provide suitable trash dumpster.

Any order will be predicated upon the acceptance of Holman's standard Terms and Conditions of Sale.

Holman Boiler Works, Inc.
1956 Singleton Blvd.
Dallas, Texas 75212
Fax: 214-631-2742

TACL NO. A015490C

"Regulated by The Texas Department of Licensing and Registration, P.O. Box 12157, Austin, TX 78711, 1/800-803-9202."

We hope this budget proposal may serve as a solution to your current boiler needs, and we at Holman Boiler Works look forward to a long business relationship with BEP Western Currency. Please call us at 214-637-0020, if you have any questions or require additional information.

Submitted by: Ken Johansen, P.E.
Holman Boiler Works Inc.
Dallas, Texas

See additional attachments

Appendix D:
WCF Natural Gas Usage

WCF Natural Gas Usage

	Boiler #1	Boiler #2	Boiler #3	*Monthly Total Consumption
	2003 BOILER TOTALS*			
AUG	1,001,000	11,000	3,398,000	4,410,000
SEP	1,581,000	214,000	2,020,000	3,815,000
OCT	2,431,000	782,000	237,000	3,450,000
NOV	5,773,000	2,237,000	60,000	8,070,000
DEC	11,322,000	25,000	5,000	11,352,000
	2004 BOILER TOTALS*			
JAN	12,562,000	4,000	19,000	12,585,000
FEB	12,861,000	46,000	7,000	12,914,000
MAR	11,405,000	30,000	4,000	11,439,000
APR	7,946,000	21,000	4,000	7,971,000
MAY	6,614,000	0.28	4,000	6,618,000
JUN	2,046,000	0	578,000	2,624,000
JUL	6,235,000	0	0	6,235,000

*cu/ft

SERVICE:	MMBTU	TIGER (J03-00018)
Aug. 03	6,936	$32,037.72
Sep. 03	7,355	$31,552.95
Oct. 03	8,281	$35,525.49
Nov. 03	10,486	$44,984.94
Dec.03	13,441	$57,661.89
Jan. 04	15,063	$64,620.27
Feb. 04	15,214	$65,268.06
Mar. 04	12,478	$53,530.62
Apr. 04	9,860	$42,299.40
May. 04	8,688	$37,271.52
Jun. 04	8,765	$37,601.85
Jul. 04	8,848	$37,957.92
Aug. 04	8,477	
Sep. 04	8,418	

2002 - 2003 NATURAL GAS

	TIGER (J03-00018)	LONE STAR (J03-00020) MIN. PUR.	DIST. FEE
OCTOBER	$26,302.26	$2,440.15	$6,191.29
NOVEMBER	$38,399.79	$2,698.80	$7,650.75
DECEMBER	$54,585.96	$2,864.96	$10,892.71
JANUARY	$65,675.61	$2,995.04	$13,514.22
FEBRUARY	$52,097.76	$3,517.11	$11,710.18
MARCH	$53,419.08	$5,011.02	$11,381.31
APRIL	$39,948.48	$4,649.06	$9,104.59
MAY	$36,005.97	$4,630.48	$7,869.65
JUNE	$34,139.82	$4,417.65	$7,729.82
JULY	$27,872.13	$4,459.91	$6,224.39
AUGUST	$32,037.72	$4,176.90	$6,781.25
SEPTEMBER			
	$460,484.58	$41,861.08	$99,050.16